Oct. 22, 1963 J. D. ZARTMAN ET AL 3,108,175

ELECTRICALLY HEATED FABRICS

Filed Dec. 18, 1961

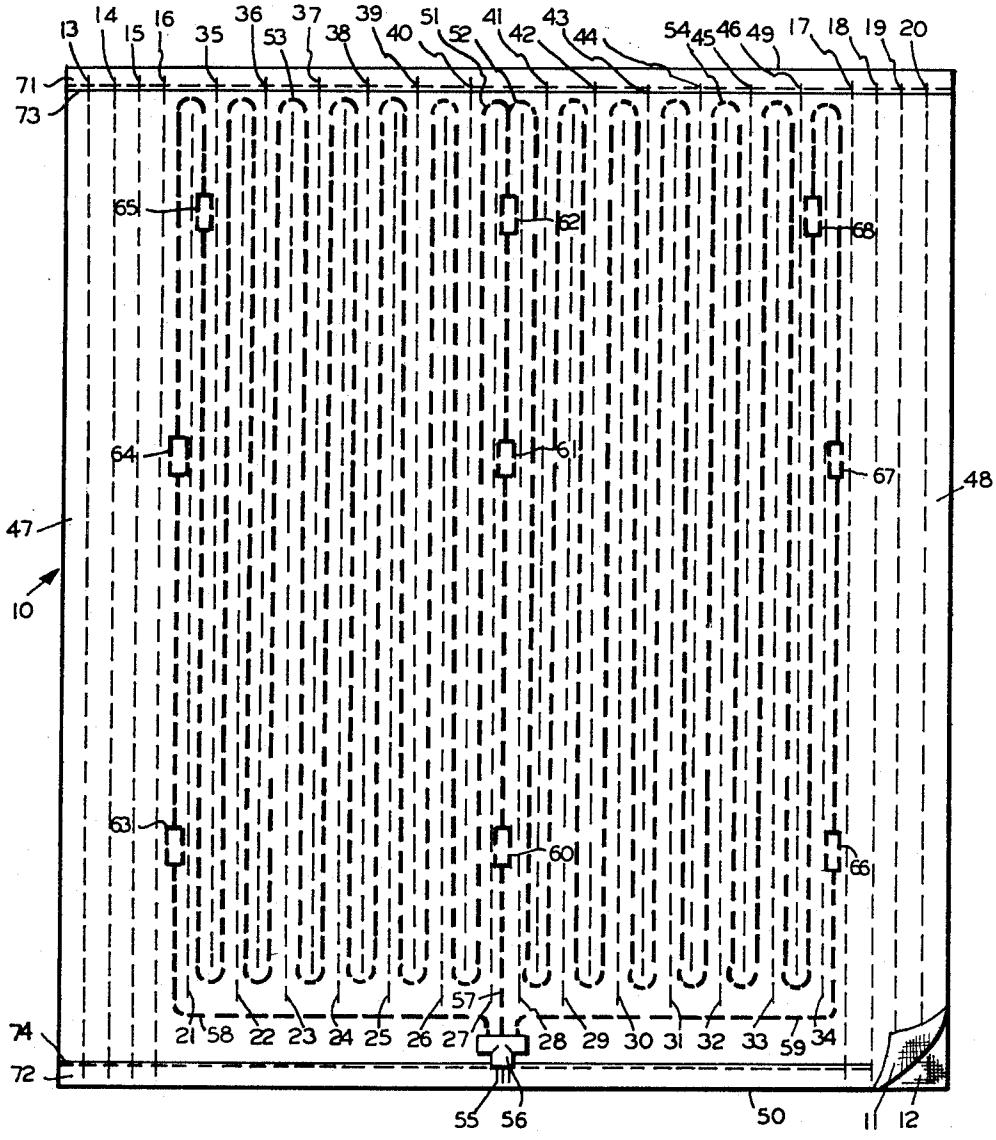

FIG. 1

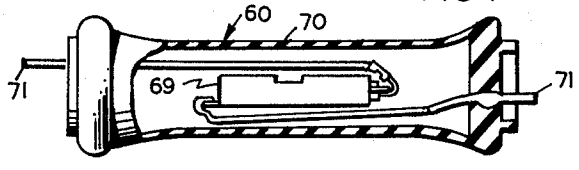

FIG. 2

INVENTORS
JOHN D. ZARTMAN
GORDON R. DOLAN
BY Robert D. Sommer
AGENT

United States Patent Office 3,108,175 Patented Oct. 22, 1963

3,108,175

ELECTRICALLY HEATED FABRICS

John D. Zartman, Belton, and Gordon R. Dolan, Anderson, S.C., assignors to Essex Wire Corporation

Filed Dec. 18, 1961, Ser. No. 159,854
3 Claims. (Cl. 219—46)

This invention relates to electrically heated fabrics such as electric bedcovers, wherein heating wires connected to thermostats are provided between layers of the fabric.

In electrically heated fabrics of this character, it is customary to stitch or weave two layers of textile together along spaced lines to form parallel channels extending lengthwise of the fabric. An example of such fabric construction is disclosed in the Ivar O. Moberg United States Patent No. 2,203,918, issued June 11, 1940. Electric heating wires with protective thermostats connected thereto are threaded through the channels in the desired arrangement. The thermostats are suitably connected to the heater wires for location in different portions of the fabric whereby, upon overheating of any portion of the fabric, a thermostat operates to interrupt the heating circuit. To facilitate the manufacture of the electrically heated fabric for bedcovers, the thermostats are usually located in only three channels with three thermostats arranged in spaced relation in each of these channels between the head and foot ends of the bedcover.

Because all textiles shrink to a degree, the fabric will decrease in length during use. The length of the heating wires does not change and will exceed the combined length of the channels when the fabric shrinks. This results in a surplus amount of wire in each channel. The surplus wire would be of little consequence if it were evenly distributed throughout all the channels of the fabric. However, the weight of the thermostats tends to shift the thermostats toward the foot end of the bedcover and draws the surplus heating wire into the channels in which the thermostats are normally located. When the thermostats shift from their desired locations toward the foot end of the bedcover, the upper portion of the bedcover is left without any overheat protection. In some cases, difficulty has also been experienced when a thermostat is subjected to direct heating by an adjacent length of surplus heating wire and takes control of the bedcover temperature away from the temperature control device.

In our copending United States application No. 41,145, filed July 6, 1960, now abandoned, there is disclosed one means of restraining movement of heating wires with connected thermostats which are contained in the channels of a two-layer bedcover. In this copending application, portions of the channels in which thermostats are disposed are reduced in width to prevent the free passage therethrough of a thermostat, yet are of such width as to permit the thermostats to be forced through the reduced portions during wiring of the bedcover.

Such bedcover construction, although suitable for its intended purposes, is somewhat more difficult to wire than bedcovers having channels with no constrictions. Also, in forcing the thermostats through the constricted portions of the channels, the heating wires and their connections to the thermostats may be subjected to excessive forces.

It is therefore an object of the present invention to provide an improved electrically heated fabric construction having means for restraining movement of the heating wires and the thermostats.

It is a further object of the present invention to provide an improved electrically heated fabric construction in the thermostats and heating wires have less tendency to shift positions than in prior constructions.

In the preferred embodiment of the invention, the invention is applied to an electric blanket with a two-layer shell member having a series of dividers providing channels that extend lengthwise of the blanket to receive a heating element. The heating element has a connecting loop of heating wire disposed about one end of a divider and connected to thermostat switches disposed in channels on each side of the divider. A line of stitching securing the edge binding to the blanket shell member passes close to the end of the divider to prevent movement of the thermostat switches out of their respective channels should they be otherwise free to move.

Other objects and features of the invention will be apparent from the following description and the accompanying drawing, in which:

FIG. 1 is a diagrammatic plan view partly broken away of an electrically heated bedcovering embodying our invention, and FIG. 2 is an enlarged view, partly in section, of a thermostat switch shown removed from the bedcovering.

Referring to the drawing, the invention is shown as applied to a two-layer blanket or shell member **10** which may be of the type disclosed in the previously mentioned Moberg patent. It should be understood that this invention applies to other types of electric bedcovering and the blanket **10** is shown by way of illustration only. The blanket **10** is woven or otherwise formed with an upper layer **11** of fabric united with a lower layer **12** of fabric by parallel rows of connections or dividers **13–46**, thereby forming channels between the dividers.

The groups of dividers **13–16** and **17–20**, respectively, extend across two non-heated side areas **47** and **48** from adjacent the upper or head end **49** of the blanket **10** to adjacent the lower or foot end **50** of the blanket **10**. In the heated central area **51** of the blanket **10** lying between dividers **16** and **17**, the dividers **35–46** extend from adjacent the head end **49** to a line spaced a substantial distance from the foot end **50** of the blanket **10**. The dividers **21–34**, also lying in the heated area **51**, are substantially equal in length to the dividers **35–46** but extend from a line spaced somewhat inwardly from the upper ends of dividers **35–46** to a line below the lower ends of dividers **35–46**.

An electric heating element **52** is disposed between the two layers **11** and **12** in channels formed by the dividers **16, 17, 21–46**. It will be seen that at the head end **49** of blanket **10**, the heating element **52** is looped about the ends of dividers **21–34** with adjacent loops being separated from each other by the adjacent ends of dividers **35–46**. Similarly, at the foot end **50**, the heating element **52** is looped about the ends of dividers **35–46**, the adjacent ends of dividers **21–34** separating the looped portion of heating element **52** from each other and from other adjacent parts of the heating element **52**.

The heating element **52** comprises two continuous lengths of insulated resistance or heating wires **53** and **54** and a protective thermostat wiring harness **55**. The wiring harness **55** includes a connector plug **56** at the

foot end 50 of the blanket 10 and three branches 57, 58 and 59, each connected at one end to plug 56 and consisting of three thermostats and connecting portions of heating wires similar to heating wires 53 and 54. Branch 57 with its three thermostats 60, 61, 62 is disposed in the central channel of heating area formed by dividers 27 and 28. A portion of branch 58, including two thermostats 63 and 64, is disposed in the outermost channel of heating area 51, formed by dividers 16 and 21, and a second portion including thermostat 65 is disposed in the adjacent inner channel formed by dividers 21 and 35. Similarly, a portion of branch 59 with two thermostats 66 and 67 is disposed in the other outermost channel of heating area 51 and a second portion with thermostat 68 is disposed in the adjacent inner channel. The adjacent ends of heating wires 53 and 54 are connected to thermostat 62 and the opposite ends of heating wires 53 and 54 are connected, respectively, to thermostats 65 and 68.

It will be noted that the three thermostats 62, 65, 68 are positioned near the head end 49 of the blanket 10, the three thermostats 60, 63, 66 are positioned near the foot end 50 of the blanket 10, and the three thermostats 61, 64, 67 are positioned intermediate the ends 49 and 50. These thermostats function as overheat switches to open one or both parts of the circuit of the heating element 52 in the event of the blanket becoming overheated. Except that thermostat 62 is constructed for connection at one end to two, instead of one, heating wires, the thermostats 60–68 may be identical in construction and have identical temperature settings. As shown in FIG. 2, the thermostats each have an elongated and generally tubular shape and comprise a thermostatic switch 69 sealed in a thermoplastic tube 70 with attached wires 71 extending through sealed opposite ends of the tube 70.

The heating element 52 is wired in the blanket 10 by inserting branch 57 of the preassembled wiring harness 55 into the central channel of the heated area 51 from the foot end 50 of the blanket 10, and inserting branches 58 and 59 into their respective outermost channel of the heated area 51 from the foot end 50 of the blanket 10. The heating wires 53 and 54 are threaded through the remaining channels by means of a shuttle in a well-known manner. After the heating wires 53 and 54 are attached and sealed to the thermostats 62, 65, 68, the latter are inserted in their respective channels. It will be noted that prior to attachment of the heating wires 53 and 54 to thermostats 65 and 68, an end of each wire extends from the head end of the two channels formed, respectively, by the pair of dividers 21 and 35 and the pair of dividers 34 and 46. After attachment of the thermostats 65 and 68, these wire ends, together with the attached thermostats, are shifted to the positions shown in FIG. 1.

The edges of the head end 49 and the foot end 50 of the blanket 10 are enclosed with edge bindings 71 and 72, respectively, of suitable fabric tape. The bindings 71 and 72, which may have their edges turned in, are secured, respectively, to the blanket 10 by binding stitches 73 and 74. In accordance with a feature of the present invention, each of the dividers 21 and 34, and preferably of the other dividers 22–23, extends to a point closely spaced from the edge of the head end 49. The stitching 73 is applied to the blanket 10 so as to be spaced from the ends of the dividers a dimension slightly less than the width of the thermostats 65 and 68 so that the thermostats cannot pass between the stitching and the ends of the divider. By employing suitable lengths of connecting wires between the thermostats of each branch 58, 59 of the wiring harness, the thermostats will remain in their proper channels, even though their positions should shift when shrinkage of the blanket results in a surplus of heating wire. It will be noted that, should the thermostats shift positions, one thermostat of each pair of thermostats 64, 65 and 67, 68 will remain in the upper or head end portion of the blanket 10. This is important because it is this portion which is most commonly subjected to overheating conditions such as the folding back of the blanket or the covering of the blanket by a pillow. It is also to be noted that the tendency of the thermostats to shift with the present construction is considerably less than when all three thermostats of one branch are disposed in a single channel. In such prior constructions the weight of all three thermostats in a single channel tends to shift the thermostats in the same direction. In the present construction, with one of the thermostats being located in a channel adjoining the channel in which the other thermostats are located, the shifting force of the weight of the one thermostat balances or cancels the shifting force of the weight of one of the other thermostats.

From the foregoing, it will be observed that the described construction of the blanket achieves the objects of this invention and, further, is particularly suited for low-cost, large-scale manufacture.

While the invention has been shown and described in its preferred embodiment and has included certain details, it should be understood that the invention is not to be limited to the precise details herein illustrated and described, since the same may be carried out in other ways falling within the scope of the invention as claimed.

What we claim is:

1. In an electrically heated fabric comprising a two-layer member including a heated area having a series of dividers spaced across the width of said heated area and extending in the direction of the length thereof to define a plurality of channels, a heating element threaded in said channels and including a heating wire and a plurality of thermostat switches larger in size than said heating wire; the improvement comprising:

(*a*) a connecting length of said heating wire having a loop extending about the end of one of said dividers into adjacent first and second channels;

(*b*) two of said thermostat switches being connected in series circuit by said connecting length of heating wire and positioned, respectively, in said first and second channels at substantially different distances from said end of said one divider;

(*c*) a line of stitching spaced from said end of said one divider and extending across the width of said member to secure the two layers of said member together and to provide a restricted passage between said line of stitching and said end of said one divider, said line of stitching being spaced from said end of said one divider by such a distance as to prevent movement of either of said two thermostat switches through said restricted passage from one to the other of said first and second channels.

2. The improvement in an electrically heated fabric according to claim 1 wherein said line of stitching extends along one edge of said member, said one edge having an edge binding, and said line of stitching passing through said edge binding to secure said edge binding to said member.

3. In an electrically heated fabric comprising a two-layer member having a series of dividers space across the width of said member and extending in the direction of the length thereof to define a plurality of channels, and a heating element threaded in at least some of said channels and including a heating wire and a plurality of thermostat switches larger in size than said heating wire; the improvement comprising:

(*a*) a connecting length of said heating wire having a loop extending about the end of one of said dividers into adjacent first and second channels;

(*b*) a first one of said thermostat switches being disposed in said first channel and connected to one end of said connecting length of heating wire;

(*c*) a second one of said thermostat switches being disposed in said second channel and connected to the

other end of said connecting length of heating wire, said first and second thermostat switches being positioned respectively in said first and second channels at substantially different distances from said end of said one divider;

(*d*) securing means spaced from said end of said one divider and securing the two layers of said member together to provide a restricted passage between said securing means and said end of said one divider through which passes said loop of heating wire, and said securing means being spaced from said end of said divider by such a distance as to prevent movement of said first thermostat switch through said restricted passage from said first channel into said second channel.

References Cited in the file of this patent

UNITED STATES PATENTS

2,403,803	Kearsley	July 9, 1946
2,432,785	Moberg	Dec. 16, 1947
2,518,147	Johnson et al.	Aug. 8, 1950
2,579,383	Goudsmit	Dec. 18, 1951
2,961,526	Dykes	Nov. 22, 1960
3,028,477	Russell	Apr. 3, 1962

FOREIGN PATENTS

605,666	Great Britain	July 28, 1948