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2,990,607

METHOD OF PRODUCING ELECTRIC HEATING PADS

Filed May 31, 1955

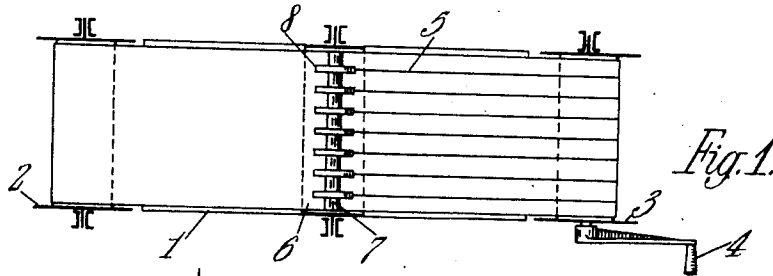


Fig. 1.

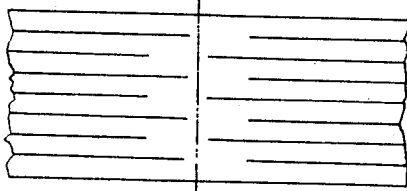


Fig. 2.

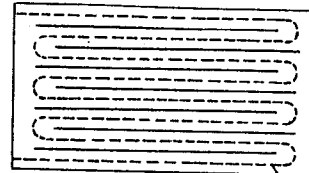


Fig. 3

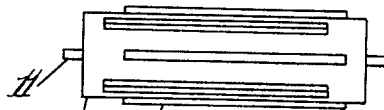


Fig. 4.

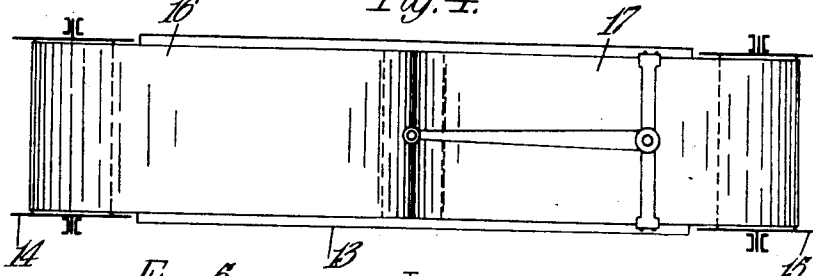


Fig. 5.

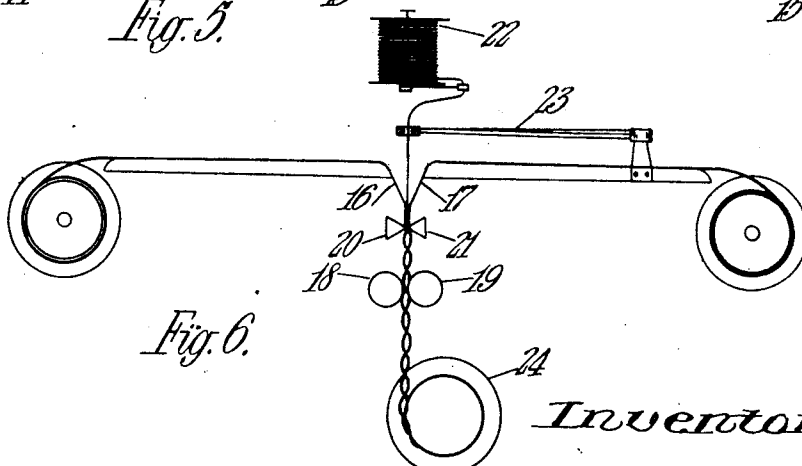


Fig. 6.

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METHOD OF PRODUCING ELECTRIC HEATING PADS

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4 Claims. (Cl. 29—155.5)

This invention relates to an industrial method for the continuous production in indefinite lengths of multi-tubular strips of synthetic resins, adapted to receive bare heating resistances without any risk of short circuits, more particularly for the mass-production of electrically heated pads and blankets.

The method is applicable to any synthetic resin or other material capable of being welded either electronically or with simple heated electrodes, whether it is produced in sheets or whether it constitutes the coating of at least one surface of some other material, which in itself is not weldable, such for instance as ordinary woven fabrics of wool, silk or cotton.

The invention comprises the threading of the heating circuits through the tubes either during or after the formation of the tubes.

Some advantageous methods of carrying out the invention are illustrated merely by way of example in the accompanying drawings, in which:

FIGURE 1 is a diagrammatic plan view of apparatus for the preparation of a multi-tubular strip, with tubes extending in the longitudinal direction, wherein the resistance wires are introduced into the tubes subsequently to the formation of the latter;

FIGURE 2 shows multi-tubular zones without resistance wires;

FIGURE 3 shows one of the multi-tubular zones of FIGURE 2, now provided with the resistance wire;

FIGURE 4 shows an electrode consisting of a metal cylinder;

FIGURE 5 is a diagrammatic plan view of apparatus for introducing the resistance wires into the tubes; during the formation of the same; and

FIGURE 6 shows the same apparatus in side elevation.

In FIGURE 1, 1 denotes a table, at the opposite ends of which are mounted rotatable rollers 2 and 3. On the roller 2 are accurately wound two superposed strips of electronically weldable material, for instance a synthetic resin, or two strips of any textile fabric the adjacent surfaces of which have been previously coated with a weldable material. 3 is a drawing roller, which is actuated by a motor or by a crank 4, and upon which the composite strip 5 is wound after unwinding from the roller 2 and being passed between electrodes 6 and 7.

The lower electrode 6 is constituted by a metal roller, and the upper electrode 7 consists of a shaft upon which are threaded rotatable metal discs 8 of equal diameters, suitably spaced apart and insulated from one another.

The electrodes 6 and 7 thus formed are connected with a common electronic generator designed for such welding.

By rotating the crank 4 and energising the electrodes 6 and 7, the two elementary strips will be welded to one another throughout their length along parallel lines corresponding to the discs 8.

If the current from the electronic generator is interrupted at predetermined equal intervals, the strip will become composed of so many adjacent alternate multi-tubular zones alternating with zones devoid of welding, where the elementary strips will remain completely separate from one another, all the welds terminating upon one and the same line transverse to the strips.

Assuming now that the even discs 8 are energised

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separately from the odd discs 8, with a retard or an anticipation between the two groups. In this case the corresponding welds will terminate on two lines transverse to the strip instead of terminating all on the same line, the ends of the welds being staggered as shown by the lines on the strip represented in FIGURE 2.

Thus, assuming that it is desired to create multitubular zones of any desired predetermined contours, and still with staggered welds, it will be necessary to energise and de-energise the discs 8 separately from one another, and in the order required by the said contours.

FIGURE 3 shows one of the multi-tubular zones of FIGURE 2, now provided with a resistance wire 9, which, owing to the staggered welds, can be employed bare without any risk of short circuits.

If it is desired to arrange the tubes in the direction of the breadth of the strip, all that is necessary is to put in place of the upper electrode 7, the electrode of FIGURE 4, consisting of a metal roller 10 rotatable upon a shaft 11, mounted parallel to the axis of the lower electrode 6. Along the lateral surface of the roller 10 are arranged, spaced part at will and in the direction of the generating lines, projections 12, staggered in relation to the ends of the said roller 10. Every time one of the projections 12 arrives against the electrode 6, a weld of the two elementary strips will be effected. In this case also multi-tubular zones of pre-determined contours can be produced.

In point of fact it will be sufficient to use a roller 10 of sufficient diameter such that in a development of its peripheral surface on to a plane the projections 12 would follow with their ends the contours of the desired multi-tubular zone.

FIGURE 5 represents diagrammatically, as seen from above, the apparatus by means of which the introduction of resistance wires into the tubes can be effected simultaneously with the formation of the tubes.

FIGURE 6 shows the same apparatus as seen from the side.

In these figures, 13 denotes a table, at the two opposite ends of which are mounted rotatable rollers 14 and 15, upon which the two elementary strips of weldable material 16 and 17 are wound separately, and from which they are guided towards the centre of the table, where drawing rollers 18 and 19, constantly pressed against the strips in correspondence with their ends, periodically occasion an advance of the said strips, the advance being adjustable at will and equal to the distance between two successive welds. By means of a suitable cam, not shown, which works synchronously with the rollers 18 and 19, two electrodes 20 and 21 connected to the electronic generator are moved towards and away from the strips, and are at the same time energised and de-energised. A second cam, also not shown, occasions, at the end of each weld, a displacement of the electrode 21 to right and left alternately in relation to the electrode 20, in order to have the welds staggered as in the case previously described. The resistance wire, wound upon a stationary bobbin 22, is by means of the arm 23 set down gently between the two strips 16 and 17 parallel to and in proximity to each weld. The arm 23, by means of a suitable cam, not shown, accomplishes alternate angular displacements to the right and to the left, in such a way that to each of these displacements there corresponds the setting of a length of resistance wire equal to the length of a weld. These displacements also are synchronised in relation to the electrodes 20 and 21 and to the rollers 18 and 19.

More specifically, a motor of suitably reduced speed causes the drawing rollers 18 and 19 to accomplish a first angular rotation corresponding to the desired advance of the elementary strips 16 and 17, or equal to the desired

distance between two successive welds, after which the said rollers undergo a stoppage. The electrodes 20 and 21 are then pressed against one another, and are thereby energized for the time necessary for effecting a first weld, simultaneously with which weld the setting will occur of a first length of resistance wire by means of the arm 23. There will follow the removal of the electrodes 20 and 21, previous to their de-energizing, and then there will be another angular rotation of the rollers 18 and 19, which will be followed by the operations indicated above, in the order already indicated, it being noted that the electrode 21 is pressed against the electrode 20, once displaced towards one side of the two strips 16 and 17, and the next time displaced towards the opposite side of the two strips, thereby having the welds staggered, as in the preceding cases.

This will give rise to a multi-tubular strip already provided with resistance wire, which, when cut to the desired length, in correspondence with two welds, will furnish so many pads or blankets, which will be completed by the addition of current-supply wires and a finishing marginal weld. Such a strip can be rolled up on a roller 24, frictionally actuated by the motor on which all the other movements described above depend.

For the sake of simplicity the various cams on which the abovementioned operations depend have not been indicated, since it would be easy for a competent expert to design various arrangements thereof which would be adapted to give rise to the requisite movements in the order indicated above.

I claim:

1. A method of producing electrically heatable flexible appliances such as pads and blankets, comprising the steps of: placing two strips of any electrically insulating fabric or other flexible material, of the same width and of indefinite length, in contact with one another, said strips both consisting, at least as regards their adjacent surfaces, of materials such as synthetic resins which are capable of being welded, passing said two strips in contact with one another between electrodes adapted to weld them together along groups of parallel lines, alternate lines terminating inwardly of the ends of lines adjacent thereto, the ends of all said lines being spaced from the outlines of said appliances to be produced, at the same time energizing said said electrodes and thereby welding said two strips together along said lines to provide a tubular space between adjacent lines; severing the composite strip thus formed into units by transverse cuts between the successive groups of welded lines and inserting a bare electrical resistance wire freely and removably through all the tubular spaces formed between said welded lines in each unit, said wire passing from one tubular space to the next around the end of the welding line which terminates inwardly of the adjacent ends of the adjacent welding lines, welding said two strips of each unit to one another along the periphery, and attaching insulated current-supply wires to the ends of said resistance wire of each unit.

2. A method of producing electrically heatable appliances such as pads and blankets, comprising the steps of: passing two superposed strips of any electrically insulating fabric or other flexible material, of the same width and of indefinite length, consisting, at least as regards their adjacent surfaces, of materials such as synthetic resins which are capable of being welded, in contact with one another between electrodes adapted to weld said two strips together along groups of parallel lines extending in the longitudinal direction of said strips, alternate lines in each group terminating inwardly of the ends of lines adjacent thereto and the length of said lines in each group being somewhat less than the length of said unit pad or blanket to be produced, at the same time energizing said electrodes and thereby welding the two strips together along said lines to provide a tubular space between adjacent lines, severing the composite strip thus formed into unit ap-

pliances by transverse cuts between said successive groups of welded lines, inserting a bare electrical resistance wire freely and removably through all the tubular spaces formed between said welded lines in each unit, said wire passing from one tubular space to the next around said end of the welding line which terminates inwardly of the adjacent end of the adjacent welding lines, welding the edges of each unit appliance together all round the periphery of the unit, and attaching insulated current-supply wires to said ends of the resistance wire of each appliance.

3. A method of producing electrically heatable appliances such as pads and blankets, comprising the steps of: passing two superposed strips of any electrically insulating fabric or other flexible material, of the same width and of indefinite length, consisting, at least as regards their adjacent surfaces, of materials such as synthetic resins which are capable of being welded, in contact with one another between electrodes adapted to weld the two strips together along groups of parallel lines extending in the transverse direction of said strips, alternate lines in each group terminating inwardly of the ends of lines adjacent thereto, the length of said lines in each group being somewhat less than the length of the unit appliance to be produced, at the same time energizing the electrodes and thereby welding the two strips together along the said lines to provide a tubular space between adjacent lines, severing the composite strip thus formed into unit appliances by transverse cuts between said successive groups of welded lines, inserting a bare electrical resistance wire freely and removably through all said tubular spaces formed between said welded lines in each unit, said wire passing from one tubular space to the next around the end of said welding line which terminates inwardly of the adjacent ends of the adjacent welding lines, welding the edges of each unit pad or blanket together all round the periphery of the unit appliance, and attaching insulated current-supply wires to the ends of the resistance wire of each unit appliance.

4. A method of producing electrically heatable appliances such as pads and blankets, of any electrically insulating fabric or other flexible material, of the same width and of indefinite length, both consisting, at least as regards their adjacent surfaces, of materials such as synthetic resins which are capable of being welded, comprising the steps of passing said two strips in contact with one another between electrodes adapted to weld said two strips together along groups of parallel lines extending in the transverse direction of said strips, alternate lines in each group terminating inwardly of the ends of lines adjacent thereto, the length of said lines in each group being somewhat less than the width of said strips, at the same time energizing the electrodes and thereby welding said two strips together along said lines, inserting a bare electrical resistance wire freely and removably through all the tubular spaces thus formed in each unit between the welded lines, said wire passing from one tubular space to the next around the end of the welding line which terminates inwardly of the adjacent ends of adjacent welding lines, severing the composite strip thus formed into unit appliances by transverse cuts between the successive groups of welding lines, welding the edges of each pad or blanket together all round the periphery, and attaching insulated current-supply wires to the ends of the resistance wire of each unit appliance.

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