

PATENT: LOW-TEMPERATURE LUBRICANT COMPOSITION

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Assignee: Polar Dynamics Robotics, Inc.

ABSTRACT

A composition and method for lubricating mechanical components in extreme low-temperature environments, specifically designed for autonomous mobile

operating in sub-zero conditions. The lubricant composition comprises a synthetic base oil mixture, proprietary cold-flow improvers, and nano-scale friction modifiers that maintain operational viscosity and lubricity at temperatures ranging from -40°C to -5°C.

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to lubricant compositions specifically engineered for use in autonomous mobile robots operating in cold storage and industrial freezer environments. More particularly, the invention pertains to a novel lubricant formulation that maintains optimal viscosity and performance characteristics at temperatures below -30°C.

Description of Related Art

[0002] Conventional industrial lubricants typically experience significant viscosity increases and performance degradation at low temperatures, leading to increased power consumption and potential mechanical failure in automated systems. Prior attempts to address this challenge have failed to achieve both consistent viscosity control and adequate wear protection below -25°C.

SUMMARY OF THE INVENTION

[0003] The present invention provides a low-temperature lubricant composition comprising:

- 65-75% synthetic polyalphaolefin base oil
- 15-20% proprietary cold-flow improver compound
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5-10% nano-scale molybdenum friction modifier

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2-5% viscosity index improver

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1-3% anti-wear additives

[0004] The composition maintains a kinematic viscosity between 20-30 cSt at -40°C while providing superior wear protection and energy efficiency in autonomous mobile robot applications.

DETAILED DESCRIPTION

Composition Components

[0005] The base oil mixture consists of specially selected synthetic polyalphaolefins with molecular weights optimized for low-temperature fluid

The proprietary cold-flow improver compound (Patent Pending, Application 63/123,456) contains modified polymethacrylate derivatives that prevent wax crystallization at extreme low temperatures.

Performance Characteristics

[0006] The lubricant composition demonstrates:

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Pour point below -45°C

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Start-up torque reduction of 40% compared to conventional lubricants

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Wear protection equivalent to standard lubricants at room temperature

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Extended drain intervals up to 2,000 operating hours

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Compatibility with common seal materials and metallic surfaces

CLAIMS

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A lubricant composition for low-temperature applications comprising:

- a) 65-75% synthetic polyalphaolefin base oil;
- b) 15-20% cold-flow improver compound;
- c) 5-10% nano-scale friction modifier;
- d) 2-5% viscosity index improver; and
- e) 1-3% anti-wear additives.

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The composition of claim 1, wherein said composition maintains kinematic v

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A method of lubricating mechanical components in autonomous mobile robots

DRAWINGS

[Figure 1: Viscosity vs. Temperature Performance Curve]

[Figure 2: Wear Protection Test Results]

[Figure 3: Chemical Structure of Cold-Flow Improver]

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ASSIGNMENT RECORD

This patent is assigned to Polar Dynamics Robotics, Inc., a Delaware corporation, as recorded in the USPTO Assignment Database on October 15, 2023, reel/frame 045123/0789.

MAINTENANCE FEES

First maintenance fee due: March 21, 2025

Status: Not yet payable

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