SELF-CHARGING HIKING POLE

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PROBLEM STATEMENT

Beginner hikers often overlook packing essential gear for hikes, leaving them vulnerable in emergencies. Without a power source, a dead phone can mean no way to call for help. This design provides a reliable backup power solution for unexpected situations by effectively making use of kinetic energy that would otherwise be wasted.

MECHANICAL ASSEMBLY

Frame

- Aluminum cylinder mold for wrapping carbon fiber

Lathe

- Specific diameter for pole 3-stage assembly.
- Enable pole's expansion & contraction.

Fig 1 - Mold making using Lathe

CARBON FIBER + RESIN COATING

Material Innovation:

- Hollow carbon fiber + resin coating for optimal strength-to-weight ratio.
- Lighter, more efficient at housing electronic components.

Fig 2 - Epoxy resin coating

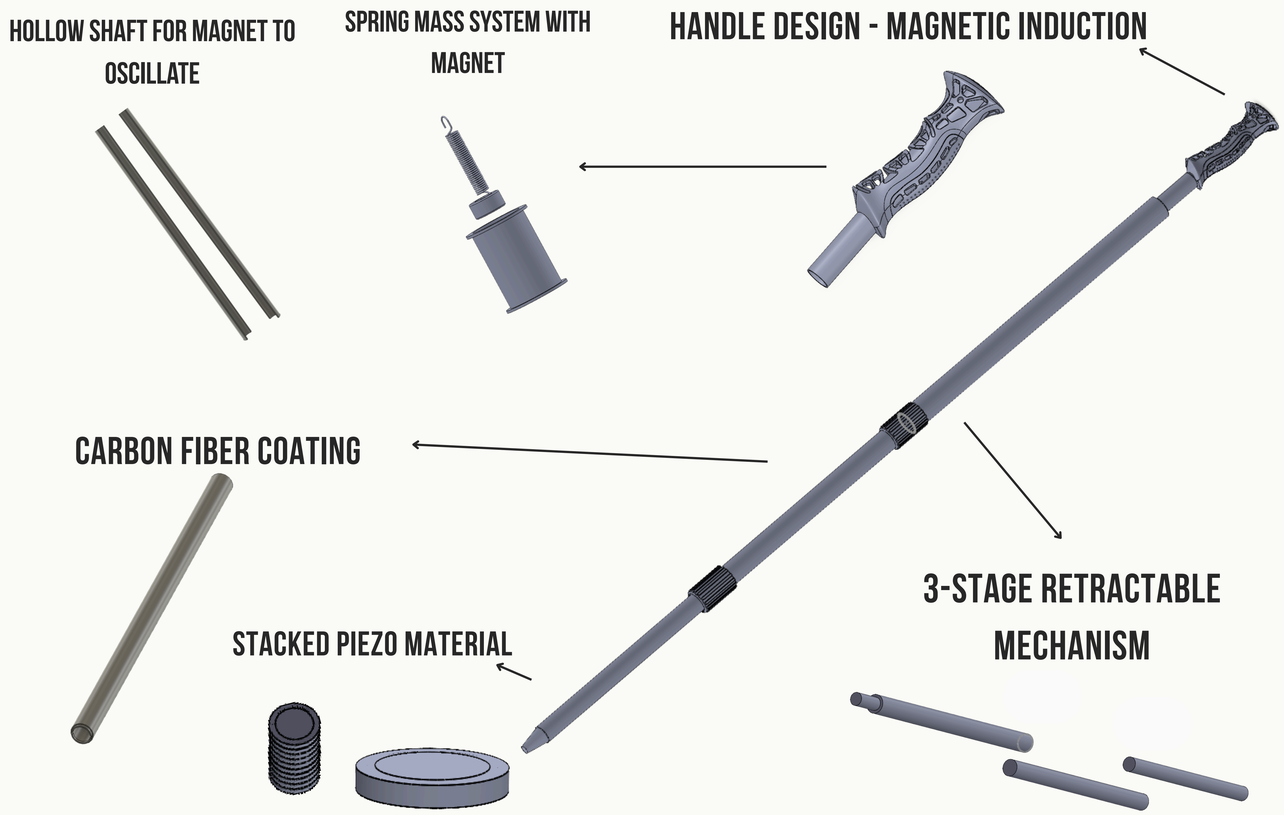
Fig 3 - Carbon fibre wrapping

Design Advantage:

- Hollow interior houses electronic components (Piezo + Induction) without compromising structural integrity.
- Resin coating enhances durability, strength, and long-term reliability.

Performance Benefits:

- Carbon fiber's lightweight properties offset the weight of heavy electronics, improving portability and usability.



PIEZOELECTRICITY

- Piezoelectric materials generate electricity when in tension, compression, or bending.
- Housed in separate compartments within the mid-section of the pole, most efficient when stacked.
- Efficiency improved by:
  - Series connections within each compartment (stacked elements), increasing voltage.
  - Wires connected in parallel between compartments - current combines across sections and increases overall output.

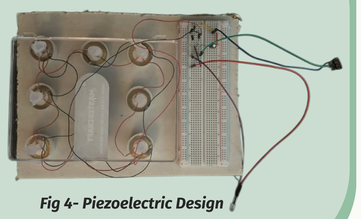


Fig 4- Piezoelectric Design

MAGNETIC INDUCTION

Mechanism

- A soft spring suspends a magnet and a weight.
- A surrounding copper coil (~5000 loops) is positioned around the spring's outer edges.
- The magnet moves in and out the coil as the spring extends and contracts.
- Guards prevent collisions, ensuring smooth oscillation and minimal wear.

Energy Production

- Magnets oscillate within the copper coil.
- Changing magnetic flux induces (creates) an electric current.

CIRCUIT DESIGN

- Two input "OR" gate for piezoelectric and magnetic induction source.
- Each source connected to rectifier converting AC to DC output.
- Induction & piezoelectricity generate alternating current (AC), which is converted to direct current (DC) using full bridge rectifiers, making it suitable for device charging.

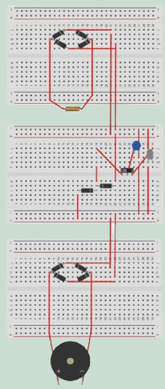


Fig 5- Circuit Design

GOALS

- Charge a 5V battery.
- Consistent power supply.
- Structurally resilient, able to withstand multiple usages.
- Lightweight