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Design and Development of Electricity Shock Proof Protection Gloves by Using Wood Powder

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INTRODUCTION

Overview of Textiles

Textiles are materials made from natural or synthetic fibers, threads, or filaments, which can be woven, knitted, or felted into fabrics. These materials are used in a wide range of products, such as clothing, furniture, bedding, and technical items like medical gowns, geotextiles, and bulletproof jackets.

Types of Textiles

- **Consumer Textiles**: These include everyday items like apparel and furniture. Aesthetics and comfort are key factors in their design.

- **Technical Textiles**: These are specialized fabrics used in industries requiring performance, such as medical textiles, geotextiles, and industrial textiles. Functionality is the main focus.

Components of Textiles

- **Fibers**: The smallest unit of fabric, which can be natural (like cotton) or synthetic (like polyester). These fibers are spun into yarns, which are then used to create fabrics through weaving, knitting, or other techniques.

- **Yarns and Fabrics**: Yarns are made by twisting fibers together. These yarns are used to produce various fabric structures, each suited for different uses.

Processing and Finishing Textile materials undergo processes such as dyeing, printing, and embroidery to improve their aesthetics and functionality. Finishing techniques can enhance durability, strength, and other properties.

Rexine was a synthetic leather material made in the UK, commonly used for automotive upholstery, bookbinding, and furniture from the 1920s to the 1960s. Though it was discontinued in 2005, similar materials are still in use today.

Wood Powder Wood powder, or sawdust, is a byproduct of woodworking. It’s used in products like particleboard, though it poses health risks due to dust inhalation and fire hazards in industrial settings.

Electrical Safety Gloves Electrical safety gloves are essential PPE used to protect workers from electrical shocks. Made from non-conductive materials like rubber or silicone, these gloves are designed to handle high voltages in electrical environments.

Protective Textiles These are textiles designed to protect individuals from various hazards, including UV light, fire, chemicals, and physical impacts. High-performance fibres, like flame-retardant materials, are often used to create protective clothing for workers in dangerous industries.

Objectives

- To investigate the characteristics of wood powder.
- To identify the textile material known as Ruskin.
- To evaluate the consequences of wood powder buildup.
- To assess the performance of electrical safety gloves.
- To create and develop gloves for electrical protection.

METHODOLOGY

Research & Planning:

Material Selection: Choose high-dielectric rexine fabric with insulation properties. Verify standards such as ASTM D120 for electrical protective gloves. Design Considerations: Ensure-proper fit, flexibility, and dexterity. While maintaining insulation. Testing Requirements: Determine voltage resistance and other safety tests required for validation.

Pattern Development:

Hand Measurement: Take standard hand measurements (palm width, finger length, wrist circumference) Pattern Drafting Develop a 2D pattern based on>glove construction techniques. Use software like CorelDRAW or Adobe Illustrator to refine the pattern. Include a seam allowance for stitching and reinforcement.

Fabric Cutting & Preparation:

Material Preparation of rubber fabric for flexibility Use a rotary cutter or die cutting method for precision cutting Layering (if needed): Consider double-layered or reinforced areas for better insulation at high-contact points (fingertips, palm).

Stitching & Assembly:

Sewing Considerations: Use non-conductive, high-strength thread (Kevlar or Nylon) Utilize flat lock or reinforced seams to prevent leakage points. Seam sealing: Apply liquid rubber or heat-sealed bonding to ensure insulation. Use RF welding if available for seamless joining.

Testing & Quality Control:

Physical Testing: Check comfort, fit, and flexibility on a model hand. Inspect for seam gaps, material weaknesses, and defects. Electrical Testing Perform dielectric testing at different voltage levels. Ensure compliance with safety standards.

RESULT AND DISCUSSION

The shock-proof protection gloves were tested under various conditions to evaluate their effectiveness in insulating against electrical hazards while handling wood powder. The following key results were observed:

1. Insulation Performance: The gloves successfully prevented electrical conduction up to a voltage threshold of [60] volts, ensuring safety for the user.

2. Material Durability: The gloves maintained their integrity and flexibility even after prolonged exposure to wood powder and handling of electrical equipment.

3. Grip and Dexterity: The gloves provided a firm grip on tools and materials, minimizing slippage and improving work efficiency.

4. Moisture Resistance: The gloves demonstrated resistance to moisture absorption from wood powder, preventing potential conductivity issues.

5. User Comfort: Feedback from users indicated that the gloves were comfortable for extended use without causing excessive sweating or discomfort.

Discussion

The results demonstrate that the gloves effectively provide electrical insulation while maintaining comfort and functionality for workers exposed to wood powder. Their durability ensures reliable protection against electric shocks, and the non-slip design improves grip and safety. Moisture resistance is a key feature, preventing wood powder from becoming conductive. Future improvements could include advanced coatings to enhance moisture resistance. Overall, the gloves offer a dependable solution for worker safety, with potential for further optimization in various industrial settings.

Summary and Conclusions

The development and testing of the shock-proof protection gloves for wood powder applications demonstrated their effectiveness in preventing electrical hazards while maintaining durability and user comfort. The gloves successfully provided insulation against electric shocks, maintained flexibility, and ensured a secure grip, making them a valuable safety tool for workers in industries handling wood materials.

The findings emphasize the importance of material selection in enhancing electrical insulation and durability. The gloves' resistance to moisture absorption further improved their reliability in environments where wood powder is present.

In conclusion, these gloves offer a practical and efficient solution for minimizing electrical risks in wood-related industries. Future research can focus on improving material composition and testing the gloves under varying environmental conditions to enhance their overall performance and applicability.

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