United States Patent

Chapman

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[54] THERMOELECTRIC PILLOW

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[52] **U.S. Cl.**.....**62/3,** 165/46, 297/180, 165/135

[51] **Int. Cl.**.....**F25b 21/02**

[58] **Field of Search**.....62/3

[56] **References Cited**

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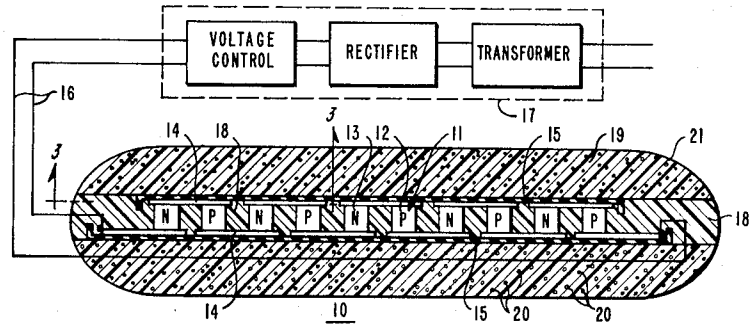
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[57] **ABSTRACT**

A thermoelectric pillow having a thermoelectric unit which operates according to the Peltier effect to transfer heat from a first side to a second side thereby cooling the first side and heating the second side.

11 Claims, 3 Drawing Figures



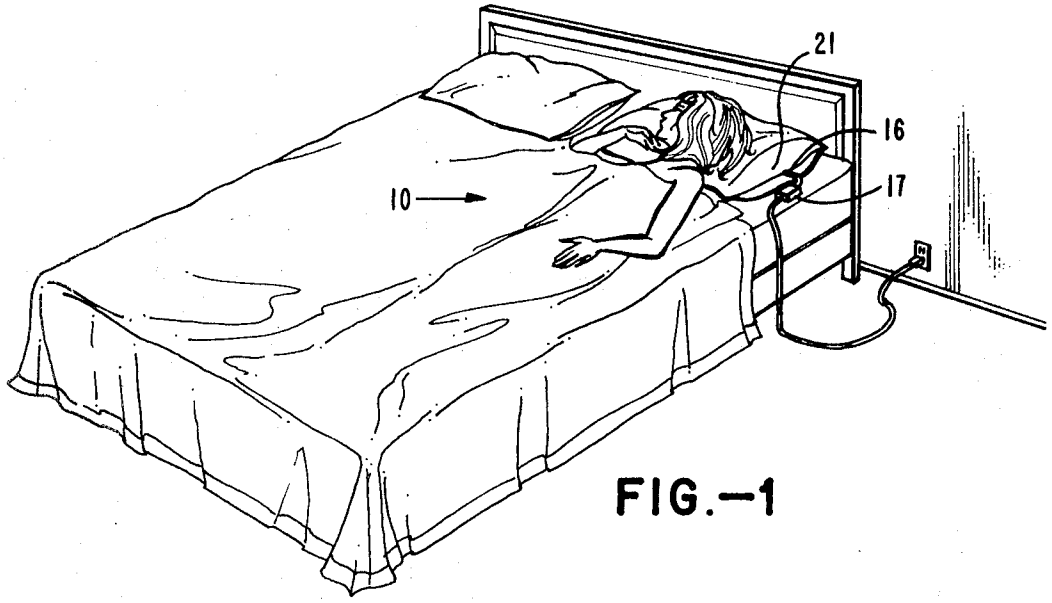


FIG.—1

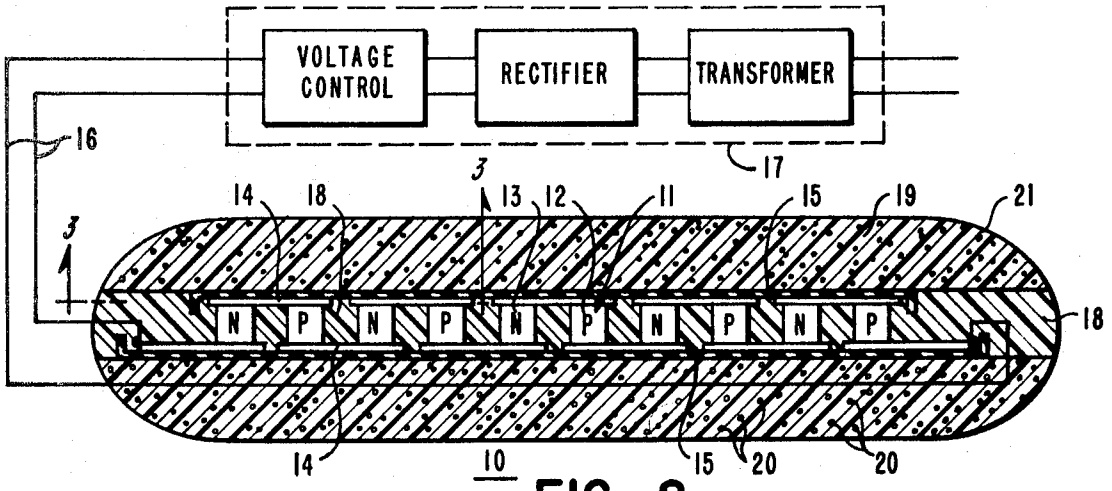


FIG.—2

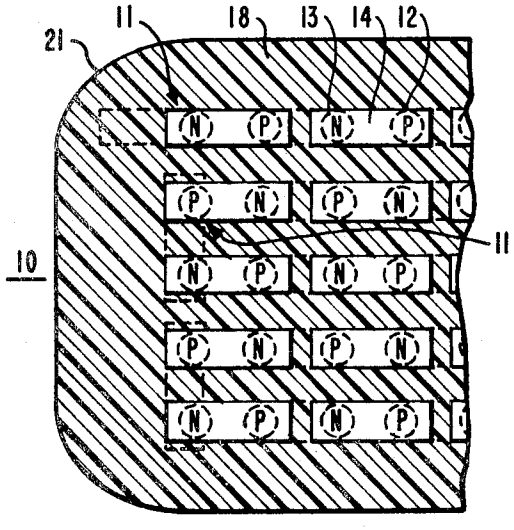


FIG.—3

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THERMOELECTRIC PILLOW

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention provides a cool pillow which might be used in a variety of situations. One situation might occur when a person must sleep in a warm room. Since there is a substantial flow of blood through the head and neck areas, the cooling of this region has the physiological effect of making a person feel cool all over. This physiological cooling effect, together with a psychological feeling of coolness that comes from cooling the head and neck region, enables a person to attain a high degree of comfort by sleeping on a cool pillow even though the room may be uncomfortably warm. A cool pillow might also be used to help reduce the fever of a person who is sick. In general, a cool pillow may be used in any situation where a cool, padded surface is needed.

2. Description of the Prior Art

Current methods of providing a cool surface are messy, inefficient, and provide little control over the temperature. One method is to run cold water through a towel or other cloth, wring out most of the water and then apply the damp towel or cloth to the body. Another method is to fill a plastic bag with ice cubes. Body fever is sometimes cooled by placing a patient in a cold shower. However, none of these methods are as convenient as plugging a dry, cool pillow into a standard electrical outlet.

SUMMARY OF THE INVENTION

When an electrical current flows across the junction between two different materials, a quantity of heat, proportional to the total charge crossing the junction, is displaced or absorbed depending upon the direction of current. This effect is due to the existence of an electromotive force at the junction of the two materials and is known as the Peltier effect. In recent years it as been discovered that a group of materials known as semiconductors are very efficient in producing this cooling or heating in accordance with the Peltier effect.

If a number of copper or aluminum bars are used to connect alternately P-type and N-type semiconductor materials, the bars can be made to form two relatively smooth, flat surfaces with the semiconductor elements between the two surfaces. When an electrical current is passed through the series connected bars and semiconductor elements, one surface is cooled and the opposite surface is heated. By reversing the direction of current flow, the cool and hot surfaces will be interchanged. This invention uses a series of thermoelectric junctions to provide a thermoelectric unit which can be made warm on one side and cool on the other side.

The thermoelectric pillow is comprised of a thermoelectric unit, thermal insulation material preventing undesirable heat transfer between the cool and warm portions of the pillow, material to electrically insulate the thermoelectric unit, padding material having high thermal conductivity and a plastic case to seal and protect the internal portions of the pillow. High thermal conductivity through the padding is attained by dispersing particles of material having high thermal conductivity, such as copper or aluminum. The padding material may be selected from the many suitable materials well known in the art.

A control provides a DC voltage of selected polarity and magnitude. A stepdown transformer within the control electrically isolates the pillow from the relatively high voltage power source, thereby preventing any danger of serious electrical shock due to a malfunction within the pillow. The polarity of the voltage determines which surface of the pillow will heat and which will cool, while the magnitude of the voltage determines the amount of heating or cooling.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood from the following description, together with the accompanying drawings, in which:

FIG. 1 is a perspective view of a bed with a thermoelectric pillow thereon;

FIG. 2 is a longitudinal cross section of a thermoelectric pillow in conjunction with a block diagram of the control; and,

FIG. 3 is a plan view partly broken away of a thermoelectric pillow.

DETAILED DESCRIPTION

FIG. 1 shows a thermoelectric pillow **10** according to the present invention with exterior cover **21**, control **17**, and electrical wires **16**. Referring now to FIGS. **2** and **3**, the thermoelectric pillow **10** has a thermoelectric unit **11** which transfers heat from one side to the other when electrical current is passed through it. This heat transferring property of the thermoelectric unit, which is well known in the art as the Peltier effect, is attained by alternately connecting P-type **12** and N-type **13** semiconductor materials in series. Relatively thin, flat, metallic bars **14** are used to form the junctions between the different semiconductr materials. These bars **14** can be of any well-known material such as aluminum or copper which have the characteristics of high thermal and electrical conductivity. In addition to conducting electrical current between semiconductor elements, these bars **14** absorb heat from adjacent portions of the pillow **10** and conduct it to the semiconductor elements on the cool side, and absorb heat from the semiconductor elements and conduct it to the adjacent portions of the pillow on the warm side. The direction of current through the thermoelectric unit **11** determines which side is warm and which side is cool. Electrical insulation **15** restricts the current to a single path through the thermoelectric unit. The electrical insulation **15** should have good thermal conductivity so as not to restrict the transfer of heat between the bars **14** and the outer portions of the pillow. Electrical conductors **16** connect the thermoelectric unit **11** with a control **17**, which transforms a standard AC voltage to a direct current of selected magnitude and polarity. The control **17** may be constructed according to any of a number of arrangements well known in the art, such as a commercial device known as a variac and a rectifier, or a transformer, rectifier and rheostat.

Thermal insulation **18** fills the spaces between semiconductor elements **12** and **13** and forms a relatively thin layer separating the two sides of the pillow. The purpose of the thermal insulation **18** is to restrict undesirable heat transfer from the warm side to the cool side.

Padding **19** is placed on both sides of the thermoelectric unit **11** for cushioning the body when the pillow is used. The padding **19** may be any of a variety of suitable materials well known to the art, such as polyurethane foam, sponge rubber or cotton. Heat conducting material **20** which has been reduced to a powder or fine granules is intermingled with the padding **19** to facilitate the transfer of heat between the thermoelectric unit **11** and the surface of the pillow. Copper, aluminum or other material having high thermal conductivity may be used.

An exterior cover **21** surrounds the pillow, sealing, protecting and supporting the interior portions. The exterior cover **21** may be fashioned from any plastic or rubber material well known to the art and enables the pillow to be easily laundered or cleaned.

What is claimed is:

1. A thermoelectric pillow comprising:

a plurality of semiconductor junctions which function in accordance with the Peltier effect;

electrical insulation means for electrically insulating the semiconductor junctions;

thermal insulation means for restricting heat transfer between the opposite sides of said semiconductor junctions;

padding material of low thermal conductivity located adjacent the semiconductor junctions on opposite sides thereof;

material of high thermal conductivity interspersed with the padding material; and

exterior cover means for supporting and protecting the padding material.

2. The thermoelectric pillow of claim 1 wherein said material of high thermal conductivity comprises small particles.

3. The thermoelectric pillow of claim 1 wherein said material of high thermal conductivity comprises a powder.

4. A thermoelectric pillow comprising:

a thermoelectric unit operating according to the Peltier effect to provide the pillow with a warm side and a cool side;

thermal insulation means thermally separating the cool side of the pillow from the warm side of the pillow;

electrical insulation means for electrically insulating the thermoelectric unit;

padding means of relatively low thermal conductivity having material of relatively high thermal conductivity intermingled therewith located adjacent the thermoelectric unit on both the cool side and warm side;

exterior cover means for providing an outer surface and hermetically sealing the internal parts of the pillow; and,

control means for selectively regulating the surface temperatures of the pillow.

5. The thermoelectric pillow of claim 4 wherein the control means includes means for converting alternating current power to a direct current of selected magnitude and polarity for application to said semiconductor junctions.

6. A thermoelectric pillow comprising:

a plurality of semiconductor junctions forming a thermoelectric unit which operates in accordance with the Peltier effect;

thermal insulation material filling the spaces between semiconductor junctions;

electrical insulation material having high thermal conductivity surrounding the thermoelectric unit;

padding material of low thermal conductivity intermingled with material of high thermal conductivity surrounding said electrical insulation material;

relatively thin sheetlike plastic material surrounding said padding material and providing a seal;

means for providing electrical connection between the thermoelectric element and a control means;

control means for supplying a variable current of selected magnitude and polarity;

means for providing electrical connection between the control means and a source of electrical power.

7. A thermoelectric pillow comprising:

a plurality of semiconductor junctions arranged in series to provide a thermoelectric unit;

thermal insulation material filling the spaces between semiconductor junctions in the thermoelectric unit;

a relatively thin layer of electrical insulation material surrounding the thermoelectric unit;

a relatively thick layer of polyurethane foam padding material surrounding the layer of electrical insulation material;

particulate material of high thermal conductivity intermingled with the layer of padding material;

a relatively thin layer of plastic material surrounding the padding material and providing a seal;

means for providing electrical connection between the thermoelectric element and a temperature controlling means;

control means for providing an electrical current of selected magnitude and polarity to the thermoelectric unit;

means for providing an electrical connection between the temperature controller and the source of electrical power.

8. The thermoelectric pillow of claim 5 wherein the control means comprises a variac and a voltage controlled rectifier.

9. The thermoelectric pillow of claim 5 wherein the control means comprises a stepdown transformer, rectifier means for providing a direct current and a rheostat.

10. A thermoelectric pillow comprising a plurality of semiconductor elements electrically connected in series to form a thermoelectric unit having a first surface and a second surface;

electrical insulation means for electrically insulating the thermoelectric unit;

first and second sponge rubber padding means disposed adjacent the first and second surfaces of the thermoelectric unit for providing a cushion effect;

thermal insulation material filling all spaces between the first and second surfaces of the thermoelectric unit and separating the first and second padding means to the extent that they extend beyond the thermoelectric unit;

material of high thermal conductivity reduced to small granules and intermingled with the first and second padding means;

a relatively thin layer of plastic material forming the exterior of the pillow;

control means for providing a current of selected magnitude and polarity;

terminal means for electrically connecting the control means between a source of electrical power and the thermoelectric unit.

11. For use in a thermoelectric pillow which uses a thermoelectric unit operating in accordance with the Peltier effect,

padding means of low thermal conductivity for providing a cushioning effect intermingled with particles of material having high thermal conductivity.

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