April 10, 1951 G. W. CRISE 2,548,468

METHOD OF PRODUCING ELECTRIC BED WARMERS

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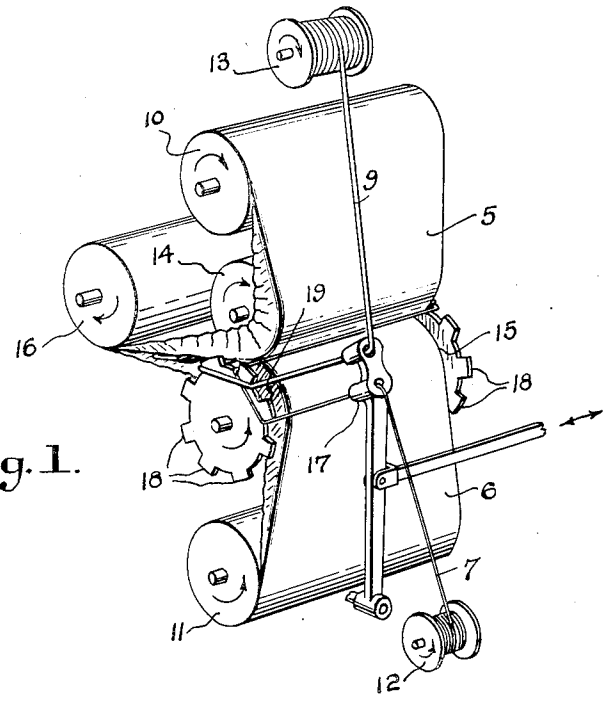

Fig. 1.

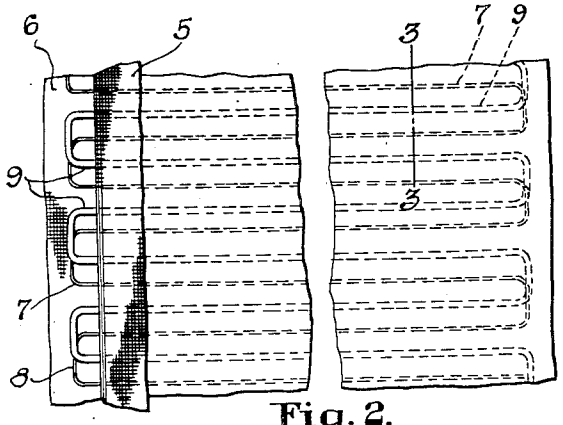

Fig. 2.

Fig. 3.

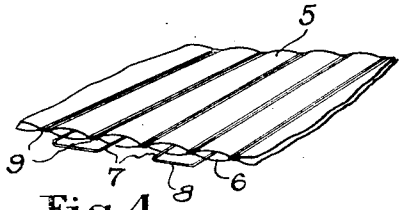

Fig. 4.

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METHOD OF PRODUCING ELECTRIC BED WARMERS

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1 Claim. (Cl. 219—46)

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The present invention deals with electrically heated bed warmers and the like, and has particular reference to bed warmers of the type adapted to be positioned upon the mattress of a bed for supplying heat to the body of a person lying thereon. The present application is intended as a continuation-in-part of my copending United States application, Serial No. 773,964, filed September 15, 1947.

It is an object of the present invention to provide an improved flexible bed warmer which comprises an outer jacket including a pair of flexible fabric sheets between which is carried a continuous flat coil of resistance wire, with the separate sheets being united in a manner to segregate the individual portions of the resistance wire, by continuous transverse flexible seams of bonding material which have previously been integrally fused within the mesh of the fabric sheets and allowed to set to weld the two sheets together.

It is another object of this invention to provide improved methods for the manufacture of such bed warmers, which methods make possible the formation of such bed warmers in a substantially continuous manner, utilizing relatively simple and economical apparatus.

For a further and more detailed understanding of the present invention and the additional objects and advantages thereof, reference is made to the following description and the accompanying drawing wherein:

Fig. 1 is a perspective view, illustrating in diagrammatic form one type of apparatus suitable to the present invention;

Fig. 2 is a fragmentary top plan view of a bed warmer formed in accordance with the present invention; with one of the side seams thereof folded backwardly to illustrate the overlapping nature of the alternate rows of resistance wire and bonding material;

Fig. 3 is a fragmentary vertical sectional view taken along the line 3—3 of Fig. 2;

Fig. 4 is a fragmentary perspective view of a portion of the present improved bed warmer, having the edges of the outer fabric jacket cut away to disclose the end loops of the electrical resistance wire carried therebetween.

Referring now to the drawing, it will be seen that the present invention makes use of a pair of porous fabric sheets or plies 5 and 6 which may compose the outer jacket or covering of a finished bed warmer, or which may form an inner heating element casing which may be finally disposed between the layers of a finished outer

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covering formed from a more expensive material, such as wool or silk. Disposed between the two sheets 5 and 6 in transversely extending and longitudinally spaced order are the continuous rows of a flat coil of electrical resistance wire 7. The resistance wire 7 is placed between the two layers or sheets, so as to have each longitudinally spaced row joined at its ends, as at 8, by means of an end loop with the ends of adjacent rows. Also disposed between the two sheets 5 and 6, and interposed alternately between the rows of resistance wire 7, are the similar rows 9 of a continuous flat coil of flexible bonding material which has previously been fused and allowed to set within the mesh of the two fabric sheets to unite the same against relative separation along a plurality of transversely extending and longitudinally spaced flexible seams. In this manner, the rows of bonding material 9 define a plurality of transversely disposed pockets between the two sheets, in which are disposed the individual rows of resistance wire.

As shown particularly in Fig. 2 of the drawing, the ends loops of both the resistance wire 7 and the bonding material 9 are disposed between the two fabric sheets 5 and 6 so as to terminate a distance inwardly from the outer side edges of the sheets, in order that the same may be subsequently closed, as by sewing or cementing to provide a completely closed envelope containing the electrical heating element of the warming pad.

The material from which the rows or seams of flexible bonding material 9 are formed is preferably a thermoplastic type synthetic resin which possesses a relatively high degree of flexibility and good dielectric properties, and which melts or softens appreciably at temperatures well above the maximum operating temperatures of the resistance wire 7, but at temperatures substantially below that which would be detrimental to or would cause deterioration of the fabric sheets 5 and 6. Such a temperature should approximate 300° F., it being understood that the maximum operating temperatures within the resistance wire 7 will be in the neighborhood of 200° F. Many materials are suitable for use in this capacity, which possess the desired temperature properties, which are moisture-resistant, possess good dielectric properties, and yet retain their flexibility and strength after having been melted or fused. For example, unvulcanized rubber, or preferably, certain thermoplastic synthetic resins such as, the polyvinyls, polysterenes, and acrylic type of resins. It has been

found through practice, that the use of a thermoplastic type of resin known as polyvinyl chloride, as the bonding material for the fabric sheets, has produced excellent results, in that this material can readily be softened at a temperature of 300° F., possesses extremely good dielectric and moisture-resistant properties, and yet retains its tough flexibility indefinitely after having been melted.

Fig. 1 of the drawing discloses in diagrammatic form one type of apparatus suitable for use in the formation of my improved electrically heated bed warmer. The assembly generally comprises two cloth-supplying rolls 10 and 11 upon which bolts of the fabric material are wound, a feed spool 12 upon which the resistance wire 7 is wound, a second feed spool 13 which carries the flexible bonding material in wire or cord form, a pair of spaced electrically heated compression rolls 14 and 15, a wind up roll 16, and a mechanically operated reciprocating wire and bonding material feeding arm 17. In operation, two continuous sheets of the fabric material are led from the cloth-supplying rolls 10 and 11 around the heated compression rolls 14 and 15, while the resistance wire and bonding material, fed from their respective spools 12 and 13, are arranged in alternate transverse rows upon the lower sheet 6 by the reciprocating arm 17, with the end loops of the bonding material and resistance wire being initially formed and held by a plurality of radially projecting spring-pressed fingers 18 which are carried for synchronized rotation with the lower heated roll 15, whose motion, in turn, is synchronized with the reciprocating motion of the feed arm 17, in order that successive rows and loops are formed during continuous or intermittent rotation of the compression rolls 14 and 15. As the two sheets of fabric material, with the interposed rows of resistance wire and bonding material, pass between the two heated compression rolls 14 and 15, the rows of bonding material are melted or fused and pressed into the mesh of the two fabric sheets, to form a flexible, yet strong adhesive weld between the fabric sheets. From the compression rolls 14 and 15, the fused assembly is wound about the wind up roll 16, and at the same time permitted to cool, in order to set the bonding material. The assembly may be taken from the wind up roll to be cut in desired lengths in accordance with the dimensions of a finished bed warmer, and to be otherwise finished, such as by closing the outer edges of the two fabric sheets to form an enclosed envelope.

In initially passing the two sheets of fabric between the compression rolls 14 and 15, the width of the sheets is such that the outer edges are allowed to overlap the compression rolls, as at 19, so that ample material is afforded at the outer side edges of the sheets, in order that the same may be subsequently hemmed or cemented together to complete the outer jacket of the bed warmer, and at the same time to enclose the end loops of the resistance wire and bonding material which were previously carried upon the spring pressed fingers 18. If desired, the end loop portions of the rows or coils of resistance wire and bonding material may also be heated and compressed in order to fuse that portion of the bonding material within the fabric of the two sheets, and at the same time close the side edge portions of the two fabric sheets to complete the outer jacket of the bed warmer.

Before finally closing the outer edges of the

thus assembled sheets, the same are taken from the wind up roll 16 and cut into desired lengths, with the severed ends of the resistance wire being electrically connected, as by soldering, with a current supply line or wire, not shown. The current supply line, as disclosed in my previous co-pending application, Serial No. 773,964, filed September 15, 1947, may advantageously be anchored between the two fabric sheets 5 and 6 by applying an outer covering of the meltable bonding material thereto, and subsequently heating the same to fuse such covering within the mesh of the two fabric sheets, thereby preventing any relative separation between the lead wire and the outer jacket, and additionally preventing any strain, transmitted through the lead wire, to the internal resistance wire 7 of the bed warmer.

As an alternate method of fusing the bonding material within the fabric sheets, instead of applying heat and pressure to the assembly of sheets and bonding material, a suitable liquid solvent may be applied through the sheets to the bonding material, or directly to the bonding material, to partially dissolve the bonding material, thereby allowing the same to fuse within the mesh of the fabric sheets, and to subsequently set to provide the prerequisite flexible and adhesive weld between the respective sheets. It will be manifest that in applying such solvent, the weld or fusion region should be confined to the positions of the alternate rows of bonding material, in order not to adversely affect the overall porosity of the finished bed warmer, as the same must be capable of transmitting moisture from the body of a person lying thereon during bed warming operations.

Referring to Fig. 2 of the drawing, it will be seen that the alternate rows of plastic bonding material provide a plurality of open pockets which extend substantially transversely of the outer jacket, and which contain the separate rows of electrical resistance wire, the latter being free to move a limited distance within the pockets, which in the event of a break within the resistance wire, will allow the wire to part freely thereby eliminating the possibility of arcing, with consequent dangerous results. Further, through the provision of the separate resistance wire and bonding material, the bonding material may be supplied in relatively inexpensive thread or cord form, thereby eliminating the necessity for previously applying the same directly to the resistance wire, as disclosed in my previous co-pending application.

In view of the foregoing, it will be seen that the present invention provides a structurally simple yet mechanically efficient bed warmer which is characterized by its flexibility, its comfort to the user, and its safety in operation. The present invention further provides improved methods for the construction of such bed warmers, wherein considerable yardage of the fabric material having the necessary resistance wire embedded therein may be produced in a substantially continuous operation, with the integrally formed assembly being cut in accordance with the desired dimensions of a finished bed warmer after initially bonding and anchoring the heating element between the sheets comprising the outer jacket of the warmer.

I claim:

In the construction of flexible, electrically heated bed warmers, the method which comprises simultaneously stringing alternately spaced continuous strands of electrical resistance wire and flexible fusible dielectric bonding material trans-

versely between a pair of longitudinally convergent porous fabric sheets, each transverse length of resistance wire and fusible bonding material being connected at one end by a loop with a successive transverse length to provide separate continuous grids of wire and bonding material arranged in longitudinally staggered relation throughout substantially the length of said sheets, the end loops of wire and bonding material overlapping one another substantially along the side edges of said sheets; progressively fusing each transverse length of bonding material along the line of convergence of said sheets; applying compressive forces to said sheets while said bonding material is fused to cause the bonding material to impregnate said sheets along transversely disposed longitudinally spaced seams; and thereafter causing said bonding material to set and firmly unite said sheets along a plurality of transversely disposed longitudinally spaced seams and to loosely confine each transverse length of resistance wire between said sheets and between successive seams of bonding material.

GEORGE W. CRISE.

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