EXTREME ENVIRONMENT USER INTERFACE PATENT

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UNITED STATES PATENT APPLICATION NO. 16/78

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TITLE OF INVENTION:

System and Method for Temperature-Resistant Human-Machine Inter

Industrial Environments

APPLICANT:

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INVENTORS:

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ABSTRACT

A system and method for implementing user interface controls operab

cold environments, comprising a temperature-hardened touchscreen

cold-resistant haptic feedback mechanisms, and thermally-isolated ele
components capable of maintaining functionality in ambient temperatu
from -40 C to +50 C. The invention includes proprietary coating techn
specialized conductive materials, and adaptive sensitivity algorithms t
enable consistent touch response while wearing insulated protective e

BACKGROUND OF INVENTION

[001] Industrial automation systems operating in cold storage environm
significant challenges related to user interface reliability and accessibi
Conventional touchscreen and control interfaces typically fail or exhib
degraded performance in sub-zero temperatures due to component li
material properties.

[002] Existing solutions require separate heated enclosures or suffer f
reduced sensitivity when operators wear protective gear, creating inef

and safety concerns in cold chain operations.

DETAILED DESCRIPTION

1. System Components

[010] The extreme environment user interface comprises:

a) A reinforced display assembly utilizing proprietary BlueCore(TM) temperature-resistant LCD technology

b) Capacitive sensing array with dynamic calibration for gloved operat

c) Thermally-isolated control board housing with vacuum-sealed comp

d) Integrated heating elements with power-optimized activation protoc

e) Environmental monitoring sensors and adaptive performance contr

2. Material Specifications

[020] The interface employs specialized materials including:

a) Carbon-nanotube enhanced conductive layers

b) Ceramic-polymer composite substrates

c) Low-temperature elastomeric seals

d) Thermally-conductive interface compounds

e) Impact-resistant polycarbonate exterior

3. Operating Parameters

[030] The system maintains full functionality within:

a) Temperature range: -40 C to +50 C

b) Humidity: 0-100% non-condensing

c) Impact resistance: IK08 rating

d) Ingress protection: IP65

e) Operating voltage: 12-24V DC

4. Novel Features

[040] Key innovations include:

a) Adaptive sensitivity algorithms that automatically adjust to varying g
thicknesses

b) Power-efficient selective heating of critical components

c) Redundant input validation to prevent false triggers

d) Self-diagnostic capabilities with predictive maintenance alerts

e) Wireless firmware updates via encrypted protocols

CLAIMS

A temperature-hardened user interface system comprising:

a) A touch-sensitive display operable in sub-zero environments

b) Thermal isolation mechanisms for electronic components

c) Adaptive input processing for insulated operator interaction

d) Environmental monitoring and performance optimization controls

The system of claim 1, wherein the touch-sensitive display maintains

The system of claim 1, further comprising proprietary coating technolo

[Claims 4-20 continued...]

DRAWINGS

[Reference to attached technical drawings showing system componen
details]

DECLARATION

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

Executed on: March 15, 2021

By: /s/ Marcus Chen

Chief Technology Officer

Polar Dynamics Robotics, Inc.

POWER OF ATTORNEY

The undersigned hereby appoints Davidson & Wright LLP, Registratio
as attorney of record with full power of substitution and revocation to
prosecute this application and transact all business in the Patent and
Office connected therewith.

Executed on: March 15, 2021

By: /s/ Victoria Wells

Chief Financial Officer

Polar Dynamics Robotics, Inc.