United States Patent [19]

Yuasa

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[54] **ELECTRIC GARMENT**

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[21] Appl. No.: **214,498**

Related U.S. Application Data

[63] Continuation of Ser. No. 99,833, Dec. 21, 1970, abandoned.

[30] **Foreign Application Priority Data**

Mar. 10, 1970 Japan 45/23337

[52] **U.S. Cl.** **219/211,** 219/527, 338/211, 338/224, 338/225

[51] **Int. Cl.** **H05b 1/00**

[58] **Field of Search** ..... 219/211, 212, 527–529, 219/549; 338/211, 224, 308, 225; 128/379–382; 2/2.1 A, 2.1 R; 161/62, 83, 92, 160

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[57] **ABSTRACT**

An electric garment having heating elements on the inside surface of the garment, the heating elements connecting to a power source outside the garment through a cord so as to generate heat from the elements. The heating elements comprise an electroconductive fabric knitted of a chemical fiber and a metallic fiber coated on the surface of the fabric with an electroconductive agent prepared from a mixture of thermosetting resin, carbon powder and metal powder, the heating element being further covered with a spongelike heat retaining layer having independent bubbles.

3 Claims, 4 Drawing Figures

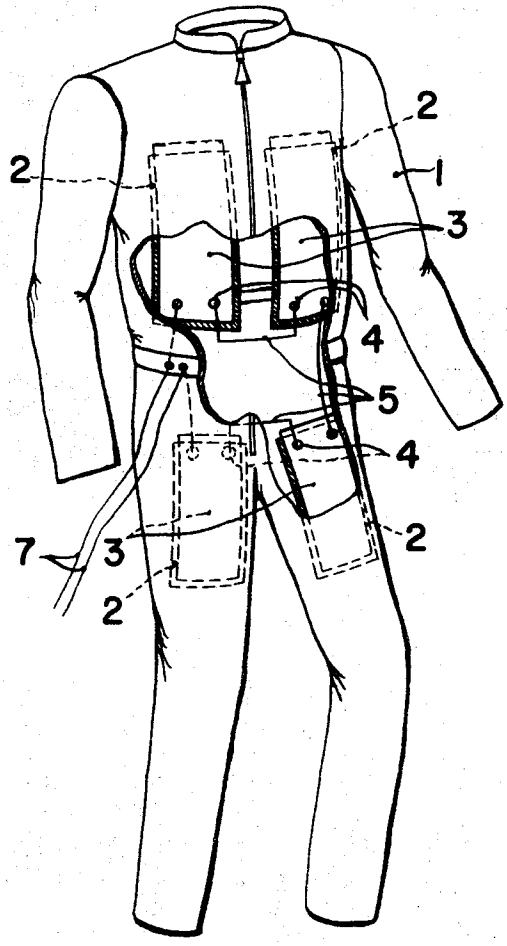


FIG. 1

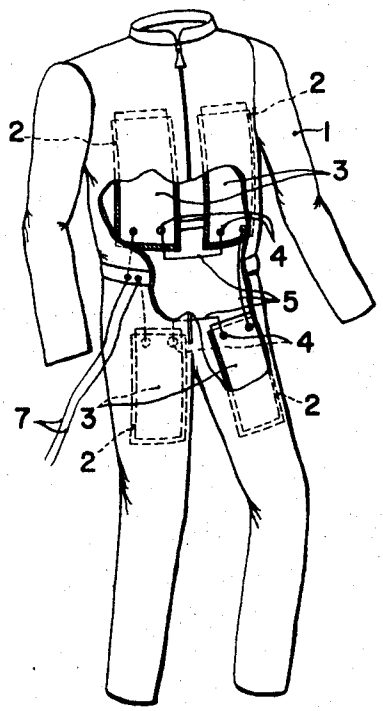


FIG. 2

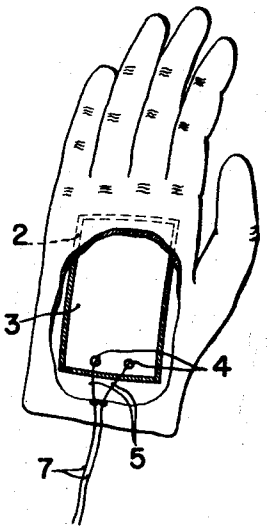


FIG. 3

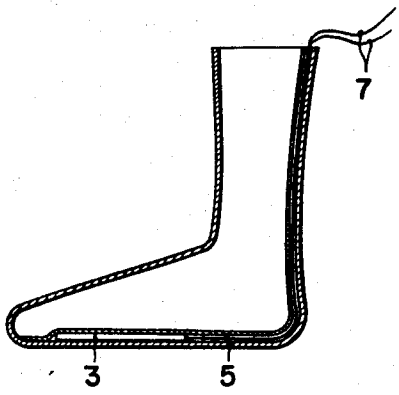
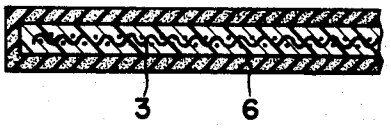


FIG. 4



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ELECTRIC GARMENT

This is a continuation of application Ser. No. 99,833, filed Dec. 21, 1970, now abandoned.

This invention relates to a cold protection garment, and more particularly to an electric garment for use in protection from cold by incorporating heating elements into a garment and subjecting the heating elements to generation of heat through electric energy.

The cold protection garment heretofore used in cold districts was of the type in which cotton flock or rayon flock was stuffed between the outer fabric and regular lining of fur or synthetic fiber and was sewn together. But the garments of this type are all designed to keep the temperature of the human body, and have to worn one over another in layers to prevent the transpiration of body heat in a colder climate, and accordingly they are not free from the disadvantage in that the wearer of such a garment is deprived of his quick and easy actions. Furthermore, it may be easy to keep the body warm, but in the case of keeping hands and feet warm it does not answer the purpose merely to wear one garment over another. Consequently, it is all the more problematic how to keep those regions warm and the type of garments conventionally used has much to be desired as a cold protection garment in that it cannot prevent the frequent outbreak of frost-bite in frigid districts.

This invention, in view of the disadvantages of the kind described, has incorporated heating elements into a garment.

A primary object of this invention is to provide an electric garment that is thin, yet capable of fully protecting a wearer from cold.

Another object of the invention is to provide a flexible and functional electric garment for cold protection.

Yet another object of the invention is to provide a low-priced electric garment for cold protection.

A detailed description of this invention in one form will be made with reference to the accompanying drawing in which:

FIG. 1 is a front elevation, broken in part, of an electric garment according to this invention;

FIG. 2 is a front elevation, broken in part, of an embodiment of the invention in a glove;

FIG. 3 is a front elevation, broken in part, of an embodiment of the invention in a sock; and

FIG. 4 is an enlarged longitudinal sectional front elevation showing the structure of a heating element used in the invention.

Referring now to FIG. 1, a garment 1 is made of a synthetic resin fiber such as polyamide resin or of fur or the like and is a one-piece type. The garment is designed to put on and off by means of a zip fastener.

This garment is of the construction in which pockets 2 are formed at several points in the regular lining and heating elements 3 are inserted in the pockets 2 or of the construction in which the heating elements are inserted between the outer fabric and the regular lining and sewn thereto so as to prevent movement therebetween. The heating elements are each provided adjacent to their side edges with two small holes 4 and the small holes 4 of other heating elements adjacent to said heating elements are electrically connected to said small holes 4 by means of lead wires 5. Each of the heating elements, as shown in FIG. 4, is made into the clothlike form of a knitted fabric of a thickness of about 0.5 mm alternately knitted of chemical fiber such as vinyl chloride and metallic fiber on a knitting machine and coated on the surface with an electroconductive agent prepared from a mixture of thermosetting resin such as epoxy resin and carbon powder and metal powder such as silver powder, whereby the whole of each heating element is formed into a platelike form about 1.5 mm in overall thickness. Also, the heating element is covered on the entire surface with a spongelike heat retaining layer 6 made of polyethylene, polyvinyl chloride, rubber, etc. as a chief material and having independent bubbles. As the heat retaining layer is excellent in insulating property, the heating element can sufficiently obtain a cold protection effect with a small amount of heating.

As shown in FIG. 1, when four heating elements in all are used on the upper, lower, left and right portions of the garment, the small holes 4 formed on each heating element are connected by wires 5 to each other, and the last small holes are connected to a cord 7 which is in turn connected to a power source. The cord 7 is connected to both poles of the power source of a cell, battery or the like. The heating elements described above are conected in series but they may be connected in parallel. Furthermore in the drawing, the heating elements 3 are shown as being provided at four places, upper, lower, left, and right, on the front part of the garment, but they may be positioned additionally in the rear part, i.e., on the back part of the garment. In short, the number of the heating elements provided may depend upon the amount of current to be supplied thereto so as to freely control the heating temperature for obtaining optimum temperature.

Referring now to FIG. 2, in which the invention is embodied in a glove, the glove is made of a synthetic resin fiber or leather, and the heating element 3 covered with a heat retaining layer is mounted on the inside of the glove and lead wires 5 taken out from the element 3 are connected through a snap terminal to the power source.

FIG. 3 shows the invention in another form in which it is embodied in a sock. The cold protection sock is knitted of a synthetic resin fiber and the heating element 3 covered with the heat retaining layer is mounted on the inside bottom of the sock and is connected through the cord 7 to the power source.

This heating element is designed to depend upon a cell for its portable power source. Namely, when the cell is used, the heating element is enabled to be heated to temperatures in the range of 40° to 60°C, which provides an optimum temperature while walking or working out of doors. Also, when riding on a motor cycle or the like, the use of a 12 volt battery mounted on the motor cycle as a power source could make the heating elements produce temperatures in the range of 70° to 90°C at the power consumption of 28.9 W and thus could sufficiently protect the rider from even temperatures below zero in the open air.

Since the invention can dispense with bulkiness as a garment for protection from a cold climate, it has a characteristic feature in that work efficiency can be raised by wearing the garment in the districts where it is extremly cold. Also, the use of socks can not only protect the workman from cold-bite but also, when used in bed, sleeping with the socks on can provide a simple method of keeping warmth. Also, the heating element is readily flexible and free from breaking, and therefore very easy of handling. It should be under-

stood that various modifications could be made in the invention without departing from the scope and spirit of the invention.

What is claimed is:

1. An electric garment having heating elements located on the inside surface of a garment, a power source located outside the garment, and a cord interconnecting said heating elements and said power source so as to generate heat from the elements, said heating elements comprising an electroconductive fabric knitted of a chemical fiber and a metallic fiber, and a coating on the surface of said fabric, said coating being an electroconductive agent prepared from a mixture of thermosetting resin, carbon powder and metal powder, said heating elements being further covered with a spongelike heat retaining layer having independent bubbles.

2. An electric garment according to claim 1 characterized by gloves being used as the garment.

3. An electric garment according to claim 1 characterized by socks being used as the garment.

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