

COLD CLIMATE MOBILITY SYSTEM PATENT

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Assignee: Polar Dynamics Robotics, Inc.

ABSTRACT

A system and method for autonomous mobile robot operation in sub-z

environments, comprising a temperature-hardened navigation system, chassis design, and proprietary power management architecture. The enables reliable robotic mobility in extreme cold conditions through integrated thermal management, cold-resistant sensor arrays, and adaptive control algorithms optimized for low-temperature performance.

BACKGROUND OF INVENTION

[0001] Autonomous mobile robots (AMRs) operating in cold storage and freezer environments face significant challenges related to battery performance, sensor reliability, and mechanical system operation at sub-zero temperatures. Conventional AMR designs experience degraded performance below freezing, including reduced battery capacity, compromised sensor accuracy, and increased mechanical resistance.

[0002] This invention addresses these challenges through an integrated

to cold-environment operation, incorporating novel thermal management techniques, specialized materials selection, and adaptive control systems.

SUMMARY OF INVENTION

[0003] The present invention provides a cold climate mobility system comprising:

- A thermally-isolated power system with active temperature regulation
- Multi-modal sensor array with redundant cold-resistant components
- Reinforced chassis design utilizing low-temperature composite materials
- Proprietary BlueCore(TM) navigation and control architecture
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Adaptive power management system for sub-zero operation

DETAILED DESCRIPTION

[0004] Power System

The system incorporates a dual-chamber battery enclosure with active thermal management. Primary lithium-ion cells are maintained at optimal operating temperature through a combination of passive insulation and active heating elements. Power delivery is regulated through proprietary algorithms that dynamically optimize performance based on ambient conditions.

[0005] Sensor Array

The multi-modal sensor system comprises:

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Heated LIDAR units with protective housings

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Redundant temperature-hardened cameras

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Cold-resistant proximity sensors

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Thermal imaging capabilities for environmental mapping

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Proprietary sensor fusion algorithms

[0006] Chassis Design

The reinforced chassis utilizes:

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Carbon fiber composite structural elements

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Low-temperature lubricants and bearings

- - 5 -

Thermally-isolated drive components

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Impact-resistant exterior panels

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Modular component architecture

[0007] Navigation System

The BlueCore(TM) navigation architecture features:

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Real-time environmental condition monitoring

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Adaptive path planning algorithms

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Dynamic speed control based on surface conditions

- - 6 -

Predictive maintenance scheduling

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Remote monitoring capabilities

CLAIMS

A cold climate mobility system comprising:

- a) A thermally-regulated power system
- b) Multi-modal sensor array
- c) Reinforced chassis design
- d) Adaptive control architecture
- e) Environmental monitoring systems

The system of claim 1, wherein the power system maintains operation

The system of claim 1, wherein the sensor array provides redundant e

The system of claim 1, wherein the chassis design enables operation

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ASSIGNMENT RECORD

All rights, title, and interest in this patent have been assigned to Polar Dynamics Robotics, Inc., a Delaware corporation, as recorded in the U.S. Patent Assignment Database on April 1, 2022.

MAINTENANCE FEES

First maintenance fee due: March 15, 2026

Second maintenance fee due: March 15, 2030

Third maintenance fee due: March 15, 2034

CERTIFICATION

I hereby certify that this patent document accurately reflects the invention registered with the United States Patent and Trademark Office.

/s/ Victoria Wells

Chief Financial Officer

Polar Dynamics Robotics, Inc.

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