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(56) Documents cited
GB 1585921 A GB 1258106 A

(58) Field of search
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(54) Improvements in or relating to electrically-powered heating panels

(57) An electrically-powered heating panel 1 of flexible construction, e.g. an under-carpet heater or blanket comprises a heating cable 2, with inner 3 and outer 4 heating wires (of equal resistance) connected in series with a fuse 5.

The heating wires 3, 4, which are in coiled form, are electrically insulated from each other by inner insulation 6 of thermoplastics material (Polyethylene) and sheathed in further insulation (PVC).

Under normal conditions, the current flow from line L to neutral N is by way of fuse 5, inner heating wire 3, and then outer heating wire 4, but in the event of excessive overheating at any point along the cable, the inner insulation sheath 6 will soften/melt causing a short circuit between the wires 3, 4, increasing current flow and blowing fuse 5.

Wherever an initial short circuit occurs, the nominal resistance is halved.

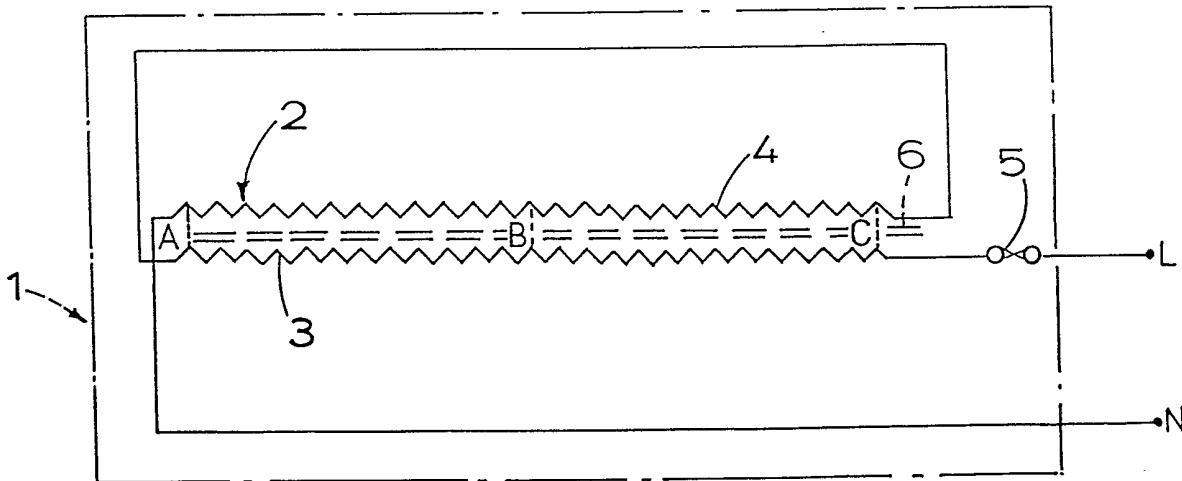


FIG.3.

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

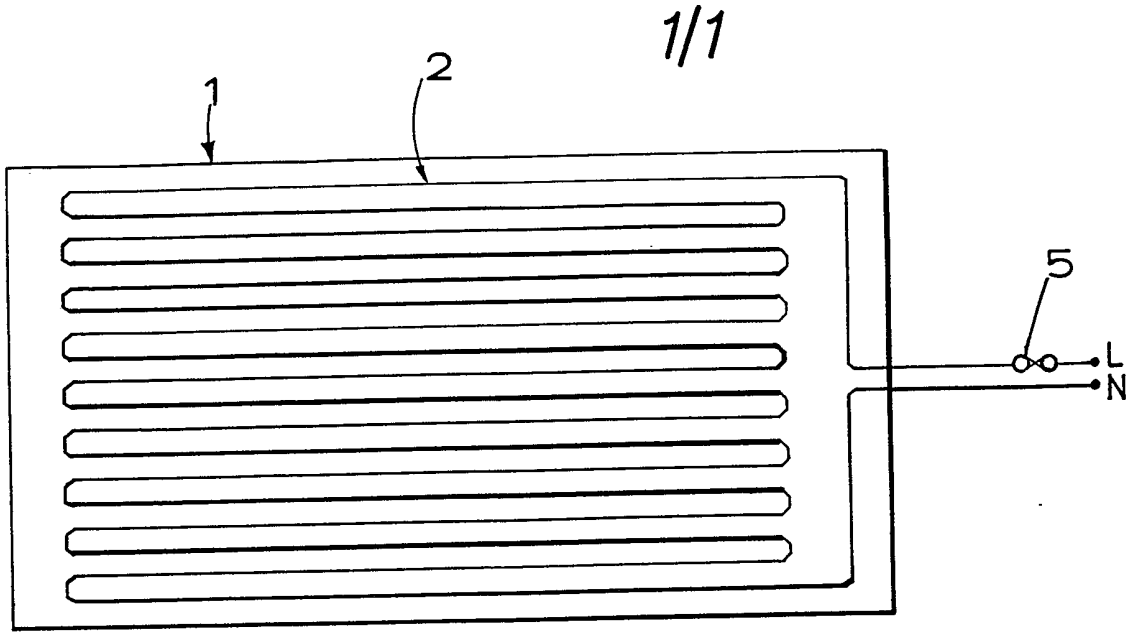


FIG. 1.

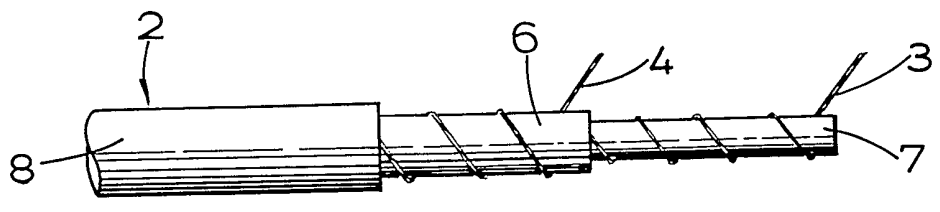


FIG. 2.

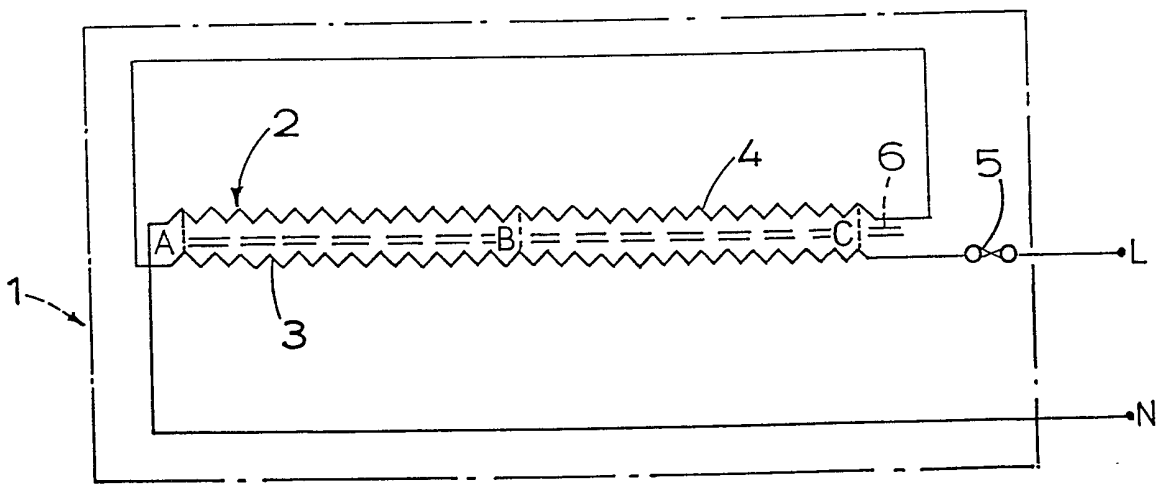


FIG. 3.

IMPROVEMENTS IN OR RELATING TO
ELECTRICALLY-POWERED HEATING PANELS

This invention relates to electrically-powered heating panels, which may be of flexible or non-flexible construction.

As used herein, the term "electrically-powered heating panel" is intended to include electrically-powered under-carpet heaters, blankets, mattresses and pads. The invention is particularly applicable however, to electrically-powered under-carpet heaters.

The present invention makes use of that form of electrically-powered heating panel comprising a tortuously-disposed dual wire heating cable. As used herein, a "dual wire heating cable" is defined as a cable containing two (inner and outer) resistance wires which are separated from each other by a first or inner insulation, the whole being enclosed in a second or outer insulation in the form of a sheath.

According to the present invention, an electrically-powered heating panel comprises a dual wire heating cable (as herein above defined) with the two heating wires connected in series together with fuse means, the two wires being of substantially equal resistance, and the inner insulation comprising material which, when overheated, allows electrical contact between the wires.

An embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings, wherein:-

Figure 1 is a plan view in section of an under-carpet heater constructed in accordance with the invention;

Figure 2 is a fragmentary side view, with some parts removed, of the dual wire heating cable used by the under-carpet heater of Figure 1; and

Figure 3 is a circuit diagram.

With reference to the drawings, an electrically-powered heating panel 1 of flexible construction, in the form of an under-carpet heater comprises, a dual wire heating cable 2, with inner (3) and outer (4) heating wires thereof connected in series together, with fuse means 5, the inner and outer heating wires 3, 4 being of substantially equal electrical resistance.

The inner and outer heating wires 3, 4, which are of coiled form, are electrically insulated from each other by inner insulation 6 of thermoplastics material.

The inner heating wire 3 is wound on a central core 7 of rayon and is covered by the insulation 6, which comprises a sheath of high density, low melting point (120°C) polyethylene. The outer heating wire 4 is wound on the sheath of insulation 6 and is itself covered with an outer insulating sheath 8 of high temperature polyvinyl chloride (PVC), another thermoplastic material. (Melting point: 150°C).

The dual wire heating cable 2 is connected, by way of a room temperature thermostat control (not shown) to a 240 AC power supply circuit represented by "line" L and "neutral" N. The fuse means 5 is connected in series between the line L and the inner heating wire 3. The wire 3 is connected in series with the wire 4, which is in turn connected in series with the neutral N.

Details of the under-carpet heater 1 are as follows:-

Power input = 450 watts

Length of heating cable 2 = 112.5M

Nominal current @ 220V = $450/220 = 2.05$ amps

Total resistance = 107.6 ohms

Resistance of outer wire 4 = 53.8 ohms

Resistance of outer wire 3 = 53.8 ohms

Fuse 5 = 3.0 amp rating

Under normal conditions, the current flow from line L to neutral N is by way of fuse 5, inner heating

wire 3, and then outer heating wire 4.

As the inner insulation sheath 6 is of polyethylene, this sheath will ^{soften/} melt and allow substantial electrical contact, (creating a short circuit), to occur between the inner and outer wires 3, 4 in the event of excessive overheating at any point along the length of the heating cable 2.

If a short circuit takes place at point "A" current will flow from the line L, through fuse 5 and inner wire 3 and onto the neutral N.

Thus only the inner heating wire 3 remains in use, the outer wire 4 being by-passed. This halves the nominal resistance of the heating cable 2 from 107.6 ohms to 53.8 ohms, thus doubling the current from 2.05 amps to 4.1 amps. The power input rises from 450 watts to 900 watts.

The increase in current flow may not be sufficient to blow the fuse 5 at once, as the fuse is rated at 3.0 amps, and the current flow is 4.1 amps. However, the increased power input will cause the inner insulation sheath 6 to further overheat, (and ^{soften/} melt), so as to cause further short circuits between the heating wires 3 and 4, and increase current flow sufficiently to ensure that the fuse 5 does indeed blow. The current supply is therefore terminated.

Wherever an initial short circuit occurs, the nominal resistance is halved. If a short circuit is at mid-point "B" then current will flow from the line L, through the fuse 5, along half of the inner wire 3 to point "B", along half of the outer wire 4, (point "B" to point "A") then onto neutral N. A short circuit at point "C" has an effect similar to that at point "A". However, instead of the inner wire 3 remaining in circuit, the outer wire 4 is in circuit on its own; inner wire 3 being by-passed.

As shown in Figure 1, the heating cable 2, which

is also flexible, is tortuously wound over the area of the under-carpet heater 1.

An important feature of the invention is that the initial short circuit only halves the resistance
5 wherever it occurs, thus ensuring no sudden current surge which could damage the heater control, i.e. the room thermostat, or cause the fuse 5 or any part of the circuit to explode. This could happen in a circuit subjected to a complete or very low resistance short
10 circuit.

Modifications of the cable 2 may include dispensing with the core 7 and providing one (or more) (uncoiled) wire 3 which extends through and is enclosed by tight-fitting sheath 6 material. If more than one
15 wire 3 is so provided, the other or others are separated therefrom by sheath 6 material.

CLAIMS

1. An electrically-powered heating panel comprising a dual wire heating cable (as defined) with the two heating wires connected in series together with fuse means, the two wires being of substantially equal resistance, the inner insulation comprising material, which, when overheated, allows electrical contact between the wires.
2. A heating panel as claimed in Claim 1, wherein the two heating wires comprise inner and outer heating wires, with the inner heating wire wound on a central core of plastics material and covered by said inner insulation, and with the outer heating wire wound on said inner insulating and covered in turn by outer insulation material.
3. A heating panel as claimed in Claim 1 or 2, wherein the inner insulation comprises polyethylene.
4. A heating panel as claimed in Claim 1, 2 or 3, comprising an under-carpet heater.
5. An electrically-powered heating panel, substantially as hereinbefore described, with reference to the accompanying drawings.

Patents Act 1977
Examiner's report to the Comptroller under
Section 17 (The Search Report)

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Relevant Technical fields (i) UK CI (Edition L) H2K: (KSB1, KSB9, KCD) G3R: (RBQ52) (ii) Int CI (Edition 5) H02H 5/04, 7/00, H05B 1/02 3/18, 3/28, 3/36, 3/48, 3/54 3/56 Databases (see over) (i) UK Patent Office (ii)	Search Examiner JOHN CAGE
	Date of Search 11 AUGUST 1993

Documents considered relevant following a search in respect of claims 1-5

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X Y	GB 1585921 (DREAMLAND) see Figure 1 and page 1 line 79 - page 2 line 62	X: 1,2,4 Y: 3
Y	GB 1258106 (MATSUSHITA) see page 2 lines 46-58	3



Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

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