

New Innovative Women Protective Garment Using Copper Yarns

¹R.Sureshkumar, ²Dr. S.U.Prabha

^{1,2}Dept. of EEE, Kumaraguru College of Technology, Coimbatore, Tamil Nadu, India

Abstract

The proposed research work is to develop new innovative women protective garment using copper yarns which helps the women to protect themselves. Copper polymer gives better comfort than fabrics. The developed fabric was converted into overcoat garment for women. Overcoats are referred as topcoats, to be worn as a outer most garment usually. It is worn by both women and mens. The circuit was developed and attached inside the garment to produce static discharges to protect themselves. Whenever the wearer receives unwanted advances, the switch can be pressed by the wearer which is placed inside the garment. When the wearer presses the switch, the electric charge was produced on the surface of the garment which emits the electric shock to the external sexual harassing persons. Hence the newly developed electromagnetic copper protective garment is the best safety measure for the women's problem and it will be an effective solution to the women to protect themselves from sexual abuse problems. Every women can protect themselves by using this developed garment along with their common wardrobes.

Keywords

Protective Garment, Electrostatic Discharge, Copper Yarns.

I. Introduction

The Violence against women is a serious problem plaguing the world; the sexual crimes against women remain still a cause of deep concern not only in developing but in the developed world also. According to the World Bank's 2012 World Development Report 1 on Gender Equality and Development, around one in every three women in the world experience physical or sexual abuse at some point in their life. According to the rape statistics released by the National Crime Records Bureau (NCRB), in the year 2012 approximately 80,000 cases of rape and molestation of women were registered in India. Many devices and gadgets have been created in attempt to provide women with self defense mechanism. One of the effective method has been with the use of electricity [3].

The research project is mainly concerned with societal problem of women abuse and safety. Clothing plays an important role in protecting the women, Antirape clothing helps to protect themselves from unwanted sexual advances. The developing e-textile garment will provide better self protection to the individual whomever wearing the garment [2]. For the development of e-textile garment we have selected cotton, polyester, copper yarns. The cotton which gives more comfort and the polyester which provide static conductivity in nature it helps to improve electro static conductivity in the garment. The major role of copper yarn is to provide electrical conductivity through the circuit connected with battery to produce charge. Copper yarn is the wire which has high electrical conductivity property and the plastisol coating is done in the inner side of the fabric which has high insulation property.

II. Objectives

1. It is a social cause oriented project which will be more useful for the women to protect from abuse.
2. To design and develop electromagnetic protective garment using cotton, polyester and metallic yarns.
3. To analyze the effect of electromagnetic charge in the protective garment.
4. To produce cost effective and user friendly product.

III. Methodology

The proposed research work is to develop new innovative women protective garment using copper yarns which helps the women to protect themselves. In this project, the 40s count cotton and 30s count polyester yarns and 40 gauge of copper yarns were selected for study. The selected yarns were blended with 80:20 ratio propositions. After blending, the yarns were converted into fabric form with the structure of a plain weave. The developed fabric was finished with one side plastisol coating for improving the insulation properties on the garment to protect the wearer. The developed coated fabrics were tested on both yarn and fabric stages [1].

Weaven fabric is produced by using a drop box loom. The structure of fabric is maintained as plain weave structure. For warp yarn 100% cotton is used and for weft yarn cotton and copper wire is used. Conventional selvedge method is used to maintain the continuity of copper wire conductivity. The pattern interface is shown below;

Count of warp	= 40
Weft count	= 40
Copper yarn	= 0.079mm
Ends/inch	= 60
Picks/inch	= 50

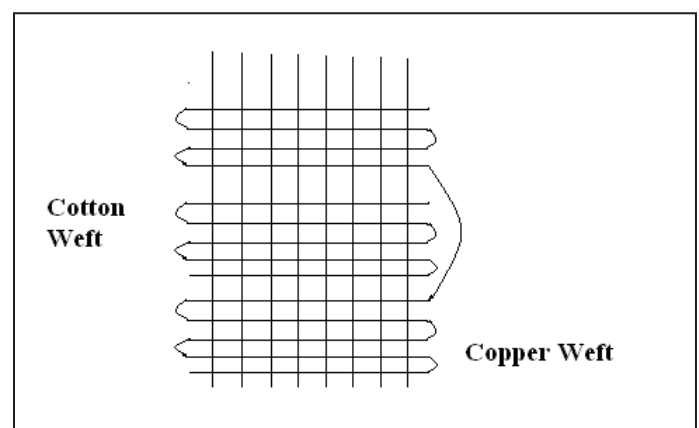


Fig. 1: Structure of cotton and Copper Weft

IV. Selection of Yarn

Cotton has many inherent properties like softness, breathability, moisture absorbency, strength, drapability, heat resistance, high wet strength, non-allergic, non irritant and also it has high insulation property which is one of the most required characteristic in this

project to protect the wearer from the shock. It is easy to handle & sew and gives better comfort to the wearer. Also it is an eco-friendly fibre. It has good air permeability in nature, suitable for all the seasons (like summer, winter). So that as a self perspective garment wearer can use it all time without any discomfort.

Polyster has high strength, high durability, it improves the serviceability of the product. It has static conductivity property in its nature which helps to improve the electrostatic charge in the garment which gives more protection to the wearer. Also manufacturing and using of hollow polyster fibres acts as an insulation. It resists shrinkage, wrinkle and abrasion. The overcoat garment we make with circuit cannot be washed most frequently so the properties like shrinkage resistance, wrinkle resistance and abrasion resistance and mildew helps the wearer to feel better and gives neat appearance while going out [2].

Copper yarn is an electromagnetic wire which has high conductivity property. It has high tensile strength, creep property, it helps to weave the fabric in required pattern. We have selected thinner 40 gauge copper yarn for weaving the fabric with cotton and copper. Copper plays a major role in producing electrostatic discharge with the help of a circuit insulated with the garment. Based on the yarn qualities the copper, cotton and polyster yarns were selected for the study to develop electromagnetic women protective garment [3].

V. Selection of Weave

The most common and closeness of basic weave structures in which the filling threads pass over and under successive warp threads and repeat the same pattern with alternate threads in the following row, producing a checked surface [2].

Plain weave (also called tabby weave, linen weave or taffeta weave) is the most basic three fundamental types of textile weaves (along with satin weave and twill). It is strong and hard-wearing and also commonly used for fashion and furnishing fabrics.

VI. Manufacturing of Fabric:

The two different category of fabric was developed with the structure of plain weave. The developed fabric was made using 40s count cotton, 30s count cotton polyster and 40 gauge copper yarns are used to make plain weave fabric. With cotton:copper EPI-67, PPI-65 and in polyster copper has its EPI-57 and PPI-41. Then the fabric was coated using plasticol coating. The coated cotton:copper fabric has its thickness and GSM are 0.37mm & 4.35gm. Then the polyster: Copper thickness and GSM are 0.35mm and 4.73gms [2].

The 80:20 blend ratios was selected for the study. There are two combinations of yarns were blended with copper. First combination was that cotton and copper blend, in that warp yarn was cotton and weft yarn was copper with 80% cotton and 20% copper (i.e) the repeat size of cotton:copper is 45*15. The second combination was that polyster and copper blend, in that polyster was used in warp and in weft way copper yarn is used in 80* 20 ratios. i.e repeat size of polyster: copper is 56*16. It is because if the copper is used in both warp and weft direction in the meeting point of two copper yarns there will be short circuit problem after the garment is connected with circuit. The reason for repeat size of 45:15 and 56:15 is when we use copper in more repeat number there will be more conductivity. In the area which has more conductivity also there will be more resistivity. It affects the affect of circuit and purpose of the garment. So that we have designed the fabric in such manner.

VII. Coating of Fabric

Plastisol is a suspension of PVC particles in a liquid plasticizer mutually dissolve each other. Plastisol is commonly used as a textile ink for screen printing as a coating. After the preparation of the plasticizer the further required ingredients were mixed and plastisol paste is prepared [1].

Then the screen is made prepared for printing. Using manual printing machine and technique the dye stuff is applied on to the fabric. For fixing and drying of the dye stuff the fabric is passed into the curing machine through conveyor under 240 degree centigrade. Finally the fabric is fused in fusing machine under 120 to 220 degree centigrade.

VIII. Manufacturing of the Product

The developed fabric was converted into garment. The special type of garment which is often used by every women. Overcoats are referred as topcoats to be worn as a outer most garment usually. It is worn by both women and mens. For functional and also as fashion purpose overcoats can be worn all times.

1. Selection & Sourcing of raw material.
2. Blend and weave selection.
3. Manufacturing of fabric samples.
4. Coating of the fabric samples.
5. Testing of fabric samples.
6. Drafting patterns.
7. Manufacturing of the product.
8. Integration of circuit with the garment.
9. Testing of electrostatic & insulation properties.
10. Analyzing the serviceability and feasibility.

A. Method of developing Electrical Circuits

1. The circuit is developed after the garment construction.
2. After the development of garment the copper wires of the fabric at the raw edges were soldered alternatively using soldering wires to create a closed circuit.
3. The alternate soldering is done and the soldering is joined with two different wires to insert the positive and negative charges.
4. The soldered wires were connected to the battery. So that current is supplied to the circuit.
5. The battery has ON/OFF switch which can be used to supply of current when needed.
6. The battery is connected to circuit for the passage of current and static electricity was produced, which creates a shock when touched.

IX. Technical Specifications of the Final Deliverables (Overcoat Garment (T-shirt):

Electrical voltage of 230V, 10-50mA is produced in T-shirt when the user presses the switch. The product dimensions are as follows;

- Full length 30"
- Shoulder to waist : 16"
- Shoulder width : 14.5"
- Neck circumference: 14"
- Waist circumference: 26"
- Armhole circumference: 14"

A. Integration of Circuit with Garment

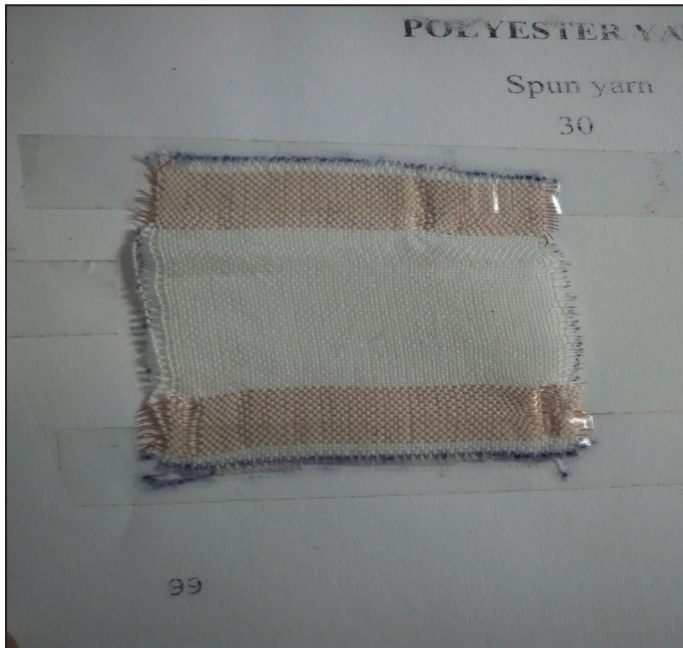


Fig. 2: Integration of Copper With Circuit

B. Circuit Diagram

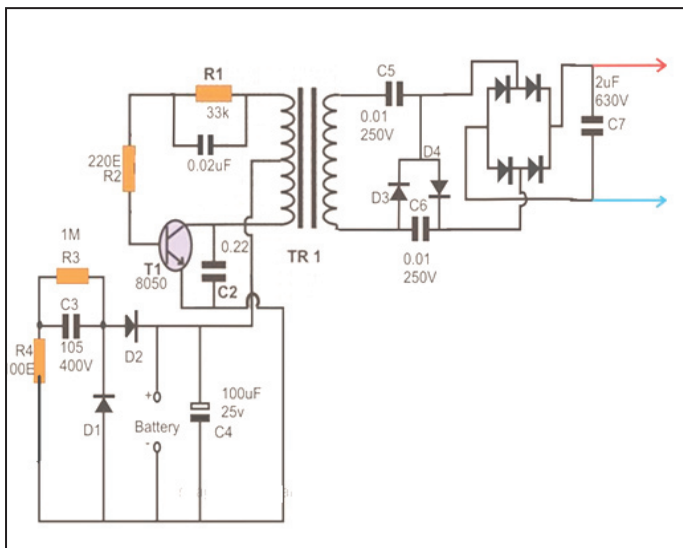


Fig. 3: Circuit Diagram

X. Conclusion

The developed new innovative garment is fully functional and gave a mild electric shock of 15-30mA which induced a momentary loss of control thereby giving the victim time to call for help or rescue herself. The developed garment weighed 800- 850 grams which is comparable to denim jackets or lined casual jackets and cost of manufacturing is estimated to be less than INR 1500/-

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R. Sureshkumar received his B.E degree in Electrical and Electronics Engineering from Government College of Technology, Coimbatore, Tamil-Nadu, in 2004 and the M.E. degree in Applied Electronics from P.S.G College of Technology, Coimbatore, Tamil Nadu, in 2009. He is currently an Assistant Professor with Department of Electrical and Electronics Engineering, Kumaraguru College of Technology, Coimbatore, TamilNadu. His research interest includes virtual instrumentation, renewable energy systems.



Dr. S. U. Prabha received her Ph.D degree in 2010 from Faculty of Engineering and Technology, Multimedia University, Malaysia. She received her M.E degree in Electrical Machines from PSG College of Technology, Bharathiyar University, Coimbatore in the year 1997. Currently, she is working as Professor and Head in EEE Department of Sri Ramakrishna Engineering College, Coimbatore. Her main research interests are Internet of Things and Renewable Energy Resources.