

PROVISIONAL PATENT APPLICATION SPECIFICATION

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ASSIGNEE:

TITLE: Closed-Loop Authenticated Event Trigger System with Zero-Latency Haptic Synchronization and Game-State Telemetry (The "Warp Factor" Architecture)

CROSS-REFERENCE TO RELATED APPLICATIONS:

This application claims priority and acts as a subsystem extension of the "APE-X.ai" ecosystem, relating to authenticated biometric triggers and real-time game-state data processing as established under USPTO Patent #12,333,564.

1. FIELD OF THE INVENTION

The present invention relates to advanced telemetry and officiating infrastructure, specifically an authenticated, self-contained electronic sensor system (the "E-Whistle") that instantaneously halts timing systems and transmits zero-latency haptic feedback to localized transceiver nodes, providing equitable gameplay for deaf and hard-of-hearing individuals and generating verified event data for digital platforms.

2. BACKGROUND OF THE INVENTION

For decades, high-stakes sporting events have relied on human-operated timing systems. The inherent latency between an official recognizing an event, blowing an acoustic whistle, and a timekeeper manually stopping a clock often results in the loss of crucial game-time (frequently 1.5 seconds or more).

Prior art attempted to solve this using belt-worn microphone packs (e.g., Precision Time Systems) that "listen" for a whistle tone. However, these systems are not self-contained, are highly susceptible to ambient crowd noise interference, and do not address the secondary problem: athletic inclusion. Furthermore, deaf and hard-of-hearing (P.D. & H.H.) athletes remain severely disadvantaged, relying on archaic visual cues or drum vibrations to initiate or halt play.

3. SUMMARY OF THE INVENTION The "Warp Factor" architecture solves both latency and inclusion simultaneously by digitizing the event trigger at the source. The invention places a micro-electromechanical system (MEMS) pressure transducer inside a standard sports whistle. Upon detecting a specific internal air pressure change (biometric human breath), the device instantly broadcasts an encrypted, secure command.

This single "verified event trigger" accomplishes three simultaneous actions:

Clock Stoppage: Sends a secured radio/FM/BLE signal to the master scoreboard, halting the clock within 1/10,000th of a second.

Haptic Synchronization: Transmits an encrypted command to localized transponding vibrators worn by P.D. & H.H. athletes (e.g., integrated into neckbands or armbands). The system utilizes Time-of-Flight (ToF) calculations to ensure the haptic pulse engages the athlete at the exact millisecond an acoustic soundwave would reach a hearing athlete.

Data Monetization: Logs the whistle-blow as a cryptographically verified "Game-State Event" into the APE-X.ai blockchain/intranet ecosystem, providing instant, fraud-proof data triggers for live broadcasting, sports analytics, and verified fan engagement platforms.

4. DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The Actuator (The Whistle): The whistle housing contains a completely self-contained solid-state transmitter. A highly sensitive internal pressure sensor measures dynamic air pressure changes (<1 Pa at up to 1 kHz frequencies) created specifically by human breath. This ensures the trigger is a verified human action, preventing spoofing.

The Encryption Layer: To prevent unauthorized actuation (e.g., fans blowing whistles in the crowd), the transmitter utilizes a secure, rotating authorization code protocol—similar in security to encrypted automotive locking systems, but operating on a sub-millisecond, closed-loop intranet frequency.

The Swarm Intranet (Transceivers): The invention utilizes an ad-hoc networking protocol ("Swarm Behaviour in Mobile Devices"). Wearable transponding vibrators act as both receivers and localized relays. By bouncing the originating signal from one secure wearable device to the next, the system creates a ubiquitous computing net covering up to 150 meters, guaranteeing delivery of the haptic "stop/start" command regardless of stadium RF interference.

Universal Scalability: The closed-loop authenticated trigger has applications beyond sports, including emergency civil broadcasting, industrial machinery "dead-man" switches, and public safety infrastructure where instantaneous, secure, verified human commands are required.

The P.D. & H.H. Hardware Infrastructure (The "Receiver Node"): To enable equitable athletic participation, the system includes a dedicated wearable peripheral (e.g., an armband, wristband, or integrated helmet receiver). This hardware comprises:

- **The Micro-Controller & Antenna:** A low-energy RF/Ultra-Wideband (UWB) receiver chip capable of processing the encrypted 1 kHz frequency burst from the primary E-Whistle.
- **The Haptic Actuator:** A high-fidelity Linear Resonant Actuator (LRA) or Eccentric Rotating Mass (ERM) motor designed to deliver a specific, instantaneous vibrational cadence (e.g., a sharp double-pulse for a play-stoppage, a long pulse for a penalty).
- **The Biometric Form Factor:** The hardware is housed in a ruggedized, sweat-resistant casing that maintains direct skin contact to ensure zero mechanical dampening of the haptic signal.

The Software Architecture (Latency & Synchronization Protocol): The core innovation enabling fair play is the system's "Acoustic-Parity Algorithm." Because electronic signals (RF/UWB) travel at the speed of light, and acoustic soundwaves travel at the speed of sound (approx. 343 m/s), an unmodified electronic signal would reach the P.D. & H.H. athlete's wearable *before* the hearing athlete hears the whistle, creating an unfair advantage.

- **Time-of-Flight (ToF) Calculation:** The software utilizes UWB spatial awareness to continuously calculate the exact distance between the E-Whistle (the referee) and the Receiver Node (the athlete).
- **The Delay Buffer:** The algorithm divides this distance by the speed of sound to determine the exact acoustic delay. The software then buffers the haptic trigger by that exact millisecond value.
- **The Result:** The haptic actuator vibrates against the P.D. & H.H. athlete's skin at the precise microsecond the acoustic soundwave reaches the auditory cortex of the hearing athletes on the field, achieving perfect sensory parity.

The Actuator (The Hybrid Acoustic/Electronic Whistle): The device retains a traditional physical resonant chamber (pea or pealess design) to generate a standard, high-decibel auditory whistle tone for hearing athletes, live spectators, and ambient game-play. Internally, the housing contains the self-contained solid-state transmitter. To prevent false-positives caused by a referee "idling" or holding the device in their mouth, the internal micro-electromechanical (MEMS) pressure sensor is calibrated with a **High-Pressure Pneumatic Threshold**. The algorithm continuously analyzes the air-flow velocity and pressure differential, specifically distinguishing between ambient pulmonary respiration (normal breathing) and a forceful, deliberate pneumatic expulsion (an intentional "blow"), ensuring the system only triggers upon a verified officiating command.

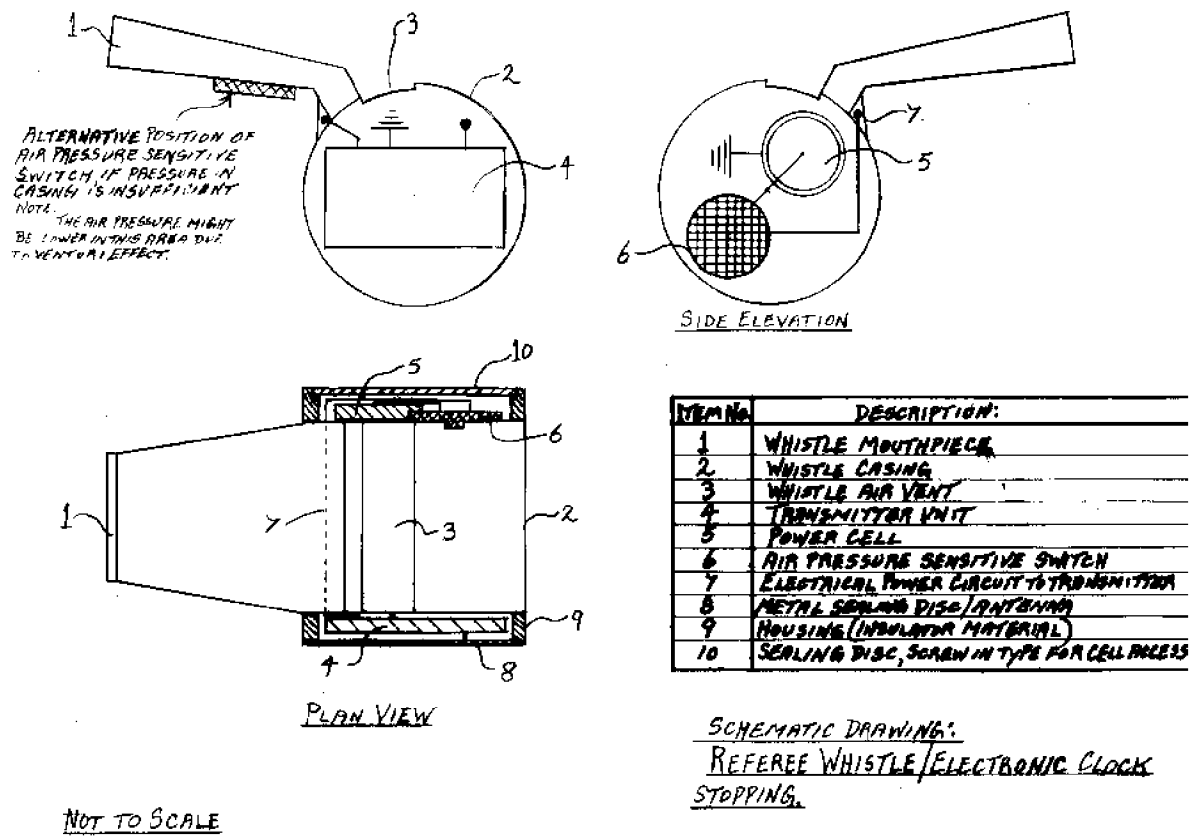
Industrial and Civil Infrastructure Embodiments: While the preferred embodiment focuses on athletic officiating and sensory parity, the underlying "Warp Factor" architecture operates as a universal, verifiable human-to-machine interface (HMI).

- **Industrial Safety (The "Smart Dead-Man Switch"):** In heavy industrial or autonomous manufacturing environments, the biometric pressure transducer replaces standard manual emergency-stop (E-stop) buttons. A supervisor's breath actuation instantly broadcasts a verifiable, UWB-encrypted "halt" command to all autonomous machinery within the swarm network, bypassing the latency of centralized Wi-Fi networks. The haptic wearables simultaneously alert all workers on the floor (who are wearing heavy auditory protection) to the exact nature of the stoppage.
- **Civil / Smart City Protocol:** The system functions as an API for municipal infrastructure. Law enforcement or emergency responders utilizing the authenticated trigger can instantly override pedestrian traffic signals or initiate localized facility lockdowns, wherein the biometric encryption guarantees the command originated from an authorized human official and cannot be spoofed by external electronic interference.

5. PROVISIONAL CLAIMS

1. A self-contained officiating device comprising an internal pressure transducer capable of detecting human breath variations, coupled with an encrypted transmitter designed to instantaneously halt remote timing systems and actuate remote haptic wearables.
2. A method of synchronizing game-play for hearing-impaired individuals using Time-of-Flight (ToF) calculations to delay a haptic vibration to perfectly match the acoustic propagation of a whistle sound.
3. An ad-hoc "swarm" networking protocol wherein body-worn vibrator units relay encrypted biometric trigger data to ensure total field coverage and eliminate transmission dead zones.
4. The integration of the aforementioned verified event trigger into a wider digital ecosystem (APE-X.ai) to generate monetizable, latency-free game-state telemetry.
5. A system for achieving sensory parity in officiating, comprising a centralized authenticated transmitter and a plurality of remote wearable receivers, wherein an **Acoustic-Parity Algorithm** dynamically calculates the spatial distance between the transmitter and each respective receiver using Ultra-Wideband (UWB) telemetry, and intentionally buffers the actuation of a haptic motor by a time-value equal to said distance divided by the speed of sound.
6. The system of claim 5, wherein the wearable receiver utilizes a Linear Resonant Actuator (LRA) or Eccentric Rotating Mass (ERM) motor to deliver physiological feedback precisely synchronized with the localized arrival of an acoustic wavefront.
7. An anti-spoofing biometric validation method for event-trigger generation, wherein the internal micro-electromechanical (MEMS) pressure transducer of the primary actuator is calibrated with a high-pressure pneumatic threshold designed to distinguish between ambient pulmonary respiration and a deliberate, forceful exhalation, thereby rejecting false-positives from idle mouth-holding, ambient acoustic noise, crowd interference, and non-biometric electronic triggers, while simultaneously permitting the mechanical generation of a standard acoustic auditory signal
8. The integration of the authenticated event trigger of Claim 1 as a secure application programming interface (API) node, configured to transmit zero-latency, cryptographically verified game-state commands directly to venue infrastructure, including but not limited to electronic scoreboards, broadcast metadata streams, and live sports-betting clearinghouses.
9. An industrial and civil safety system utilizing the authenticated biometric transmitter of Claim 1, wherein the dynamic pressure transducer is configured to override autonomous machinery protocols and facility infrastructure (including but not limited to traffic relays and emergency-stop circuits) via an encrypted, decentralized UWB swarm network, operating independently of vulnerable centralized Wi-Fi or cellular grids.

10. A method of providing secondary auditory-bypass alerts in high-decibel industrial environments, wherein the acoustic-parity algorithm of Claim 5 is utilized to deliver synchronized haptic warnings to personnel wearing auditory protective equipment, ensuring simultaneous threat awareness regardless of proximity to the initiating verified event trigger.



"Figure 1: Physical embodiment of the Warp Factor E-Whistle incorporating closed-loop telemetry."