Nov. 18, 1969 TOSHIAKI INUI 3,478,422

METHOD OF MAKING AN ELECTRIC BLANKET

Filed Aug. 26, 1966 3 Sheets-Sheet 1

FIG. 1.

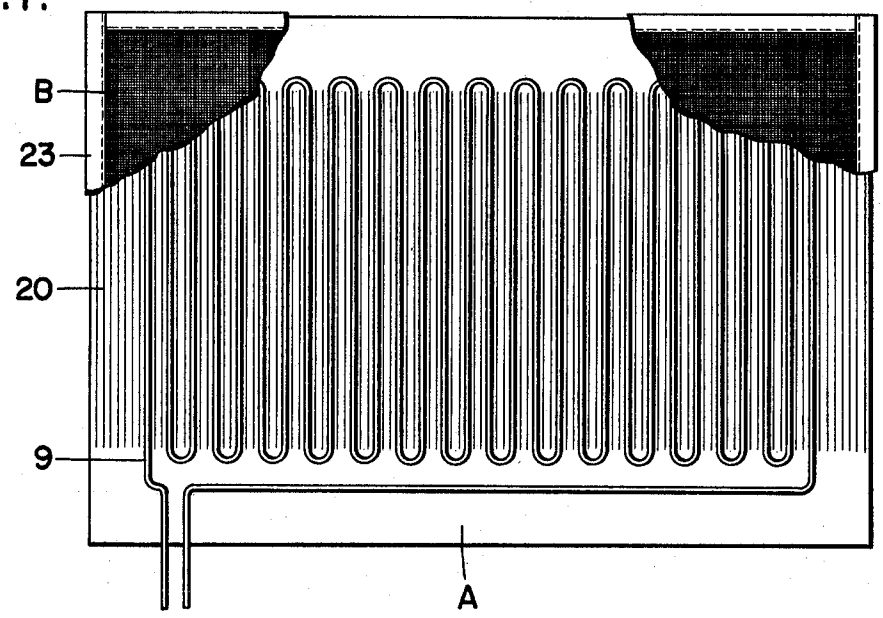
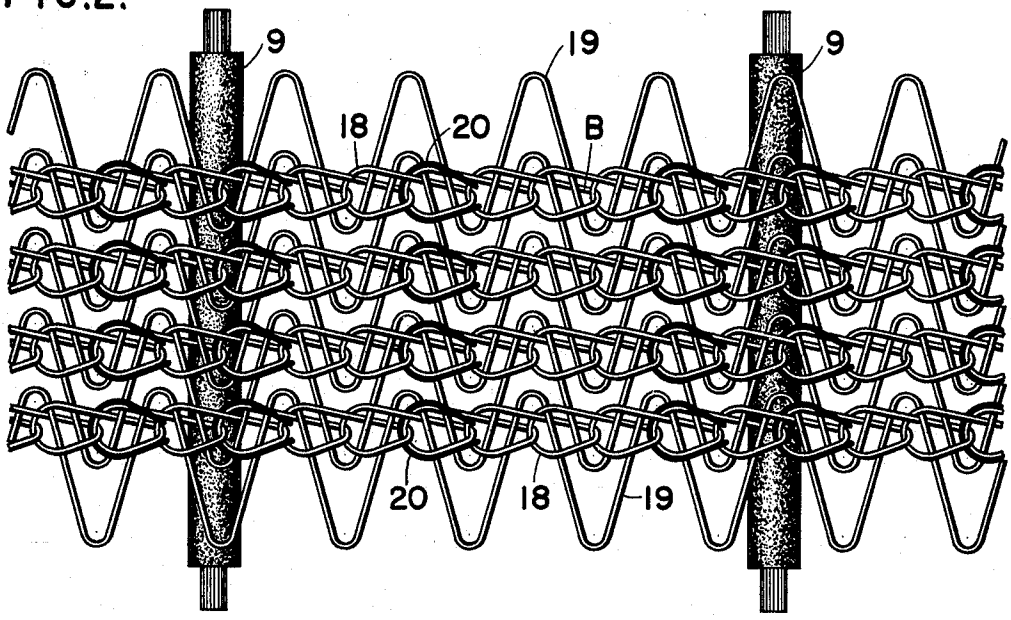


FIG. 2.



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FIG.3.

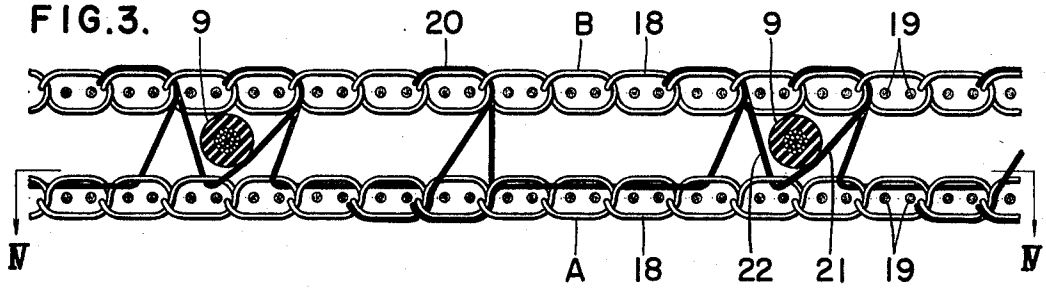
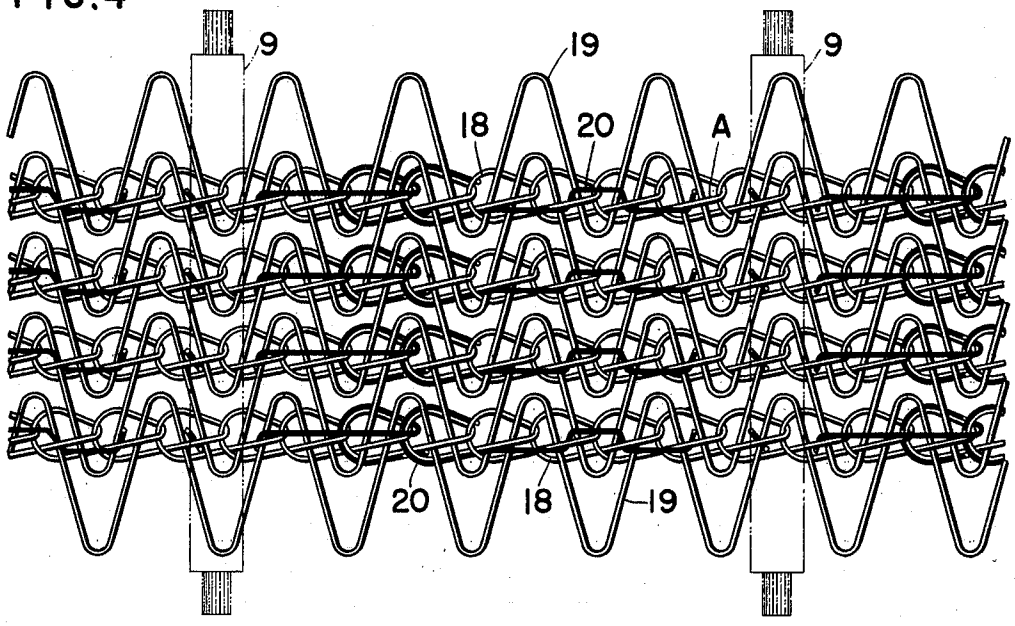


FIG.4



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METHOD OF MAKING AN ELECTRIC BLANKET

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FIG.5.

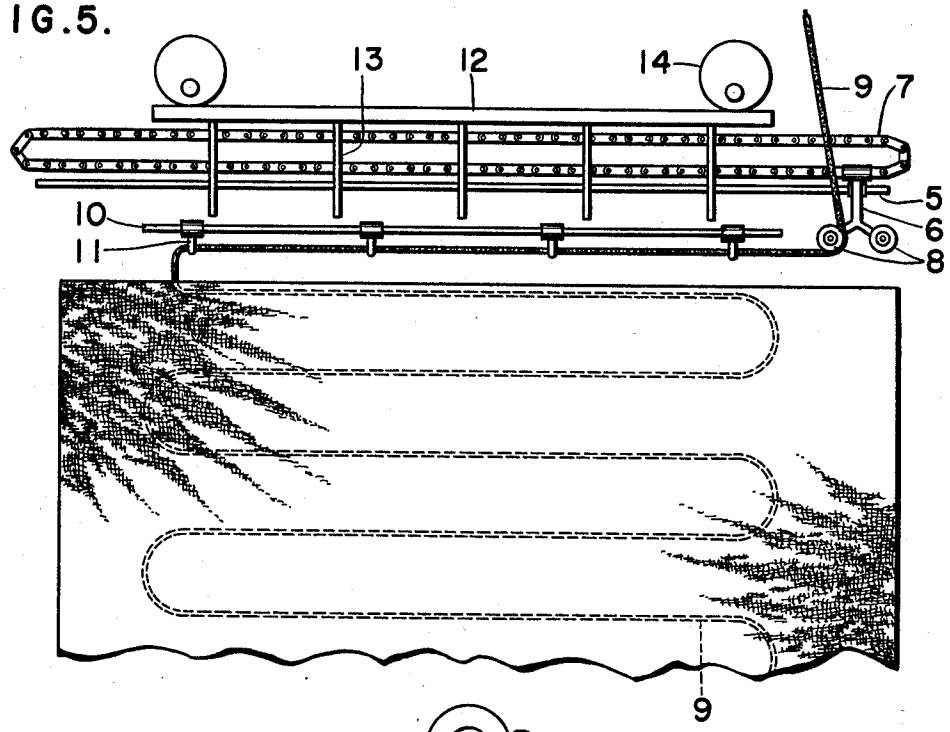
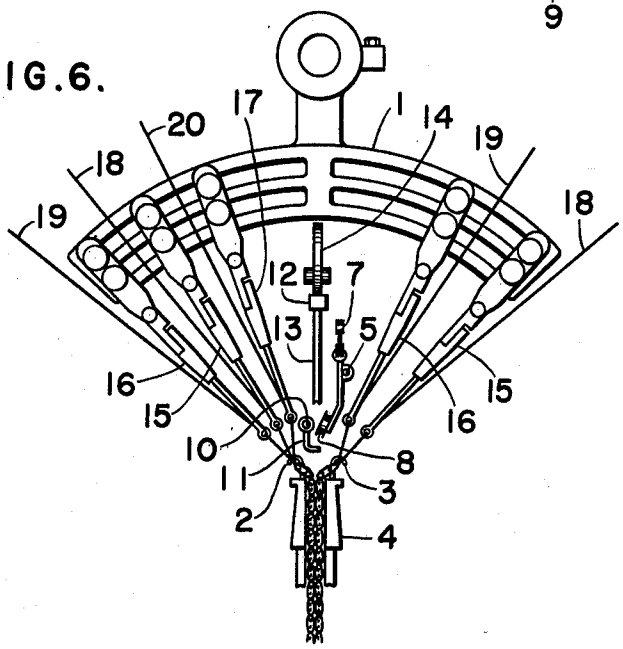


FIG.6.



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METHOD OF MAKING AN ELECTRIC BLANKET

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Int. Cl. H05b 3/00
U.S. Cl. 29—611 2 Claims

ABSTRACT OF THE DISCLOSURE

The method and apparatus for the making of an electric blanket provides for the insertion of an insulated heating element into the blanket fabric at the same time when the knitted fabric is being knitted into a two-ply blanket fabric on the knitting machine.

This invention relates to a method of manufacturing an electric blanket and more particularly to a method of manufacturing an electric blanket in which an insulated heating element is inserted during the step of knitting a two-ply blanket on the double knitting machine and to an electric blanket manufactured thereby.

The electric blankets heretofore in use have been manufactured in the form of textile fabric on the weaving machine in consideration of the required napping in the final step of manufacture. In order to insert an insulated heating element in the woven fabric of the kind described, it has been the general practice to form in the step of weaving the fabric a plurality of pockets in the areas of the fabric in which to insert the heating element and to insert manually the heating element in the pockets after the fabric has been woven, and to establish an electric heating circuit by attaching such members as a thermostat, and to finally sew together the heating element inserted areas on the sewing machine. The prior art method of the kind described had disadvantages in that the heating element had to be inserted into the pockets of the two-ply fabric by hand and that the insertion of the heating element into the pockets of the two-ply fabric by hand accordingly increased the number of steps of manufacture, entailing reduced production efficiency in such a manner as to make mass production too difficult for the product to be sold at a price that is economically justifiable to permit its purchase and wide use by users. Furthermore, two-ply fabrics woven on the weaving machine are woven twofold along the entire width thereof, and accordingly, even when the heating element is successfully inserted simultaneously during the step of weaving, the bent portions of the heating element on both lateral edges of the blanket are lapped outside of the blanket sides, so that the blanket thus manufactured is of no practical use. Such being the case, the methods of inserting a heating element into the two-ply fabric during the step of fabric being woven have brought about no successful application.

An object of the invention is to manufacture an electric blanket fabric by one step of process by eliminating the disadvantages inherent in the electric blanket made of two-ply fabric. The inventor has found that a knitted fabric can be knitted twofold to any desired width thereof on the knitting machine and that, even in the case of a knitted fabric, napping can be carried out, too, if it is done on one surface alone. According to the invention, the insulated heating element is inserted into the blanket fabric at the same time when the knitted fabric is being knitted into a two-ply blanket fabric on the knitting machine. In this way, the method of the invention saves manual labor and makes it possible to introduce a mass

production system by reducing production steps to one step.

According to the method of the invention, an insulated heating element feed means adapted to move laterally and to insert a heating element into the knitting portion of the knitting machine is suppored together wih a fabric kniting yarn guide by a rocking arm upwardly of the knitting portion of a double knitting machine, warps and wefts are fed to front and rear needle rows, respectively so that knitting is carried out in a manner in which two sheets of fabric are woven at the same time and in which a connecting yarn is fed and inserted into one of the sheets of fabric by means of another yarn guide, said connecting yarn is intermittently caught by the knitting needle of the other sheet of fabric during repeated cycles of knitting operation thereby to partially connect both sheets of fabric and to knit the same, and in which when any given place of the connecting portion is knitted, a heating element is fed to the knitting portion of the knitting machine by said heating element feed means, the heating element is inserted into the knitted loop of the connecting yarn, thereby to insert the insulated heating element integrally into the two-ply knitted fabric.

Description is now made of an embodiment of the invention in conjunction with the accompanying drawings in which:

FIG. 1 is a plan view of an embodiment of the invention in which an electric blanket manufactured in accordance with the method of the invention is broken in part on one surface thereof to show a state of an insulated heating element being inserted into the blanket;

FIG. 2 is an enlarged plan view showing in part the structure of the embodiment of FIG. 1;

FIG. 3 is a longitudinal sectional front elevation of FIG. 2;

FIG. 4 is a cross sectional plan view taken along line IV—IV of FIG. 3;

FIG. 5 is a front elevational view showing schematically a means for inserting the electric heating element; and

FIG. 6 is a side elevational view of the structure illustrated in FIG. 5.

Referring now to the drawings and in particular to FIGS. 5 and 6, a rocking arm **1** supporting yarn guides of the double knitting machine is provided with a means for feeding a heating element. Said means comprises a mechanism for arranging the heating element for moving the heating element in a direction of knitted width and extending it to the required width by unwinding the heating element that was wound on a take-up means and a lowering mechanism for feeding the extended heating element to the knitting portion. That is to say, upwardly of front and rear knitting needle rows **2** and **3**, both ends of a supporting bar **5** in parallel to a needle bed **4** is secured to the rocking arm **1**, and a heating element cross feed guide **6** is suspended by the supporting bar **5**. A portion of said cross feed guide **6** is secured to a chain **7** provided so as to make reciprocating movement along a knitted width. Said chain **7** is reciprocated by the actuation of an electric motor which repeats positive or negative rotation on and off by means of a limit switch or timer. The cross feed guide **6** can be moved crosswise by the reciprocating movement of the chain **7**. the crosswise movement of the cross feed guide **6** causes rollers **8** and **9** to guide an insulated heating element **9** to arranging in a successive line of U-shape curves, said rollers being provided at the lower end of the guide **6**. In order to prevent the heating element moved crosswise upwardly of the knitted portion in the manner described from falling on the knitted portion, the heating element **9** is held by supporting arms **11** provided on a support shaft **10** having both ends thereof journalled in the machine frame.

A lowering mechanism comprising providing a support rod **12** with push arms **13** in parallel is provided upwardly of the heating element held crosswise by the supporting arms **11**. Said support rod **12** is supported at both ends on the machine frame and is adapted to be lowered intermittently by the rotation of cams **14** and to rotate the shaft **10** to put out of place the heating element which is held by the supporting arms **11** at the time of the lowering mechanism being lowered thereby to make it possible for the push arms **13** that are lowered to feed the heating element to the knitted portion. Longitudinally of the rocking arm **1** are provided a warp guide **15** and a weft guide **16**, and a yarn connecting guide **17** is added to one of such a group of guides.

As described, double knitting is carried out by the use of a double knitting machine equipped with a means for feeding the heating element in such a manner that fabrics A and B to be knitted are simultaneously knitted by supplying a front needle **2** and rear needle **3** with warp **18** and weft **19**, respectively. Connecting yarn **20** that is supplied by the guide **17** at this time is inserted into the fabric A without being caught by the needle **2**. Accordingly, the connecting yarn **20** is held down by the warp **18** and inserted into a loop produced as shown in FIGS. 3 and 4.

As described, when the fabric A is knitted to a predetermined length in such a state in which the connecting yarn **20** is held down by the warp **18** and inserted into the fabric A, the connecting yarn **20** together with the warp **18** is caught by the needle **3** on the opposite side thereby to knit and form a loop in the fabric B. When in this way the fabrics A and B are connected while the loop is being formed in the fabric B, the knitting operation of the connecting yarn **20** is stopped and the yarn **20** is again inserted into the fabric A while being held down by the warp **18**. When both fabrics are connected together by the knitting operation of the connecting yarn **20** as described above, first the connecting yarn **20** is caught by the knitting needle **2** to form a loop in the fabric A and then caught by the needle **3** to form a loop in the fabric B as shown in FIG. 3, and thereafter both fabrics may be connected.

As described, the fabrics A and B are connected and formed into a two-ply fabric by conducting the knitting operation of the connecting yarn **20** intermittently at every preselected length of knitted fabric. On the other hand, before the fabrics are knitted, the heating element guide **6** is caused to move crosswise to the preselected heating element inserting position by driving the chain **7** thereby to make the supporting arms **11** take up the heating element **9**, and at the time of insertion of the heating element, the supporting arms are rotated to put the heating element **9** out of place and at the same time to lower the push arms **13**, thereby to feed the knitting portion of the knitting machine with the heating element **9**. When in this way the heating element **9** is lowered, the connecting yarn **20** forms a loop in the fabric B on the opposite side, and again the heating element **9** is laid in the connecting portion **21** which is in a state of being inserted in the fabric A and further the connecting portion **22** formed by looping the connecting yarn **20** in the fabric B is laid in the heating element **9**. That is to say, the heating element **9** is held contained by the connecting portions **21** and **22** and secured between the fabrics A and B. And by the time the heating element **9** is inserted next, the heating element is put on the guide **6** by moving the heating element guide **6** in an opposite direction, and when it is inserted, the operation described is repeated. If this operation of inserting the heating element is repeated on and off, a long piece of heating element **9** is arranged in a successive line of U-shape curves and an electric circuit is established through which to obtain mild temperature.

As described, while the fabrics A and B are being knitted separately and simultaneously, the connecting yarn **20** to be inserted into the fabric A is caused to conduct a knitting operation intermittently in the fabric B thereby to connect both fabrics to each other and is caused to feed the heating element at a given time when the knitting operation is conducted, thereby to knit a heating element integrally inserted fabric.

The above knitting is carried out, as shown in FIG. 1, in a manner in which a certain space is left at both side edges of the fabric. That is say, it is designed that the yarn guide **17** to feed the connecting yarn **20** is made smaller in number than the warp guide **15** and weft guide **16** to knit the fabric, and that no connecting yarn is fed to both lateral ends of the knitted fabric and the fabrics A and B are separately knitted at both ends. The heating element **9** of suitably preset length so as to obtain electrically preselected heating and to maintain an optimum temperature is fed in proportion to the spaces at which the connecting yarn **20** is inserted. When the two-ply knitting of fabric is over, the fabric is napped on both surfaces by a napping machine for being finished up into a blanket form and is hemstitched.

As described, since the electric blanket of the invention is manufactured through the simultaneous operation of knitting a two-ply fabric on one hand, and connecting two sheets of fabric and inserting a heating element thereinto on the other, it does not require such many steps of process as were required by the prior methods but can be manufactured simply and by one step of process, with the result that the blanket of the invention is fit for mass production and can be manufactured at low cost. Furthermore, since the heating element is held contained by the connecting yarns and secured between the two-ply fabric, it moves integrally with the fabric without possibility of the element inserted thereinto being damaged but with advantages of its safety and durability in use being increased.

What is claimed is:

1. A method of manufacturing an electric blanket characterized in that it comprises feeding warp and weft to the front and rear needle rows of a double knitting machine thereby knitting two sheets of fabric at the same time, feeding a connecting yarn by means of another yarn guide to one sheet of fabric of said two sheets which are being knitted and holding the connecting yarn contained in the loop of the warp and knitting the same insertedly into the fabric, causing a knitting needle adapted to knit the other fabric to intermittently catch said connecting yarn to carry out knitting operation, hereby partially connecting both sheets of fabric to each other, and at the same time when the connecting portion is knitted at any given place thereof by the connecting yarn, feeding an insulated heating element to said connecting portion thereby causing the connecting yarn to hold the heating element secured therebetween during the step of knitting by the connecting yarn so that the heating element is integrally inserted into the two-ply knitted fabric while the latter is being knitted.

2. A method of manufacturing an electric blanket characterized in that it comprises a heating element feed means which is made up of a heating element arranging mechanism for unwinding an insulated heating element wound on a take-up means thereby moving the element in a direction of knitted width and extending the same to the desired width upwardly of the knitted portion of a double knitting machine, and which is made up of a lowering mechanism for feeding the extended heating element to the knitting portion of a fabric to be knitted, causing the rocking arm of the knitting machine to support said heating element means together with a fabric knitting guide and while knitting simultaneously two sheets of fabric by means of front and rear knitting needles, feeding the connecting yarn to one sheet of said two sheets of fabric and inserting the same into said one sheet of fabric, carrying out knitting operation intermittently in the other sheet of fabric thereby connecting

partially both sheets of fabric for knitting and when the connecting portion is knitted at any given place thereof by means of connecting yarn, feeding the heating element to the knitting portion of the knitting machine by means of said heating element feed means thereby inserting the heating element integrally into the two-ply fabric.

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