COLD-ENVIRONMENT SERVO MOTOR DESIGN PATENT

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Assignee: Polar Dynamics Robotics, Inc.

ABSTRACT

A servo motor system specifically designed for reliable operation in extreme cold environments, comprising a thermally-isolated housing assembly, cold-resistant lubricant circulation system, and proprietary magnetic field compensation mechanisms enabling consistent torque delivery at temperatur ranging from -40°C to +25°C. The system incorporates novel thermal manage features and specialized materials to maintain precision control in sub-zero industrial environments.

BACKGROUND OF INVENTION

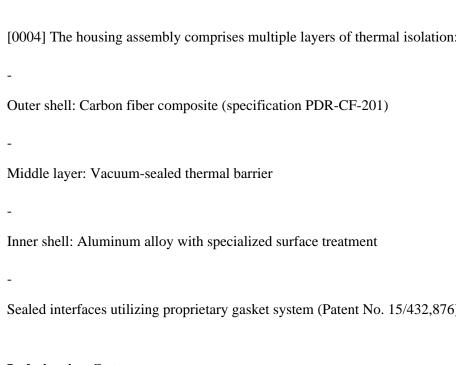
[0001] Conventional servo motors experience significant performance degra in cold environments due to increased viscosity of lubricants, thermal contraction of components, and altered magnetic field characteristics. This invention addresses these challenges through innovative design elements specifically engineered for cold-environment operation.

[0002] Prior art solutions have failed to adequately address the combined challenges of thermal isolation, consistent lubrication, and magnetic field stability in extreme cold conditions, particularly in automated mobile robotic

applications requiring precise position control.
SUMMARY OF INVENTION
[0003] The present invention provides a servo motor system comprising:
- A thermally-isolated housing assembly utilizing composite materials with lo
- A pressurized lubricant circulation system incorporating proprietary cold-res
- Magnetic field compensation mechanisms adjusting field strength based on t
- Integrated temperature monitoring and adaptive control systems
- Specialized bearing assemblies designed for extreme cold operation

DETAILED DESCRIPTION

Housing Assembly



Lubrication System

[0005] The lubrication system incorporates:
-
Synthetic lubricant compound PDR-L100 rated for -50°C operation
-
Pressurized circulation system maintaining 2.4 MPa at operating temperature
-
Filtered recirculation with debris monitoring
-
Temperature-compensated viscosity control
Magnetic Field Management
[0006] The magnetic system includes:
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Neodymium magnets with temperature-specific coating

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Active field strength compensation using Hall effect sensors

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Microprocessor-controlled field adjustment algorithms

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Thermal monitoring and feedback control loop

CLAIMS

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A cold-environment servo motor system comprising:

- a. A thermally-isolated housing assembly
- b. A pressurized lubricant circulation system
- c. Temperature-compensated magnetic field control
- d. Integrated thermal management systems

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The system of claim 1, wherein the housing assembly comprises multiple lay

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The system of claim 1, wherein the lubricant circulation system maintains pr

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The system of claim 1, wherein the magnetic field control system actively ac

DRAWINGS

[0007] Figure 1: Cross-sectional view of housing assembly

[0008] Figure 2: Lubrication system schematic

[0009] Figure 3: Magnetic field compensation diagram

[0010] Figure 4: Control system architecture

INVEÑTORS

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ASSIGNMENT

The inventors hereby assign all right, title, and interest in this patent application to Polar Dynamics Robotics, Inc., a Delaware corporation, include the right to file corresponding patent applications in foreign countries and claim priority therefrom.

DECLARATION

I hereby gleclare that I am the original inventor of the subject matter which is claimed and for which a patent is sought; that I have reviewed and understan

the contents of this application; and that all statements made herein are true

and further that these statements were made with the knowledge that willful

false statements are punishable by fine or imprisonment, or both, under Section

1001 of Title 18 of the United States Code.

Executed on: March 15, 2022

Dr. James Barrett

Marcus Chen



