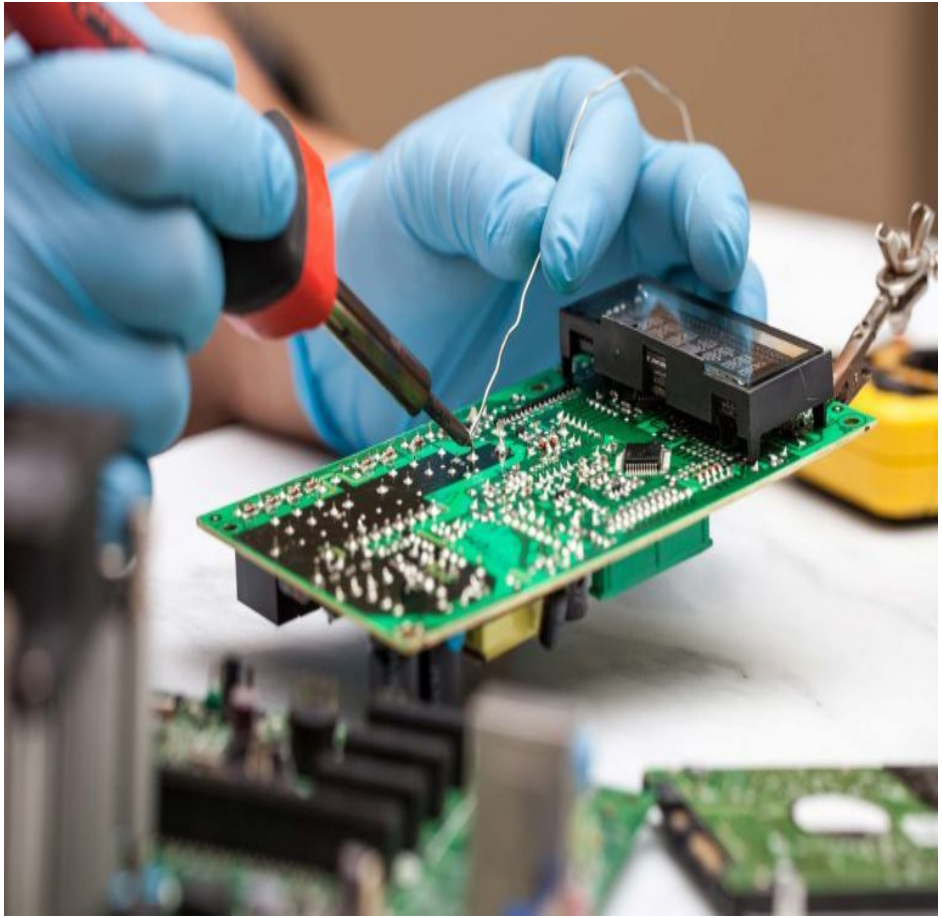


Safe Solder Assist

Harshada Kale
- IIT Gandhinagar

Sahil Rao
- IIT Jammu

Challenges in Traditional Soldering Irons

Needs both hands to manually feed solder wire

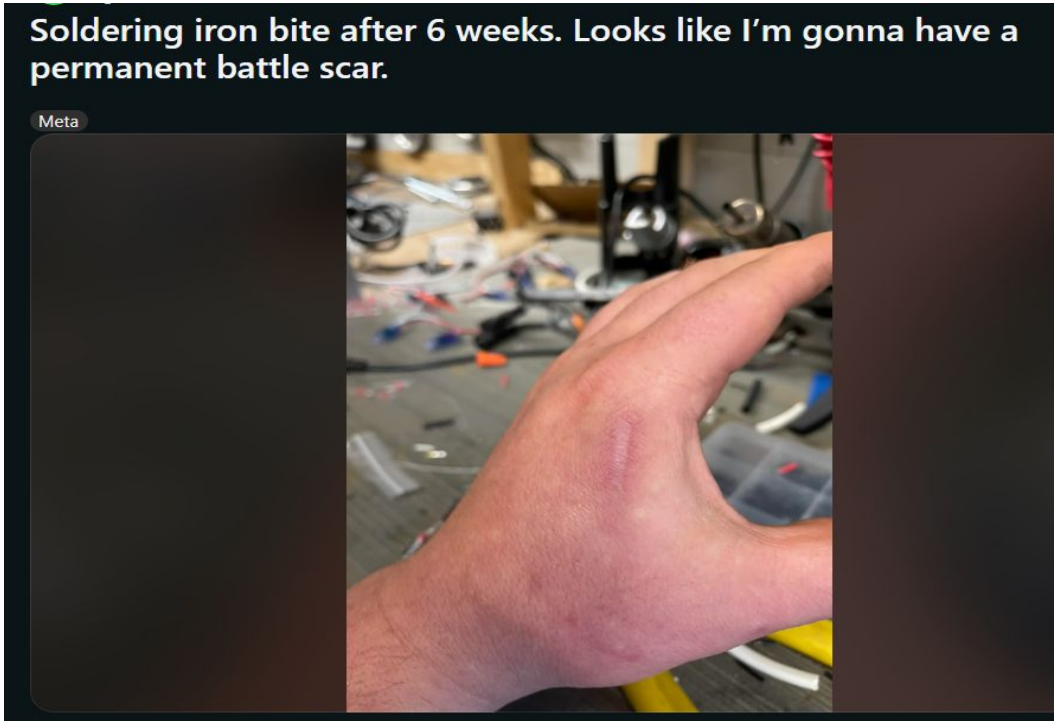
⬇

Constantly trying to avoid burns disrupts workflow and lowers productivity.

⬇

- Operational inefficiency
- Safety concerns

Class and Subclass: B23K 3/0607
B23K 3/085



“Full hand grabbing the iron from the wrong end when hot. Ouch!”

Some Reddit comments from soldering iron users:

“I’ve had times where I’ve not put the soldering iron in its holder. I then went to pick it up and grabbed the hot end. It was stinging for literal hours afterwards, worst pain I’ve felt in quite some time.”

“I'm legally blind and soldering is REALLY DIFFICULT and I probably shouldn't be attempting to do it at all... but... I was soldering some wires onto a BLDC motor driver board so I could hook it to an ESP32... and.. I tried to grab the iron and grabbed it on wrong end... OUCH. Took a few weeks to heal. ”

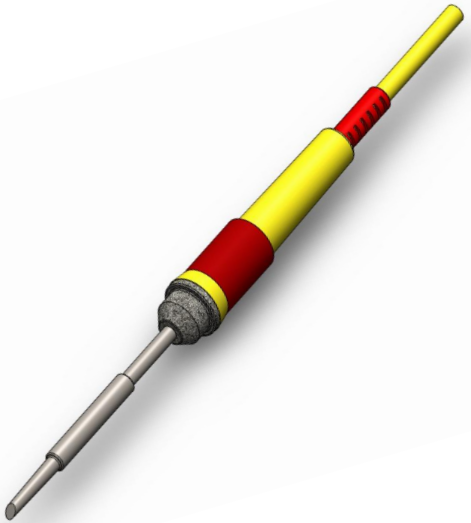
Our solution is an modular attachment for the traditional soldering irons consisting of an insulation cover and a wire feeding device for efficiency and safety.

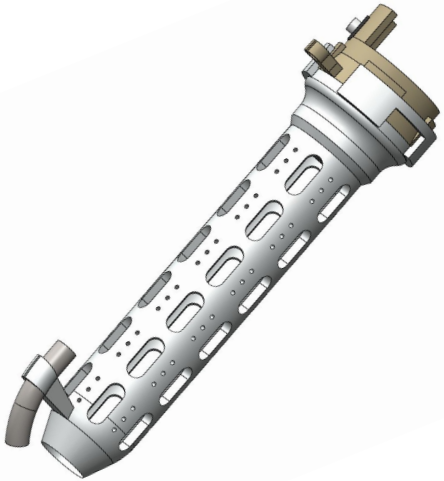
Challenges in developing Solution

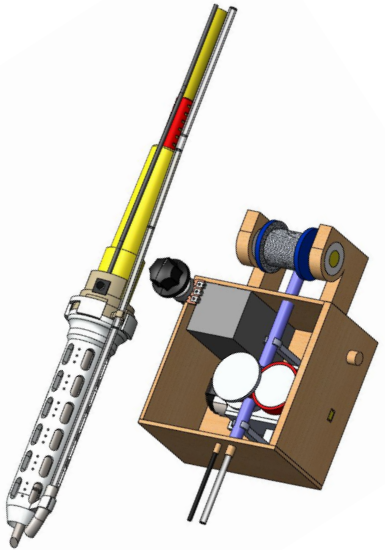
- **Technical Complexity:** Combining insulation and controlled wire feeding in a compact design.
- **User Convenience:** Ensuring seamless integration with existing soldering irons.
- **Material Selection:** Choosing the right materials for effective insulation.
- **Overheating Risk:** Preventing tip overheating due to insulation cover

Our device is:

- Modular attachment
- Ventilated insulation cover
- Precise wire feeding mechanism



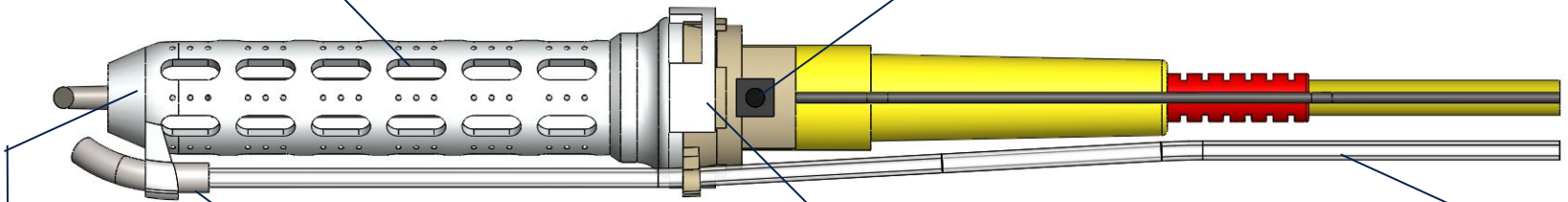




Insulation Cover:

Ventilation Holes: Prevent overheating

Feed Control Switch: Easy solder wire feed control



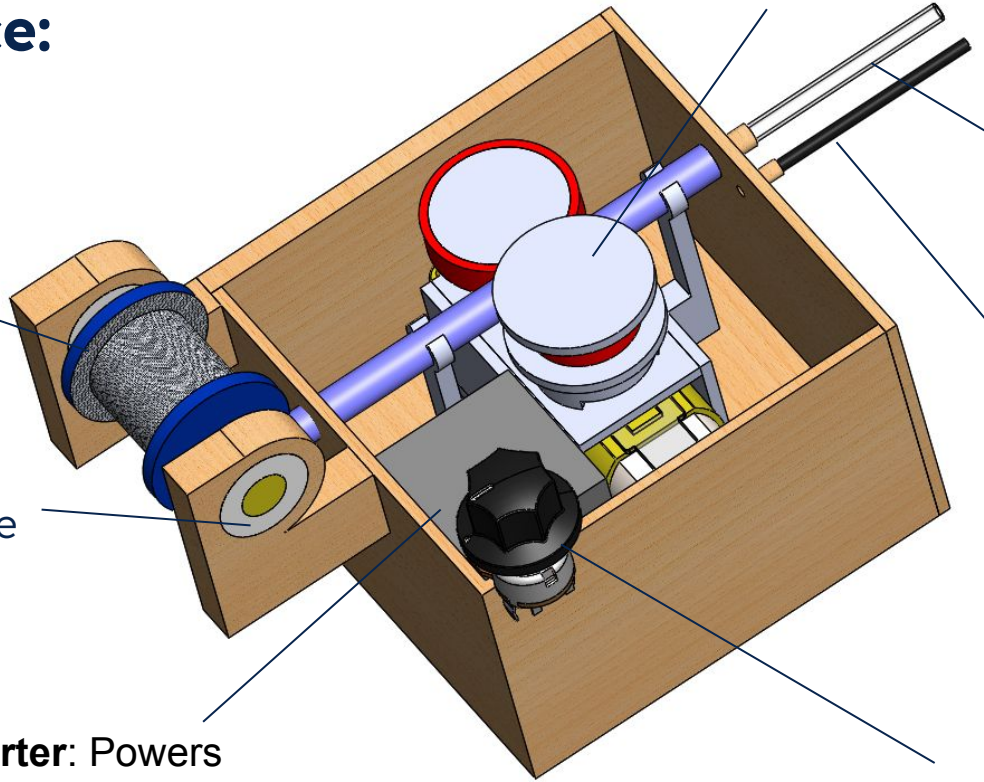
Safety Insulation: Protects user from burns

GooseNeck Tube: Adjustable position for Wire Feeding

Interlocking: For attaching insulation cover

PTFE Guiding Tube: Efficient solder wire feeding

Feeding device:



Motor and Gears:
Feeds the solder wire

PTFE Tube: Offers less friction.

Solder wire spool

Ball-Bearings: Low friction in pulling wire

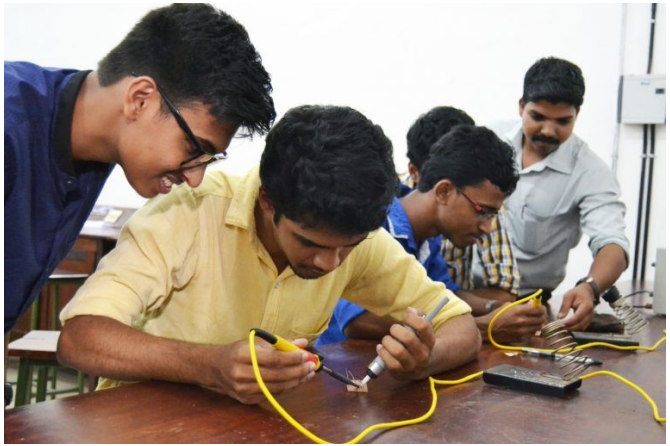
Wire to switch on solder iron

AC-DC Converter: Powers DC motor from AC supply

Potentiometer: Controls feeding speed

Target Audience:

- Educational Institutions
  - For student projects and laboratory use
- Hobbyists and DIY Enthusiasts
  - For DIY and passion projects
- Technicians
  - For small scale electrical parts repairs



- **Guiding tube**

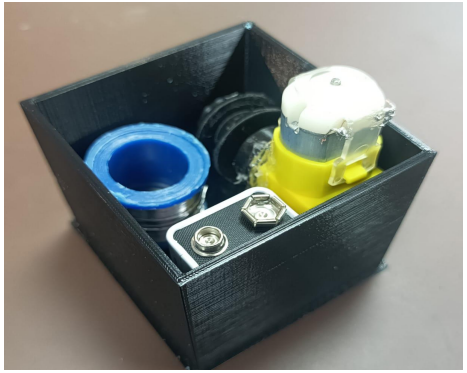
Dimensions : ID 2mm, OD 3mm
Material : PTFE Tube, gooseneck tube

- **Insulation Cover**

Weight : <20g
Dimensions : 125*30*30 mm^3
Material : Calcium silicate (Ceramic), ABS

- **Wire Feeder**

Weight : < 200 g
Dimensions : 75*75*60 mm^3

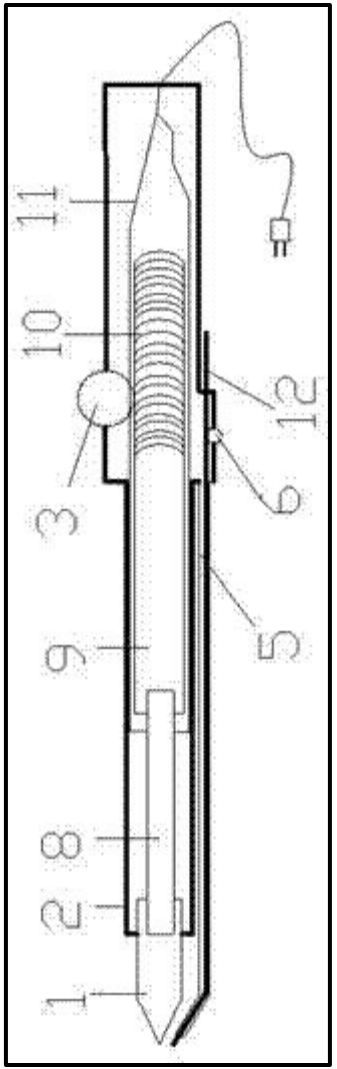


Prior Art Reference 1

Novel self-fed soldering tin type electric soldering iron

- Rack and Pinion: Cumbersome feeding mechanism.
- No Ventilation: Traps heat at the tip, causing overheating.
- Non-Modular: Not attachable or flexible.

China Patent No. CN203679478U)



Prior Art Reference 2

YIHUA 929D-II Automatically Solder Wire Feeding Soldering Iron

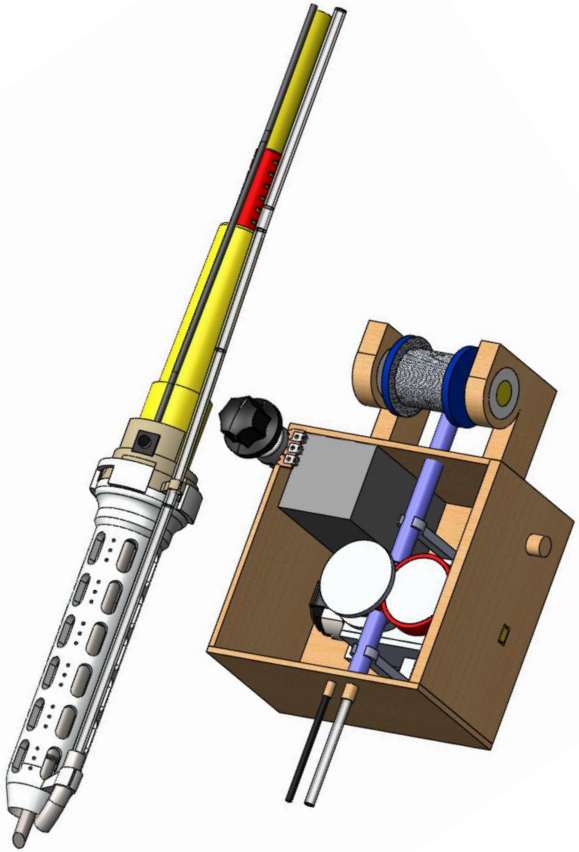
- No Thermal insulation
- Bulky design
- Uses a gun-like design - less intuitive and precise.

YIHUA. (n.d.). YIHUA 929D-II Automatically Solder Wire Feeding Soldering Iron. Retrieved from robu.in

Features	Our invention	Prior art ref 1	Prior art ref 2
Attachable	✅	❌	❌
One handed operation	✅	✅	✅
Insulation cover	✅	✅	❌
Separate Spool and Feeding Mechanism	✅	❌	❌
Ventilation for cooling	✅	❌	❌

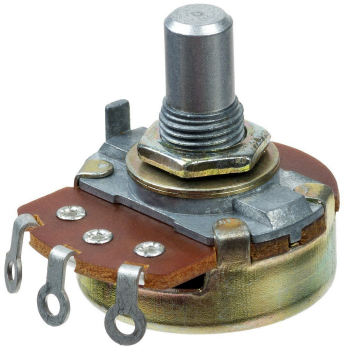
USP

- **Modular Design**: Easy to attach
- **Insulation Cover**: Ventilated for cooling and safety
- **One-Hand Operation**: Frees up hand for handling components
- **Safety First**: Reduces burn and overheating risks



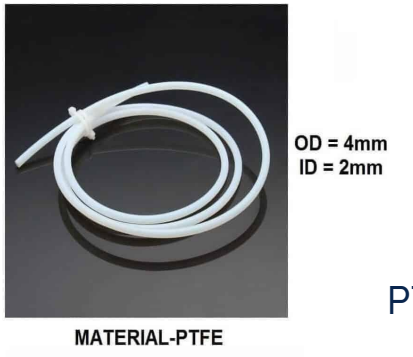
Components

Tactical Switch



Potentiometer

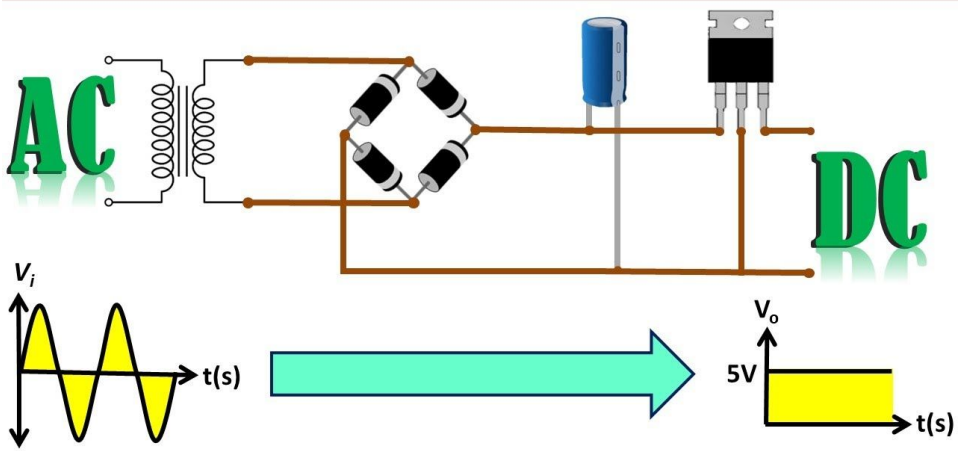
220V AC-9V DC converter
20W



PTFE Guide tube

BO Gear motor

AC DC Converter circuit:



Is there really a need for this product?

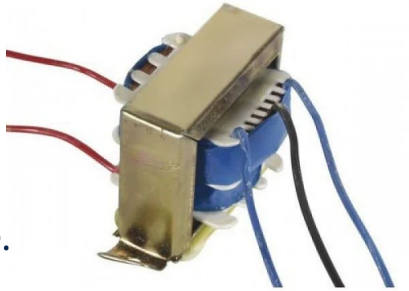
Reddit Comments:

"Got burned multiple times trying to solder small components. This is frustrating!"

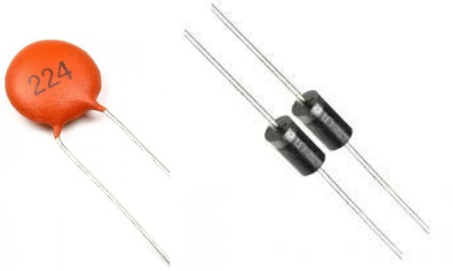
"Managing the solder wire is such a hassle, and I often end up with burns on my fingers."

Components of AC -DC converter circuit:

- **Transformer:** Steps down high AC voltage to a lower AC voltage.
- **Diodes:** For bridge rectifier to convert AC to pulsating DC
- **Capacitors:** To Smooth out pulsating DC to steady DC and to filter high frequency noise
- **Voltage Regulator:** Stabilizes the output voltage to DC



Transformer



Capacitor Diodes

Voltage regulator

Cost analysis:

1. Engineering Students:
- Each engineering college in India typically enrolls thousands of students. For instance, a mid-sized engineering college may have around 3,000 students across various disciplines.
- According to the All India Survey on Higher Education (AISHE) 2019-20 report, there are over 6,000 engineering colleges in India.
- This means there are approximately 18 million engineering students in the country, all of whom could benefit from a safer and more efficient soldering iron.

2. BSc and Polytechnic Students:
- Beyond engineering colleges, there are numerous institutions offering BSc and Polytechnic courses, many of which include electronics and related fields where soldering is a core skill.
- With hundreds of thousands of students enrolled in these programs, the potential user base expands significantly.

3. Repair Shops:
- Repair shops, which are prevalent in every city and town, regularly use soldering irons for various electronic repairs.
- In a single city, there can be hundreds of such shops, each potentially needing multiple units of your attachment for safety and efficiency improvements.

4. DIY Enthusiasts:
- The DIY community, including hobbyists and makers, is growing rapidly. These individuals frequently use soldering irons for personal projects.
- Platforms like YouTube and social media groups dedicated to DIY electronics have millions of followers, indicating a substantial market segment.

Different sizes of solder iron in market.

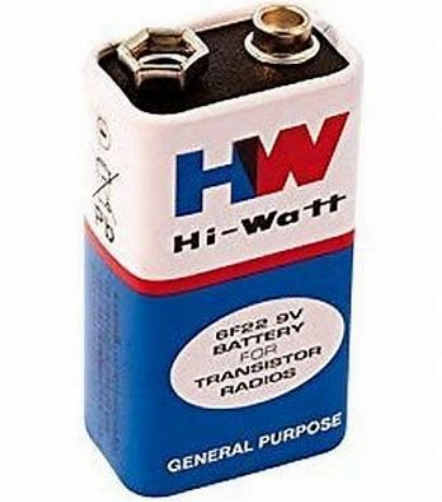
We are targeting only 2 majorly used standard sizes of solder iron.

- **Low cost solder iron :**

  Dimensions: Bit length : 100mm
  Diameter : 10 mm

- **Standard temperature controllable soldering station :**
  - Dimensions: Bit Length : 70mm
    Diameter : 8mm

Why not Battery?



- **Consistent Power:** Always available at soldering stations.
- **No Replacements:** Avoids the need for frequent battery changes.
- **Cost-Effective:** One-time investment over repeated battery costs.
- **Stable Performance:** Ensures constant motor speed, avoiding the frustration of motor speed drops and the need for frequent potentiometer adjustments as batteries drain.

Why an attachment?

- **Cost-Effective:** Enhances your existing soldering iron without the need to buy a new device.
- **User Trust:** People are more likely to adopt an attachment for their current tools than trust a completely new product.
- **Integration:** Combines solder wire feeder with insulation cover, proving non-obviousness and supporting a utility patent.

Tackling changing force requirements with decreasing solder wire

- **Horizontal Spool placement :** Solder wire spool is held horizontally to maintain consistent force requirement.
- **Ball Bearings :** Reduce friction, ensuring a smooth pull without needing to adjust force.

Why not Brushless motor?

- **Cost:** Brushless motors increase the overall cost.
- **High RPM:** Requires a high gear ratio, complicating the design.

Mass manufacturing techniques or methods?

- **ABS Components:** Produced using molding.

- **Ceramic Insulation:** Created with slurry layering or spray coating.

ABS injection moulding

What happens to solder wire when spool get empty?

- **Residual Wire Removal:**
  - When the spool is empty, the remaining wire can be easily removed with pliers.
  - Coiled guiding tube can be detached from feeder and solder wire can be pulled.

Would insulation cover and steel tube obstruct visibility and cause inconvenience.

- **Visibility :** Ventilation and openings ensure clear view of the soldering area.
- **Ergonomics :** Enhances comfort and precision without obstructing visibility

Target Audience

- Millions of hobbyists and DIY enthusiasts
- Thousands of Small to Medium Electronics Manufacturers
- Jewelry Makers
- Wood Artists and Craftspersons
- Hundreds of thousands of Repair Shops
- DIY Electronics Kit Manufacturers
- Maker Spaces and Community workshops.