

COLD-RESISTANT BATTERY HOUSING DESIGN PATENT

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Assignee: Polar Dynamics Robotics, Inc.

ABSTRACT

A cold-resistant battery housing assembly for autonomous mobile robots (AMRs) operating in sub-zero environments, comprising a multi-layer thermal isolation structure with active temperature regulation capabilities. The design enables continuous operation in temperatures as low as -40°C.

battery performance in environments ranging from -40 C to +25 C through the implementation of proprietary thermal management technology.

BACKGROUND OF INVENTION

[0001] Autonomous mobile robots operating in cold storage and industrial environments face significant challenges related to battery performance and longevity. Traditional battery housings fail to maintain optimal operating temperatures in sub-zero conditions, resulting in reduced capacity, shortened lifecycle, and compromised safety.

[0002] This invention addresses these challenges through an innovative multi-layer housing design incorporating active thermal management and proprietary insulation materials.

SUMMARY OF INVENTION

[0003]-The present invention provides a cold-resistant battery housing comprising:

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An outer shell constructed of impact-resistant composite materials

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Multiple layers of vacuum-sealed thermal isolation chambers

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Active heating elements integrated within intermediate layers

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Temperature sensors and regulatory control systems

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Proprietary BlueCore(TM) thermal management interface

DETAILED DESCRIPTION

Construction and Materials

[0004] The outer shell utilizes a proprietary carbon-fiber composite (P specifically engineered for thermal isolation and impact resistance in s environments. The shell's molecular structure maintains structural integrity at temperatures as low as -65 C.

[0005] Internal thermal isolation chambers employ vacuum-sealed technology with multiple redundant sealing mechanisms to prevent thermal transfer between battery cells and external environment.

Thermal Management System

[0006] The active thermal management system comprises:

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Distributed heating elements rated for 24V DC operation

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Temperature sensors positioned at strategic points within the housing

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Microprocessor-controlled regulation system

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Emergency thermal shutdown capabilities

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Real-time temperature monitoring and reporting

Integration Features

[0007] The housing assembly includes:

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Quick-release mounting brackets compatible with standard AMR platf

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Sealed electrical connections rated IP67 for extreme environment operation

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Diagnostic port for system monitoring and maintenance

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Emergency access panels with redundant safety mechanisms

CLAIMS

A cold-resistant battery housing assembly comprising:

- a. An outer shell constructed of thermally-isolated composite material
- b. Multiple vacuum-sealed chambers for thermal isolation
- c. Integrated heating elements for active temperature management
- d. Electronic control systems for thermal regulation
- e. Emergency safety systems and monitoring capabilities

The battery housing assembly of claim 1, wherein the thermal management system includes a heat sink and a fan.

The battery housing assembly of claim 1, wherein the outer shell comprises a first shell and a second shell.

DRAWINGS

[0008] Figure 1: Exploded view of housing assembly showing layered structure.

[0009] Figure 2: Cross-sectional view depicting thermal isolation channels.

[0010] Figure 3: Schematic of electronic control system.

[0011] Figure 4: Integration diagram showing mounting system.

INVENTOR INFORMATION

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DECLARATION

I hereby declare that all statements made herein of my own knowledge and that all statements made on information and belief are believed to be true and further that these statements were made with the knowledge that false statements and the like so made are punishable by fine or imprisonment, both, under Section 1001 of Title 18 of the United States Code.

/s/ Dr. James Barrett

Chief Robotics Officer

Polar Dynamics Robotics, Inc.

Date: March 15, 2023

