

UNITED STATES PATENT AND TRADEMARK OFFICE

PROVISIONAL PATENT APPLICATION

TITLE OF THE INVENTION

ADVANCED MODULAR ALL-WEATHER HEADGEAR AND SMART SURVIVAL ECOSYSTEM WITH FLUIDIC ENERGY HARVESTING, ACTIVE STABILIZATION, AND CRYPTOGRAPHIC TELEMETRY (AIR HEADZ)

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FIELD OF THE INVENTION

The present invention relates generally to protective headgear, cold-weather apparel, and wearable telemetry platforms. More particularly, it relates to an all-weather soft-crash headgear apparatus incorporating an adjustable pneumatic bladder matrix, active thermal breath-recycling conduits, moisture-purging facial vents, an eyewear retention system, a fluidically stabilized self-charging camera and sensor payload, and an integrated LifeLine emergency mesh-network node secured by the Jamatcha cryptographic protocol (bridging into USPTO Patent #12,333,564).

BACKGROUND OF THE INVENTION

Attempting to maintain safety, thermal comfort, clear vision, and reliable communication in extreme cold-weather and high-action environments presents significant engineering challenges. Traditional rigid alpine helmets often cause friction for users who are adverse to wearing conventional protective headgear due to discomfort, aesthetic concerns, severe weight, helmet hair, or overheating. Furthermore, rigid helmets can transfer violent kinetic energy directly to the skull during collisions with obstacles like trees or ice, failing to cushion local blunt-force impacts. High-profile sports tragedies highlight the urgent, unresolved need for comfortable, widely adoptable headgear that mitigates blunt-force trauma across critical areas of cranial vulnerability.

In addition to impact risks, extreme cold activity creates severe thermodynamic and physiological problems:

Moisture Accumulation & Freezing: Exhaled human breath (naturally expelled at 98°F or higher with substantial moisture content) becomes trapped inside traditional closed-face balaclavas or face masks. This trapped condensation leads to internal freezing, skin irritation, facial blemishes, and unsanitary moisture buildup (e.g., saliva and mucus accumulation).

Eyewear Fogging & Loss: Trapped breath escapes upward through the top of conventional face coverings, directly fogging ski goggles or sunglasses. During high-impact falls, expensive eyewear is frequently ripped off and lost or causes facial injury if knocked out of position.

Muffled Communication in Disasters: Standard fabric masks muffle human speech, preventing clear communication in lift lines or emergency scenarios (e.g., when a skier is buried in an avalanche, tree well, or snowdrift).

Power Depletion & Video Distortion in Cold: Electronic equipment (action cameras, GPS trackers, emergency beacons) rapidly drains its battery in freezing ambient temperatures. Furthermore, video capture during extreme action suffers from violent camera shake, while standard standalone beacons lack active threat detection or human verification protocols.

Therefore, a comprehensive, multi-layered solution is needed that unifies physical soft-impact cushioning, thermal breath management, anti-fogging eyewear retention, active video stabilization, multi-modal kinetic/thermal energy harvesting, and cryptographically verified emergency telemetry into a single wearable ecosystem.

SUMMARY OF THE INVENTION

The present invention overcomes the limitations of existing alpine headgear and standalone action electronics by providing an all-weather modular headgear system (Air Headz) integrated with a multi-modal fluidic suspension engine and smart survival telemetry.

Physical and Thermal Features:

Pneumatic Soft-Crash Protection: Features an internal, rechargeable air bladder matrix sculpted to cover critical areas of cranial vulnerability (forehead, temples, carotid artery, ears, base of skull). An integrated neck pump valve allows the user to adjust the pneumatic pressure on the go to achieve a custom ergonomic fit and variable impact attenuation.

Aero-Therm Breath Recycling Conduit: Captures exhaled 98°F body heat and actively channels the warm air through engineered internal conduits across the ear canals for frostbite prevention, while venting warmed air across the eyewear boundary to permanently eliminate lens fogging.

Hydro-Purge Venting Array: Incorporates a lower facial vent and no-drool moisture drain that isolates and expels saliva, mucus, and condensed breath directly into the ambient environment, keeping the inner lining completely dry.

Opti-Lock Eyewear Loss Prevention: Integrates a quick-release rear retention loop that securely anchors goggle or sunglass straps to the back of the headgear, holding eyewear safely in place both during active use and when resting off the face.

Glide-Seal Clasp & Modular Configurations: Utilizes a glove-friendly, non-freezing soft-zipper closure allowing open-face, pinned-back lapel, or full-coverage balaclava configurations without metal hardware.

Digital, Optical, and Energy Recovery Features:

Fluidically Stabilized Smart Camera Payload: Suspends an inner camera module, directional microphone array, and Digital Signal Processor (DSP) inside a sealed fluid chamber filled with a magnetorheological colloidal suspension. The fluid acts simultaneously as a multi-axis vibration dampener for cinematic video capture and as a multi-modal energy harvester.

Nanoparticle Energy Recovery System: Infuses the suspension fluid with Colloidal Quantum Dots (CQDs) for photovoltaic light harvesting and thermoelectric nanoparticles (Bismuth Telluride) to convert body heat (98°F) and kinetic friction into continuous electrical current, maintaining trickle-charging to the battery in freezing weather.

Rear-Guard Threat Detection: The DSP processes real-time optical data to recognize rapidly approaching objects (e.g., sprinting wildlife, out-of-control skiers) breaching a predefined proximity perimeter behind the user, triggering localized haptic or audible alerts.

LifeLine Telemetry Node & Jamatcha Verification: Integrates 3-axis MEMS accelerometers, GPS, and Bluetooth/mesh-network transceivers. Secured by the Jamatcha cryptographic handshake (USPTO Patent #12,333,564), the node verifies human respiration and voice signatures via the acoustic facial vent before broadcasting an authenticated SOS geolocation beacon to first responders and remote AI networks (APE-X.ai) during avalanche or impact events.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 (System Architecture & Air Headz Ecosystem): Illustrates the base balaclava structure, internal inflatable bladder matrix, lower neck pump valve, Opti-Lock eyewear loop, open-face lapel configurations, and the Aero-Therm breath recycling conduits.

FIG. 2 (Thermal Recycling & Moisture Purge Mechanics): Detailed cross-sectional view of the lower facial venting array, showing the Hydro-Purge moisture drain, the Aero-Therm recycling tube directing exhaled 98°F air to the ear warmers, and the anti-fog goggle vent.

FIG. 3 (Fluidic Suspension & Camera Payload): Cross-sectional diagram of the inner camera module suspended in magnetorheological fluid within an outer housing lined with magnetic induction coils, illustrating real-time vibration amplitude reduction and trickle-charging pathways.

FIG. 4 (Digital Telemetry & Network Architecture): Schematic mapping signal flow from the image sensor and directional microphone array through the system DSP, Jamatcha cryptographic verification handshake, Bluetooth 5.0 transceiver, and remote APE-X.ai cloud infrastructure.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

1. Form-Fitting Pneumatic Bladder Architecture & Ergo-Fit System

The headgear apparatus comprises a base layer of breathable fabric, an internal inflatable bladder matrix, and a protective outer shell. The air bladders are ergonomically sculpted to protect specific areas of physical vulnerability and rapid thermal loss, including the forehead, temples, carotid artery region, ear canals, and down past the base of the skull.

A rechargeable air pump valve disposed at the lower neck region allows the user to manually inflate or deflate the internal bladder matrix on the go. When inflated, the air bladders form-fit to the user's specific cranial contours, acting as a soft-crash helmet that actively disperses blunt-force kinetic energy during impacts against trees, rocks, or hardened snowpack. In marine applications (e.g., sailing or kayaking), a fully inflated bladder matrix provides high buoyancy to keep the user's head afloat.

2. Aero-Therm Conduit & Opti-Lock Eyewear Retention

To recycle body heat without causing moisture accumulation, the headgear incorporates an internal Aero-Therm ventilation conduit. Exhaled human breath (naturally expelled at 98°F or higher) is captured at the mouth interface and routed through flexible internal tubes upward and around the ear canals to maintain localized warmth. The conduit terminates at an upper anti-fog vent interface adjacent to the user's goggles, passing warm, dry air across the lens surface to permanently prevent lens fogging.

At the rear of the headgear, a reinforced Opti-Lock retention loop is anchored. Ski goggle or sunglass straps are passed through the Opti-Lock loop, ensuring that if eyewear is lifted off the face (e.g., while riding a chairlift or during a high-velocity fall), the eyewear remains securely attached to the back of the headgear and cannot be lost or knocked into the user's face.

3. Hydro-Purge Venting Array & Glove-Friendly Closures

The lower facial region features a specialized Hydro-Purge vented mouthpiece. Unlike standard fabric masks that absorb saliva and exhaled condensation, the Hydro-Purge valve includes a low-side moisture drain positioned near the chin. This allows spit, mucus, and heavy condensation to be gravity-drained or actively expelled directly into the external atmosphere, keeping the interior fabric dry and eliminating skin freezing or chafing. Furthermore, the acoustic opening of the mouthpiece amplifies vocal projections so that the user's voice can be clearly heard during lift-line conversations or emergency calls for help when trapped in a snowdrift or tree well.

The headgear utilizes a Glide-Seal closure system consisting of overlapping, flexible material sections fastened by a soft telescoping zipper mechanism. This eliminates metal zippers that freeze, jam, or flap against the skin, allowing users wearing heavy winter gloves or mittens to easily adjust or un-zip the lapels and pin them back behind the neck during warmer conditions.

4. Multi-Modal Fluidic Energy Harvester & Nanoparticle Matrix

Mounted within the headgear (e.g., headband or side strap) is a miniature fluidic energy harvesting chamber. The chamber contains a viscous carrier liquid (synthetic hydrocarbon or silicone oil) infused with a multi-vector nanoparticle matrix:

Magnetorheological micro-particles: Carbonyl iron particles that dynamically adjust fluid viscosity under applied magnetic fields to optimize kinetic damping.

Photovoltaic Nanoparticles: Colloidal Quantum Dots (CQDs) such as Lead Sulfide (PbS) or Perovskite nanocrystals (CsPbI_3) that capture ambient solar irradiance passing through a transparent outer aperture.

Thermoelectric Nanoparticles: Bismuth Telluride (Bi_2Te_3) or Skutterudite compounds that exploit the Seebeck effect, converting the continuous temperature gradient between 98°F body heat/expelled breath and freezing ambient air into electrical power.

Steric Stabilizers: Long-chain organic molecules (oleic acid or block copolymers) that act as microscopic bumpers, preventing particle agglomeration and maintaining fluid homogeneity under violent movement.

As the user moves (jogging, skiing, walking), an inner floating payload shifts within the fluid, moving through an array of linear electromagnetic induction coils to generate kinetic power. The combined photonic, thermal, and kinetic energy trickle-charges an internal power supply, maintaining active battery life in sub-zero weather.

5. Fluidically Stabilized Camera & Rear-Guard Threat Detection

The inner floating payload within the fluidic chamber houses a high-fidelity digital image sensor, directional microphone array, wireless Bluetooth 5.0 transceiver, and a digital signal processor (DSP). The surrounding viscous magnetorheological fluid absorbs high-frequency vibrations and head-shake, delivering smooth, mechanically stabilized action footage without requiring heavy mechanical gimballs.

The image sensor can be positioned facing backward as a human rear-guard "dashcam". The system DSP runs a motion-tracking algorithm that monitors a predefined proximity perimeter behind the user. When an object (e.g., an approaching vehicle, wild animal, or out-of-control rider) rapidly breaches the perimeter, the DSP instantly triggers a localized haptic vibration motor in the headband or an audible alarm in the ear padding, providing early warning to the user.

6. LifeLine Telematics, Jamatcha Authentication, & APE-X.ai Integration

The headgear incorporates an integrated LifeLine telemetry module containing a 3-axis MEMS accelerometer, GPS receiver, and short-range mesh radio. The module remains in a low-power state until the MEMS sensor registers an extreme kinetic event (e.g., an avalanche strike, blunt collision, or rapid deceleration).

Upon impact detection, the system initiates the Jamatcha cryptographic verification handshake (USPTO Patent #12,333,564). Micro-sensors inside the Hydro-Purge facial vent verify human biometric parameters (detecting thermal exhalation or acoustic vocalizations) to confirm a living operator. Once verified, the DSP automatically locks recorded video/audio files, commands a paired mobile device to initiate cloud backup streaming, and continuously broadcasts an authenticated SOS geolocation beacon across the peer-to-peer mesh network to rescue teams and remote AI server nodes (APE-X.ai) for real-time emergency dispatch and gamified energy yield processing.

INITIAL CLAIMS

Master Apparatus Architecture

An all-weather protective headgear apparatus comprising:

a flexible headgear body defining a cranial enclosure;

an adjustable pneumatic bladder matrix disposed within said headgear body configured to cover areas of cranial vulnerability;

an Aero-Therm thermal recycling conduit configured to capture exhaled warm breath and route said breath across a localized thermal interface;

a Hydro-Purge lower facial vent configured to isolate and expel exhaled moisture and saliva directly to the external atmosphere; and

an integrated digital telemetry node comprising a 3-axis accelerometer and a wireless transceiver.

Pneumatic & Ergonomic Features 2. The apparatus of Claim 1, wherein the pneumatic bladder matrix is sculpted to protect the user's forehead, temples, carotid artery region, ear canals, and base of the skull; and further

comprising an integrated manual air pump valve permitting on-the-go inflation to provide custom soft-crash impact attenuation. 3. The apparatus of Claim 1, further comprising a flexible Glide-Seal clasp system consisting of overlapping material lapels secured by a non-metallic, soft-zipper closure configured to be operated by a user wearing gloves. 4. The apparatus of Claim 1, further comprising an Opti-Lock eyewear retention loop anchored to a rear exterior wall of the headgear body, configured to receive and secure a strap of an eyewear assembly to prevent eyewear detachment during active movement or impact.

Thermal Recycling & Moisture Control 5. The apparatus of Claim 1, wherein the Aero-Therm thermal recycling conduit directs exhaled F warm breath over the user's ear canals and across an upper anti-fog vent interface adjacent to an eyewear boundary, eliminating lens condensation while providing localized thermal insulation. 6. The apparatus of Claim 1, wherein the Hydro-Purge lower facial vent comprises a downwardly sloped no-drool drainage port positioned near the chin, configured to gravity-drain accumulated condensation without soaking internal fabric layers, while acoustically projecting vocal speech.

Multi-Modal Fluidic Energy Harvester & Camera Payload 7. The apparatus of Claim 1, further comprising a fluidic energy harvesting module mounted to the headgear body, said module comprising an outer housing defining a fluid chamber filled with a viscous suspension fluid infused with active nanoparticles. 8. The apparatus of Claim 7, wherein the active nanoparticles comprise colloidal quantum dots configured for photovoltaic power conversion, and thermoelectric bismuth telluride nanoparticles configured to generate electrical current via the Seebeck effect by exploiting a temperature differential between exhaled body heat and cold ambient air. 9. The apparatus of Claim 7, wherein the fluid chamber houses a dynamically suspended inner payload assembly comprising a digital image sensor, directional microphone array, and a digital signal processor (DSP); wherein the viscous suspension fluid dampens kinetic vibration to stabilize captured image feeds. 10. The apparatus of Claim 9, further comprising an array of electromagnetic induction coils lined along the fluid chamber, configured to convert relative displacement of the floating inner payload into kinetic electrical current to trickle-charge an internal battery.

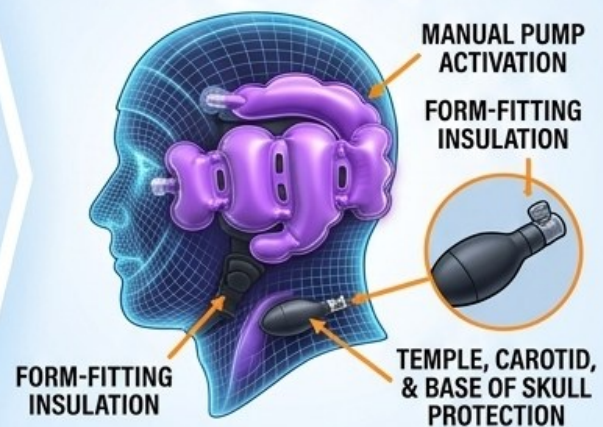
Threat Detection & Cryptographic Telemetry (LifeLine / Jamatcha / APE-X.ai) 11. The apparatus of Claim 9, wherein the DSP executes a rear-guard threat-detection algorithm utilizing the digital image sensor to monitor approaching objects behind the user; wherein breaching a predefined proximity threshold triggers a localized haptic or audible alert. 12. The apparatus of Claim 1, wherein upon detection of a kinetic impact exceeding a predefined threshold by the 3-axis accelerometer, the digital telemetry node broadcasts an SOS geolocation beacon across an active peer-to-peer mesh network. 13. The apparatus of Claim 12, wherein the digital telemetry node executes a localized cryptographic verification handshake (Jamatcha, USPTO Patent #12,333,564) utilizing sensors within the lower facial vent to detect human respiration or voice signatures, authenticating the SOS geolocation beacon prior to wireless transmission to a remote artificial intelligence network (APE-X.ai).

THE AIR HEADZ SAFETY HEADWEAR SYSTEM: CORE FUNCTIONS

AIR HEADZ: ADVANCED BALACLAVA DESIGN



PNEUMATIC BLADDER ARCHITECTURE



AERO-THERM CONDUIT (ANTI-FOG)



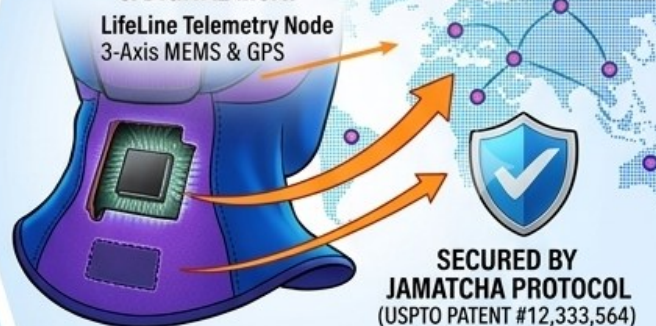
GLIDE-SEAL CLASP & Hydro-Purge VALVE



OPTI-LOCK LOOP (GOGGLE RETENTION)



LIFELINE TELEMETRY & DIGITAL MOAT



AIR HEADZ - HOW-TO GUIDE: PNEUMATIC SAFETY & COMFORT ECOSYSTEM

STEP 1 - BASE CONFIGURATION

Based on designs since 1992



STEP 2 - AFFIXING GOGGLES (SKIER)



STEP 3 - INFLATION & FIT (WORKER)



STEP 4 - CHAIRLIFT ADAPTATION



Step 5 - Warmer Weather Configurations



Step 6 - Thermal Recycling & Anti-Fog Ear Warmer

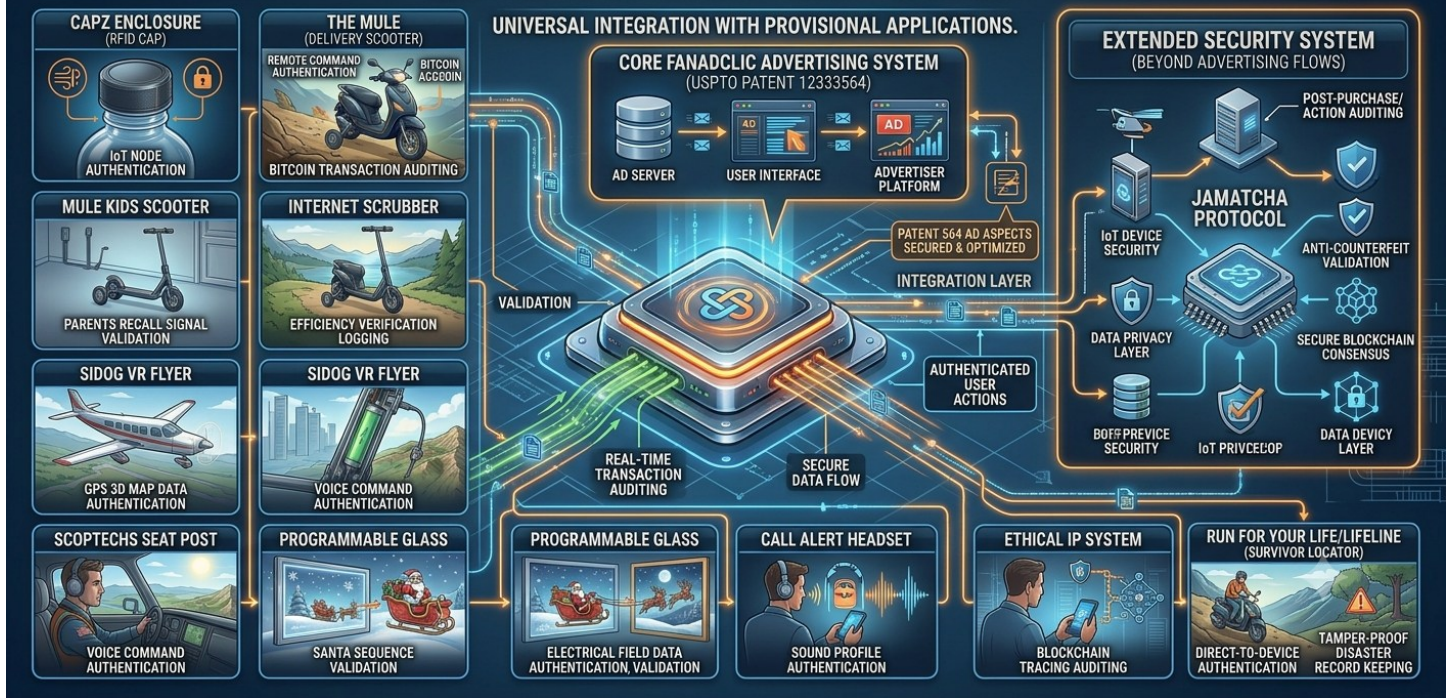


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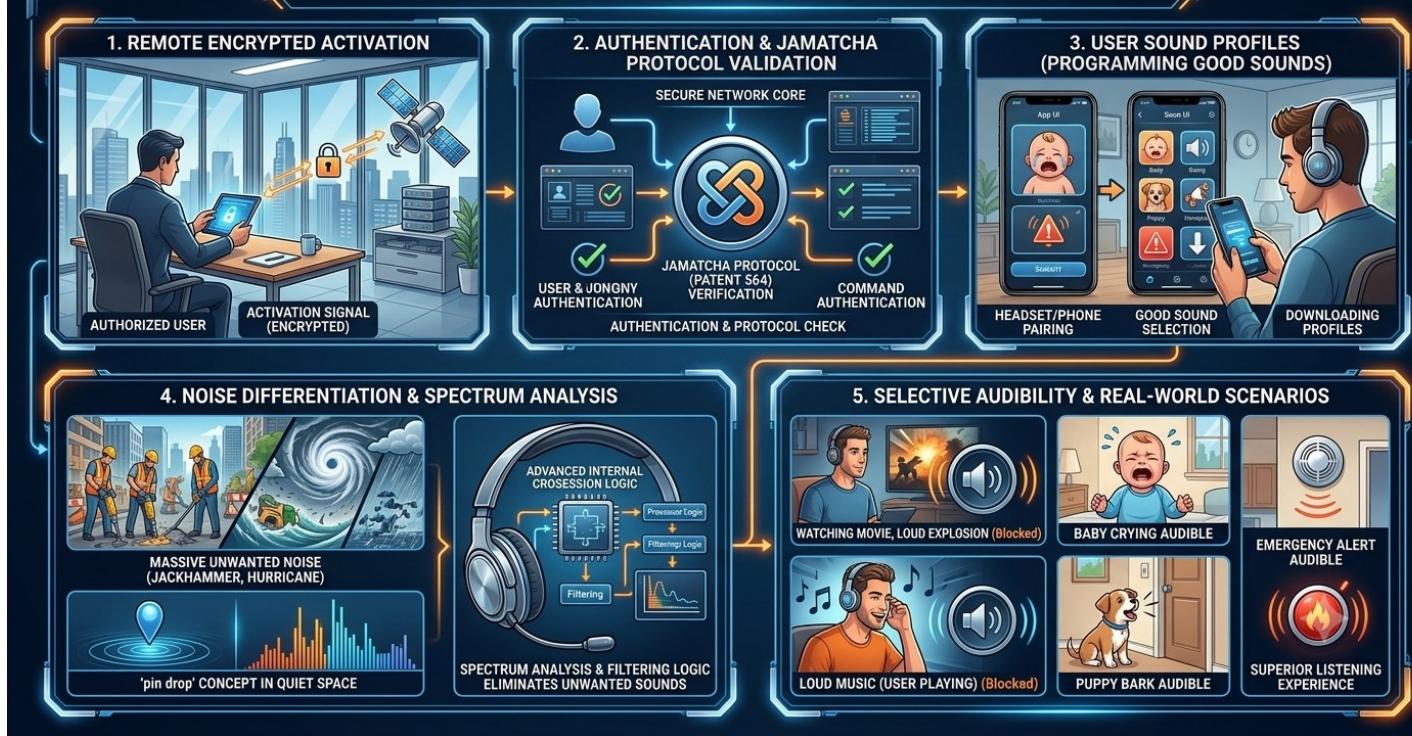
Patentable physical-to-digital integration opportunity · High resolution for print

JAMATCHA PROTOCOL: EXTENDED SECURITY FRAMEWORK & UNIVERSAL INTEGRATION MODULE

UNIVERSAL VALIDATION LAYER FOR A CONNECTED ECONOMY



CALL ALERT HEADSET & EMERGENCY SYSTEM: OPERATIONAL FLOW



GLOBAL DISASTER ALERT: NETWORK INITIATED



EARTHQUAKE: TRAPPED BENEATH RUBBLE



RESCUE TEAM USING DETECTION UNIT



RESCUE TEAM USING DETECTION UNIT



TRIAGE AND RESCUE PHASE

