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[54] **APPARATUS FOR ATTACHING FUSIBLE BACKING PIECES TO TEXTILE PIECES**

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[51] **Int. Cl.** **B32b 31/08,** B32b 31/20

[58] **Field of Search** 156/499, 539, 555, 156/210, 208, 583, 306, 543, 324; 219/243, 388, 469–471

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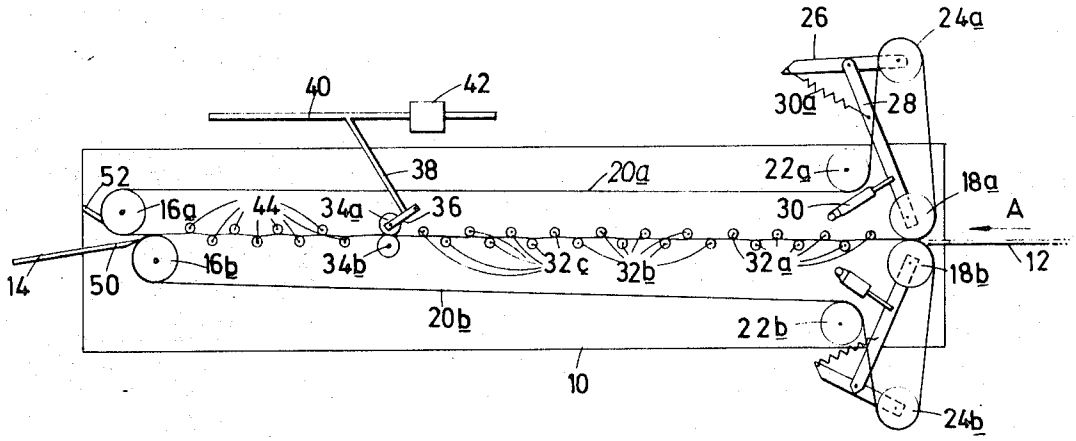
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[57] **ABSTRACT**

Apparatus for attaching fusible backing pieces to textile pieces comprises two continuous conveyor belts which are brought together at an entrance end of a conveyor, where superimposed textile and backing pieces to be fixed together are fed between the conveyor belts. From the entrance end, the conveyer belts, with the textile and backing pieces therebetween, pass along a common path defined by transverse elements over which the belts are successively deflected and which are heated to bring the belts, and the textile and backing pieces therebetween, to the required fusing temperature, after which the belts with the textile and backing pieces therebetween pass through the nip between two pressure rollers to effect fixing of the backing pieces to the textile pieces.

7 Claims, 5 Drawing Figures



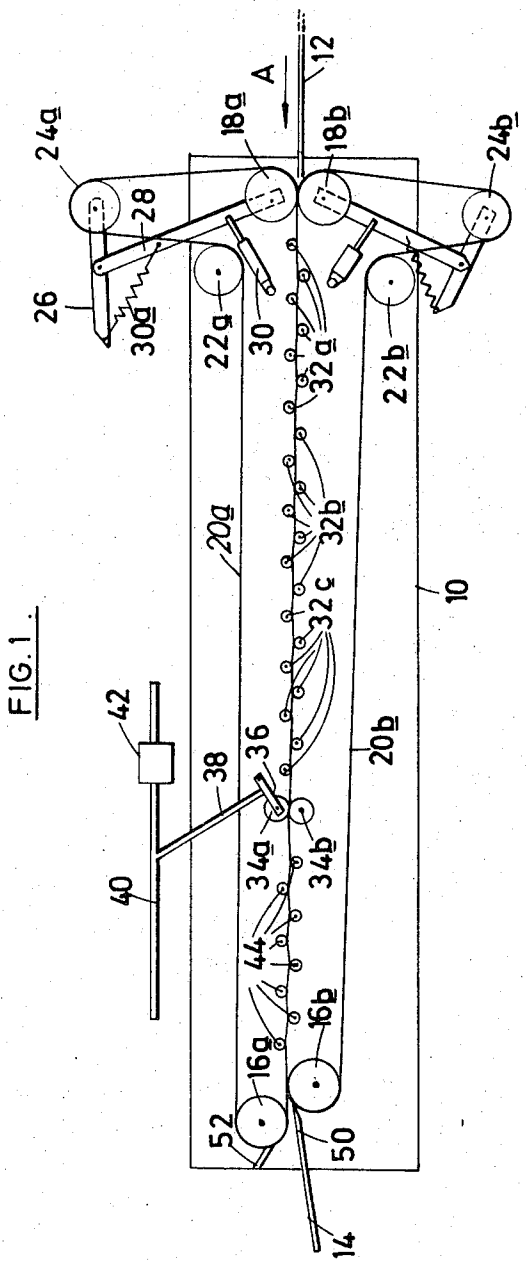
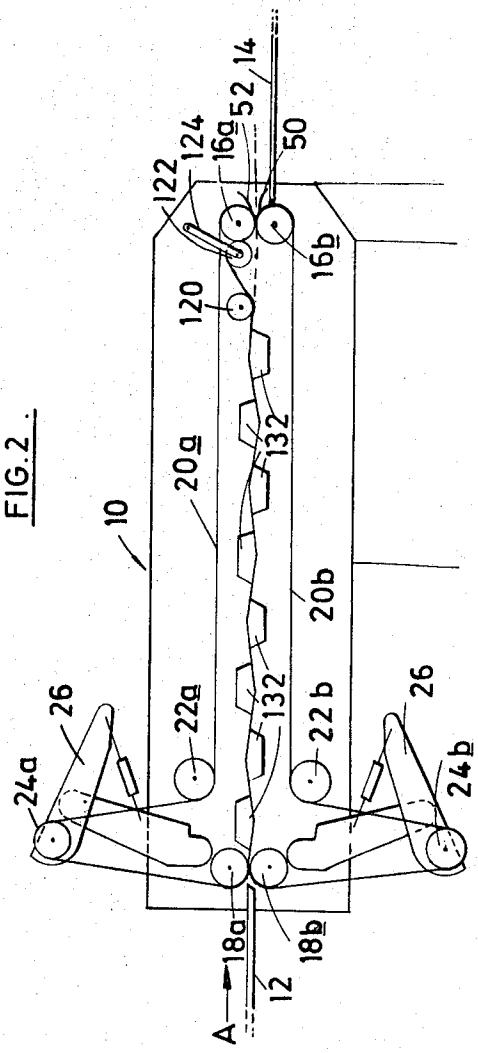


FIG. 1.

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FIG. 2.



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FIG. 3.

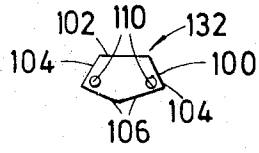


FIG. 4.

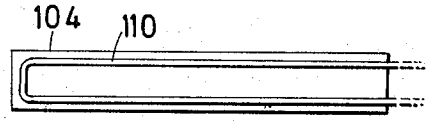
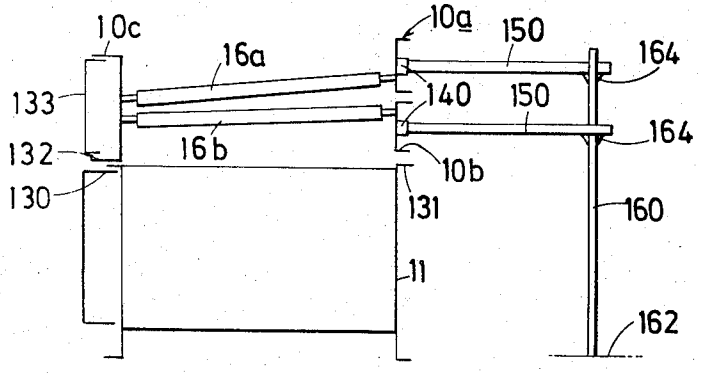


FIG. 5.



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APPARATUS FOR ATTACHING FUSIBLE BACKING PIECES TO TEXTILE PIECES

FIELD OF THE INVENTION

This invention relates to apparatus for use in attaching to pieces of textile material, backing pieces of the kind having a fusible thermoplastic material on at least one side thereof.

A typical material from which backing pieces of the above kind are cut comprises a textile sheet which is formed on one side with a pattern of dots of a thermoplastic material fused to said textile sheet. To fix a backing piece of such a textile sheet to a piece of cloth which will provide, for example, the finished outer surface of a garment, the backing piece is placed on said piece of cloth in register therewith and with the side carrying the dots of thermoplastic material engaging the reverse side of said piece of cloth.

The superimposed cloth piece and backing piece are then heated to a temperature such as to cause the thermoplastic material to reach the desired degree of plasticity and the pieces pressed together so that the thermoplastic material incorporates some of the fibers of said cloth piece so that when the pieces have cooled they are stuck together by said thermoplastic material.

However, with the thermoplastic materials used, (for example polyethylenes or polyamides) if the pieces are to be stuck together properly over their common areas, the temperature of the thermoplastics material when the pieces are pressed together must be controlled within narrow limits and the superimposed pieces must be pressed together firmly over their common area without the pressure at any point being sufficient to damage the pieces or to force the thermoplastic material through the cloth finishing piece.

DESCRIPTION OF THE PRIOR ART

In the past such backingpieces have been attached to their cloth finishing pieces by means of a press having an upper and a lower flat platen, the upper platen being heated. The superimposed pieces are placed between the platens which are then brought together with a predetermined pressure for a predetermined time before the platens are separated and the pieces removed and allowed to cool.

Due to the difficulty of maintaining a uniform temperature over the heated platen and of maintaining the heated platen flat to the necessary degree of accuracy, and to other factors, such presses have not proved entirely satisfactory for attaching backing pieces of the kind specified to their textile finishing pieces. Furthermore, such presses by their nature are intermittent rather than continuous in operation. Another disadvantage of such presses is that, while the pressure per unit area which must be exerted on the superimposed pieces may be quite small, if the platens are of a large area the total force which must be exerted between the platens is large, so that the presses must be of heavy construction to withstand the high stresses placed upon them.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an improved apparatus for use in attaching, to textile pieces, backing pieces of the kind specified.

According to the present invention there is provided apparatus for use in attaching to a piece of textile material a backing piece having a fusible thermoplastic material, on at least one of its two sides, the apparatus

comprising heating means and conveying means arranged to convey through said heating means superimposed textile and backing pieces and thereafter to pass the superimposed pieces through the nip of two cooperating pressure rollers which are biased towards each other so that the superimposed pieces are pressed together between said rollers.

Preferably said conveying means comprises two endless belts, means driving said conveyer belts and means guiding said conveyer belts so that they are brought together to follow a common conveying path from an entrance end of said conveying means to an exit end of said conveying means and so that they follow different paths from said exit end to said entrance end of said conveying means, whereby said superimposed pieces can be conveyed along said common path between said conveyor belts.

The heating means may comprise a simple oven, or infra-red or microwave heaters.

However, in the preferred embodiments of the invention the heating means comprises a plurality of elongated elements extending along parallel axes transverse to said conveying path said elements being spaced apart along said conveying path and alternate elements being on opposite sides of said conveying path, the elements being disposed so that said conveyer belts are deflected by each element along the conveying path to ensure effective contact of said belts with said rollers.

The elongated elements are preferably individually heated.

The heated elements may be arranged in a plurality of successive groups along the conveying path the elements of the last group being heated to a predetermined temperature equal to the desired temperature of the thermoplastic material before pressing the pieces together and the elements of the first group being heated to a predetermined lower temperature.

Preferably the common path of the conveyer belts passes through the nip of the pressure rollers and said common path may also, after passing through said nip also pass over one or more cooling rollers, so that the pieces are discharged at the exit end of the conveyer path at a temperature so low that the bond between the pieces will not be disturbed by handling.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic view showing in longitudinal section of embodiment of the present invention;

FIG. 2 is a schematic view showing in longitudinal section another embodiment of the present invention;

FIGS. 3 and 4 are views in cross-section and horizontal longitudinal section respectively of part of the embodiment of FIG. 2, and

FIG. 5 is a schematic cross-sectional view of the embodiment of FIG. 3 showing how the conveyer belts may be removed and replaced.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 1, the apparatus shown therein comprises a frame including two horizontally extending parallel side members one of which is indicated at 10, the side members being connected by suitable cross members (not shown) and the frame being supported on a suitable base (not shown).

The apparatus is arranged to pass superimposed textile pieces and backing pieces from a table 12 at an en-

trance end of the apparatus to a table **14** at an exit end of the appratus. At the exit end of the apparatus upper and lower conveyor rollers **16***a* and **16***b* respectively extend between the side frames **10** in which they are rotatably mounted and at the entrance end of the machine upper and lower conveyer rollers **18***a* and **18***b* respectively extend similarly between the side frames **18***a* and **18***b* and are rotatably journalled therein. The rollers **16***a*, **16***b*, **18***a* and **18***b* are tangential to a common horizontal plane.

Upper and lower endless conveyer belts **20***a* and **20***b* respectively run between the rollers **18***a* and **18***b*, along the apparatus, in a conveying direction indicated by the arrow A, to the rollers **16***a* or **16***b* respectively, around the respective roller **16***a* or **16***b* back along the apparatus in a direction opposite to the conveying direction, around a conveyer roller **22***a* or **22***b* respectively extending between and rotatable in the side frames **10** and thence over a tensioning roller **24***a* or **24***b* and back to the roller **18***a* or **18***b*.

Each end of each tensioning roller **24***a* or **24***b* is rotatably mounted at one end of a different arm **26,** and each arm **26** is pivotally connected at an intermediate point along its length to one of a different arm **28.** The other ends of the two arms **28** associated with each roller **24***a* or **24***b* are pivotally mounted on the side frames to pivot coaxially with the respective roller **18***a* or **18***b*. The end of each arm **26** remote from the roller **24***a* or **24***b* is connected by a tensioning spring **30** to an intermediate point on the corresponding arm **28.** The two arms **28** associated with each roller **24***a* or **24***b* are interconnected so as to move as one about the axis of the respective roller **18***a* or **18***b* but are spaced apart angularly about said axis and are pivoted to their respective arms **26** at different distances from the bearings carrying the rollers **24***a*. As a result, the roller **24***a* or **24***b* is parallel with the roller **18***a* or **18***b* in only one angular position of the associated arms **28,** and can be tilted with respect to the rollers **18***a* or **18***b* by moving the pair of arms **28** from this position. This is used for tracking the respective conveyer belt, a servo cylinder assembly acting between each pair of arms **28** and the frame being controlled by micro switches at each side of the respective conveyer belt so that if the conveyer belt runs to one end of its rollers it trips the micro switch on that side of the belt and the servo cylinder pivots the arms **28** to tilt the roller **24***a* or **24***b* in such a way as to cause the conveyer belt to begin to run towards the other end of its rollers.

Any other means of tracking the belts may of course be used.

From the rollers **18***a* and **18***b* which define the entrance end of the conveying means to the rollers **16***a* and **16***b* which define the exit end of the conveying means the belts **20***a* and **20***b* are in contact with each other and pass along a common conveying path. Spaced apart from each other along the conveying path are a plurality of parallel rollers **32***a*, **32***b* and **32***c*, each extending transversely between the side frames **10** and rotatably journalled therein. The rollers **32***a*, **32***b* and **32***c* are arranged alternately above and below the conveying path, and the bottoms of the upper rollers **32***a*, **32***b* or **32***c* are slightly below the level of the tops of the lower rollers so that the belts **20***a* and **20***b* together are deflected slightly in passing over or under each roller **32***a*, **32***b* or **32***c*. This ensures that each roller **32** contacts the respective conveyer belt and increases the area of contact of the roller with the respective conveyer belt. The rollers are arranged in three groups of seven and from the rollers **18***a* and **18***b* the conveyer belts first pass a group of seven rollers **32***a*, then a group of seven rollers **32***b* and finally a group of seven rollers **32***c*.

Each of the rollers **32** is of aluminum and is hollow throughout its length, and is journalled in the side frames **10** by means of hollow bushes, aligned with holes in the side frames **10,** and each of six of the seven rollers in each group is heated by an elongated heating element passes through the interior of the roller and said hollow bushes and aligned holes in the side frames, the heating element being supported in an insulated fashion by said side frames, so that the rollers are free to rotate around their respective heating elements. The remaining roller in each group carries within it a temperature sensing circuit including a temperature sensing element, for example a thermistor disposed at a window in the wall of the roller. Since the temperature sensing circuit rotates with the roller to enable the thermistor to remain at said window, the roller has at least one of its bushes insulated and carried by an insulated bearing in one of said side members and connections from said temperature sensing circuit being connected to said one insulated bush and the other bush respectively and the signal from said circuit is taken off from said one insulated bearing and the other said bearing.

Each group of rollers **32** have their heating elements supplied in parallel from a supply circuit controlled by the signal from the associated temperature sensing circuit, so as to maintain the rollers of the group at a temperature determined by a manual setting provided on a control panel for the group.

After passing all of the heated rollers **32***a*, **32***b* and **32***c* the two belts **20***a* and **20***b* together pass through the nip between a lower pressure roller **34***b* and an upper pressure roller **34***a*. Both pressure rollers **34***a* and **34***b* are machined from solid bar and the lower pressure roller **34***b* is journalled at opposite ends directly in the side frames **10.** The upper pressure roller **34***a* is journalled at opposite ends in the ends of arms **36,** the other ends of which are pivotally supported in the respective side frames **10.** The arms **36** are rigidly connected so as to prevent relative twisting thereof and an extension **38** integral with one of the arms **36** extends upwards therefrom and is welded at its upper end to an intermediate point in a horizontal counterpoise bar **40.** A counter weight can be slid over the bar **40** on either side of the extension **38** to any desired horizontal position on the bar **40** or can be removed entirely.

The dimensions of the arms **36,** extension **38** and bar **40** are such that with the counter weight removed the roller **34***a* presses on the belts **20***a* and **20***b* and the roller **34***b* with a force equal to its own weight and with the counter weight **42** at the extreme right hand end of the bar **40** as viewed in the figure the roller **34***b* exerts no pressure on the belts **20***a* and **20***b* and the roller **34***b*.

After passing the rollers **34***a* and **34***b* the belts **20***a* and **20***b* pass a group of cooling rollers **44** extending transversely across the conveying path and rotatably journalled at opposite ends in opposite side frames **10.** The rollers **44** are arranged similarly to the rollers **32***a*, **32***b* and **32***c* so that the belts **20***a* are deflected over one roller **44,** under the next, over the next and so on. The rollers **44** are hollow and are journalled in the side walls

by means of hollow bushes running in hollow bearings with a sealing fit and the rollers 44 are cooled by passing water through each roller via its hollow bearings and bushes.

At the exit end of the apparatus the belt 20*b* first runs over its roller 16*b* while the belt 20*a* continues in the conveying direction for a short distance before running over its rollers 16*a*. A take off plate 50 co-operates with the belt 20*b* as it passes over the roller 16*b*, the take off plate being aligned with the table 14. A similar plate 52 co-operates with the belt 20*a* as it runs over the roller 16*a*.

The rollers 16*a* and 16*b* are driven synchronously by suitable drive means, for example by chain drive and variable gearing from an electric motor.

The operation of the apparatus will now be described. The drive for the belts 20*a* and 20*b* is set for the desired speed and the temperature control circuits for the groups of heated rollers 32*a*, 32*b* and 32*c* are set so that after passing the group of rollers 32*c* the thermoplastic material of a backing sheet carried along the conveying path will be at the correct temperature for effective bonding. To this end it is advantageous if the rollers 32*a* are set to an upper temperature slightly below the desired temperature, and the remaining rollers set to the desired temperature.

In use superimposed cloth pieces and backing pieces are arranged on the table 12 with the face of the backing piece bearing the thermoplastic material in contact with the reverse face of its corresponding cloth piece.

The superimposed pieces are then fed between the rollers 18*a* and 18*b* and are conveyed along the conveying path between the belts 20*a* and 20*b*, which since they move at the same speed prevent the superimposed pieces from moving out of register.

The deflection of the belts over the heated rollers ensures effective contact between the rollers and the belts and effective transference of heat from the rollers to the belts and the superimposed pieces between them.

The rollers 32*a* supply most of the heat required to bring the pieces to the desired temperature, so that there is a very small temperature difference between the first and the last of the rollers 32*b* and the rollers 32*c* have to supply very little heat to the belts and superimposed pieces so that the temperature of the rollers 32*c* can easily be controlled within very fine limits. After leaving the rollers 32*c* the thermoplastics material on the backing pieces if therefore reliably at the desired temperature and before cooling takes place the belts with the superimposed pieces pass between the rollers 34*a* and 34*b*. Since each of the heated rollers contacts the belts only over a small proportion of its area at a time and since any portion of each roller is in contact with the belts for only a small part of the time each roller remains at a substantially uniform temperature over its entire surface and if the rollers are independently heated a temperature variation in one roller is not transferred to any other.

Furthermore, when the rollers are arranged in independently controlled groups, the temperature of conveyed pieces reaching the final group will be almost unaffected by the heating load placed on the rollers of the first group.

Since the rollers 34*a* and 34*b* make substantially line contact, the effective weight of the roller 34*a* is sufficient to exert enough pressure on the superimposed pieces to ensure reliable bonding of the thermoplastics with the cloth finishing piece. After passing the rollers 34*a* and 34*b* the belts, with the superimposed pieces still between them pass over and under the cooling rollers 44 to cool the pieces to a temperature at which they can be safely handled and the cloth pieces with their backing pieces bonded securely to them are discharged on to the table 14. Should any of the pieces tend to adhere to the belt 20*a* they are removed therefrom by the plate 52 and returned to the table 14.

Referring to FIG. 2 there is shown another embodiment of the present invention in which parts corresponding to parts in the embodiment of FIG. 1 are marked with the same reference numerals. In general the operation of the machine shown in FIG. 2 is the same as that described with reference to FIG. 1. Any difference will readily appear from the following description.

In the embodiment of FIG. 2 the cooling rollers are dispensed with and the rollers 32*a*, 32*b* and 32*c* are replaced by units 132, a typical one of which is shown to a larger scale in cross-section and in longitudinal section in FIGS. 3 and 4 respectively.

Each unit 132 comprises a casing 100 of sheet metal, for example aluminum formed into a beam of uniform pentagonal cross-section throughout its length and providing a horizontal wall 102, side walls 104 diverging away from the longitudinal edges of the wall 102 at equal angles thereto, and walls 106 extending away from the walls 104 to meet in the apex of an obtuse angle, to provide a ridge, the walls 106 converging in the direction away from the wall 102.

As can be seen from FIGS. 2 and 3 each unit 132 is symmetrical in cross-section about a vertical line through said apex. The angle between the walls 106 is very slight in practice, around 10° or 15° and is shown somewhat exaggerated in the drawings.

In the embodiment of FIG. 2, the conveyer belts 20*a* and 20*b* follow a common path from the rollers 18*a*, 18*b* to the rollers 16*a*, 16*b* and four lower units 132 are disposed on the underside of said common path and four upper units 132 are disposed on the upper side of said common path, the upper and lower units 132 being disposed alternately along the conveying path and all of said units 132 having their longer dimensions horizontal and at right angles to the conveying direction A.

The units 132 are spaced apart in series along the conveying path with their ridges formed at the meeting of the respective pairs of walls 106, facing towards the conveying path. Said ridges of the units 132 above the conveying path lie in a first horizontal common plane while said ridges of the units 132 below the conveying path lie in a second horizontal common plane which is above said first common plane. As can be seen from FIG. 2 the positions of the units 132 are such that if the superimposed conveyer belts 20*a* and 20*b* in their passage over the common conveying path are considered as a unitary band this band passes over, and in contact with, one wall 106 of one unit 132 over said ridge of that unit, over and in contact with the other wall 106 of that unit, from that unit 132 to the next in the conveying direction, over and in contact with one wall 106 of said next unit, over its said ridge, over and in contact with the other wall 106 of said next unit and to the next again unit and so on, the conveyor belt 20*a* contacting the upper units 132 and the conveyer belt 20*b* contacting the lower units 132. Thus, as will be seen from FIG. 2 the conveying path follows a zig-zag con-

figuration. If desired instead of each unit having two walls **106** angled outwardly with respect to each other each unit may have a wall which is outwardly convex in cross-section and over which the belts are deflected in contact.

The majority of the units **132** are each provided with an electrical heating element **110** (see FIGS. **3** and **4**) of the type comprising a filament of resistive material surrounded by a sheath of insulating material surrounded in turn by a metal tube co-axial with the resistive filament. The element **110** is bent into a substantially u-shaped configuration and is disposed within the casing **100** with one arm of the U running along the corner between one wall **104** and the adjacent wall **106** and the other arm of the U running along the corner between the other wall **104** and the other wall **106.**

The unit **132** farthest downstream in the conveying path is provided with a temperature sensing circuit instead of with a heating element. Said temperature sensing circuit includes a temperature sensing element, for example a thermistor disposed at a window in one of the walls **106.**

The free ends of the arms of the U shaped heating elements pass through one of the side frames **10** and are connected in parallel to a supply circuit controlled by the temperature sensing circuit so as to maintain the units **132** incorporating heating elements at a temperature determined by a manual setting provided on a control panel in a manner exactly similar to that described in connection with the embodiment of FIG. **1.**

If desired of course, in the embodiment of FIG. **2** the units **132** can be divided into two groups of four, one group being upstream of the other and each group including three units **132** with heaters and one unit **132** with a temperature sensing circuit controlling the heaters of the respective group, in a manner similar to that described with reference to FIG. **1,** with the downstream group being kept at the desired final temperature of the pieces to be bonded and the upstream group being kept at a slightly lower temperature.

After passing the last unit **132** along the conveying path, the conveyer belts **20***a* and **20***b* pass together under a roller **120** and then over a roller **122,** mounted on an arm **124** and biased towards the roller **16***a*, through the nip between the rollers **122** and **16***a*, around the roller **16***a* and through the nip between the rollers **16***a* and **16***b*. The purpose of this arrangement on the exit side of the units **132** is to prevent a phenomenon which may occur in the embodiment of FIG. **1** in the case of long pieces of cloth with superimposed backing pieces, with certain qualities of cloth, which phenomenon is due to the compression of the cloth piece by the rollers **16***a*, **16***b* tending to cause a longitudinal extension of the cloth piece. which tendency, if unopposed, causes a slight displacement in the upstream direction of the cloth piece immediately upstream of the rollers **16***a*, **16***b*. With relatively short pieces of cloth this displacement is unimportant, but with long pieces the cumulative effect of these displacements produces a 'bow-wave' in the cloth piece immediately upsteam of the rollers **16***a* and **16***b* which eventually folds over and produces a crease when it passes between the rollers **16***a* and **16***b* which crease cannot subsequently be removed since the cloth on either side is bonded to the backing piece.

Passing the belts **20***a* and **20***b*, around the rollers **120, 122** and **16***a* as described above prevents the occurrence of this 'bow-wave' phenomenon since from the point of contact of the belts **20***a* and **20***b* with the rollers **122** to the nip between the rollers **16***a* and **16***b* the belts are forced towards each other by forces derived from tension therein so that the superimposed cloth pieces and backing pieces passing through this region are in effect kept compressed between the belts so that frictional forces acting between the cloth pieces and backing pieces and between these pieces and the belts oppose relative displacements of the cloth pieces, backing pieces and belts and prevent the occurrence of the 'bow-wave' phenomenon.

In the embodiment of FIG. **2** the bonded cloth pieces and backing pieces pass from the rollers **16***a*, **16***b* directly on to the receiving table **14** since it has been found that, in practive subsequent artificial cooling of the pieces is generally unnecessary.

In the embodiment of FIG. **2** the rollers **16***a*, **16***b* are covered in silicone rubber and since the surfaces of the rollers **16***a*, **16***b* would be permanently deformed if one was allowed to press upon the other for an appreciable length of time with the rollers stationary the counterweight system used to bias the rollers **16***a*, **16***b* together in FIG. **1** is not adopted in FIG. **2** but instead the lower roller **16***b* in the embodiment of FIG. **2** is biased upwardly against the roller **16***a*, by a solenoid, or by a pneumatic cylinder controlled electrically or by some equivalent electrically operable means, which is controlled by the means which controls the drive for the conveyer belts in such a way that should the conveyer belts be stopped either intentionally or through some fault the rollers **16***b* will be allowed to drop away from the roller **16***a*.

Another feature of the machine of FIG. **2** is a provision which is made for easy removal and changing of the belts **20***a* and **20***b*. To this end, as shown in FIG. **4,** one of the side plates **10** is formed by two parts **10***a* and **10***b*, the part **10***a* being superimposed upon and detachable from the part **10***b* and the part **10***b* being superimposed upon and detachable from the base **11** upon which the side plates **10** rest. The base **11** conveniently provides at its top, along the two lateral sides of the machine respective horizontal flanges **130, 131** extending longitudinally of the machine. One of the side plates **10***c* is of unitary construction and is of channel shaped cross-section providing horizontal flanges at its upper and lower longitudinal edges, and has its lower horizontal flange **132** fixed permanently to the flange **130** of the base **11.** The power supply leads for the units **132,** and the leads from the temperature sensing circuitry pass through the side plate **10***c* and the open side of the channel section of the side plate **10***c* which faces outwardly from the machine, is closed off by a cover member **133** to provide a compartment for the control circuitry and instrumentation.

Each of the parts **10***a* and **10***b* is in the form of a channel section beam, the base of the channel extending in a vertical plane and the side walls extending horizontally and providing horizontal flanges. The rollers **16***a*, **18***a*, **22***a* and **120,** and the upper units **132** are each mounted at one end in the vertical wall of the side frame **10***c* in such a way as to permit limited pivotal movement in a vertical plane and the other ends of the rollers **16***a*, **18***a*, **22***a* and **120,** and the upper units **132** are mounted in the vertical wall of the upper side frame part **10***a*. Similarly, the rollers **16***b*, **18***b* and **22***b*, and the lower units **132** are each mounted at one end in the

vertical wall of the side frame **10***c* in such a way as to permit limited pivotal movement in a vertical plane and the other ends of the rollers **16***b*, **18***b* and **22***b* are mounted in the vertical side wall of the lower side frame part **10***b*.

If the split construction shown in FIG. **5** is adopted the arm **124** supporting the roller **122** on the side of the side frame **10***a*, **10***b* is conveniently secured to the lower side frame **10***b*. The mounting of the roller **122** at its end adjacent the side frame **10***c* being such as to permit limited pivotal movement of the roller **122** in a vertical plane. The rollers **22***a* and **22***b* are mounted in the side frames **10***a*, **10***b*, **10***c* in such a way that they can be quickly removed from the machine.

The side plate parts **10***a* and **10***b* each have at intervals therealong sockets **140** adapted to receive as a close fit cylindrical bars **150** of belt changing jig. The latter jig includes a support stand **160** having a supporting base **162** and support elements **164** adapted to cradle the bars **150**.

In normal operation of the machine the bars **150** are removed from their sockets **140** and the lower horizontal flange of the side frame part **10***b* is securely bolted on to the flange **131** of the base **11** while the upper horizontal flange of the side frame part **10***b* is securely bolted to the lower horizontal flange of the side frame part **10***c*.

Detachable cover panels (not shown) normally enclose the top of the machine and the exposed parts of the bottom of the lower conveyer belt run.

When it is desired to change the belts **20***a*, **20***b*, these cover plates are first removed, then the rollers **22***a* and **22***b* are removed, the bolts holding the side frame parts **10***a* and **10***b* together and the side frame **10***b* to the base **11** are undone and bars **150** are inserted in the sockets **140** of the side frame part **10***a* and are lifted to tilt the side frame part **10***a* and the rollers and units **132** mounted thereon vertically as shown in FIG. **5**.

The support elements **164** for the upper bars **150** are brought into position below the outer ends of the bars **150** and the latter are allowed to rest on these support elements. The support elements **164** are arranged at two levels one for the bars **150** engaged in the sockets **140** of the part **10***a* and one for bars **150** engaged in the sockets **140** of the part **10***b*. The support elements are arranged to be movable between positions out of the path of the tilting bars **150** and positions into said path. With the bars **150** engaged in the sockets **140** of the part **10***a* supported by their support elements the part **10***a* is maintained in a raised position spaced vertically above the part **10***b*. The belt **20***a* can therefore be drawn over the part **10***a* on to the bars **150**, which are of a length greater than the width of the belt. The bars **150** for the lower part **10***b* can now be inserted in the sockets **140** in the part **10***b* and the latter part also tilted upwards by raising the bars and the latter bars thereafter supported by their respective support elements so as to maintain the part **10***b* in a position spaced both from the part **10***a* and the base **11**. The belt **20***b* can now be drawn off over the part **10***b* on to the lower bars **150**. The bars **150** are then lowered again and the support stand and the belts removed. Reinstallation of the belts is performed simply by reversing the above sequence of operations.

The construction described with reference to FIG. **2** has the advantages that the units **132** present large heat transfer surfaces to the conveyer belts, and since the units **132** are stationary the number of moving parts is kept to a minimum and problems such as that of maintaining electrical contact between relatively moving members, are avoided.

The split construction allowing easy removal of the belts, and the counter roller construction preventing the 'bow-wave' phenomena, which have been described with reference to the embodiment of FIG. **2** could, of course, also be adopted in the embodiment of FIG. **1**.

The belts may be of perforated synthetic rubber sheeting, gauze or wire mesh depending on the nature of the materials to be bonded together.

I claim:

1. Apparatus for use in attaching to a piece of textile material a backing piece having a fusible thermoplastic material on at least one of its two sides, the apparatus comprising two cooperating pressure rollers, means biasing at least one of said rollers towards the other, heating means and conveying means for conveying through said heating means superimposed textile and backing pieces and for thereafter passing the superimposed textile pieces through the nip of said two cooperating pressure rollers, whereby said superimposed pieces are pressed together between said rollers,

said conveying means having an entrance end and an exit end, said conveying means comprising two endless conveyer belts, means driving said conveyer belts and means guiding said conveyer belts to follow a common path from said entrance end to said exit end, and to follow different paths from said exit end to said entrance end of the conveying means,

said heating means comprising a plurality of elongated elements extending along parallel axes transverse to said conveying path, said elements being spaced apart along said conveying path and alternate said elements along said path being on opposite sides of said conveying path, said elements being disposed so that said conveyer belts are deflected by each said element along the conveying path, whereby effective contact of said belts with said elements is ensured.

2. The apparatus of claim **1**, including individual heating means for each of said elongated elements.

3. The apparatus of claim **2**, wherein said elongated elements are arranged in a plurality of successive groups along the conveying path, and wherein said apparatus includes control means for said heating means operable to maintain the elements of the last group at a predetermined temperature equal to the desired temperature of the said thermoplastics material before pressing said superimposed pieces together and to maintain the rollers of the first group at a predetermined lower temperature.

4. The apparatus of claim **3**, wherein said elongated elements are rollers rotatable about said parallel axes.

5. The apparatus of claim **1**, wherein said elongated elements are fixed units in the form of hollow beams of uniform cross-section perpendicular to said axes and provided with deflecting surfaces over which said conveyer belts pass in contact in passing along said common path.

6. The apparatus of claim **5**, wherein said deflecting surfaces are outwardly convex or angled in cross-section.

7. Apparatus for use in attaching to a piece of textile material a backing piece having a fusible thermoplastic material on at least one of its two sides, the apparatus comprising two cooperating pressure rollers, means biasing at least one of said rollers towards the other, heating means, conveying means for conveying through said heating means superimposed textile and backing pieces and for thereafter passing the superimposed textile pieces through the nip of said two cooperating pressure rollers, whereby said superimposed pieces are pressed together between said rollers,

said conveying means having an entrance end and an exit end, said conveying means comprising two endless conveyer belts, means driving said conveyer belts, and means guiding said conveyer belts to follow a common path from said entrance end to said exit end, and to follow different paths from said exit end to said entrance end of the conveying means,

a counter roller on the upstream side of said pressure rollers, and means biasing said counter roller against one of said pressure rollers, said means guiding said conveyer belts operating to cause said conveyer belts, in following said common path and prior to passing through the nip of said pressure rollers, to pass first in an arc around said counter roller and in contact with a substantial part of the circumference of said counter roller, subsequently through the nip between said counter roller and said one pressure roller, then in an arc of opposite curvature around and in contact with a substantial part of the circumference of said one pressure roller, said last mentioned part extending from the nip between said one pressure roller and said counter roller to the nip between said pressure rollers.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,767,511 Dated October 23, 1973

Inventor(s) Kenneth Slade

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 48, "of embodiment" should read

--one embodiment--

Column 5, line 49, "backing pieces if" should read

--backing pieces is--

Column 10, line 57, "claim 3" should read

--claim 1--

Signed and sealed this 2nd day of July 1974.

(SEAL)
Attest

EDWARD M. FLETCHER,JR.
Attesting Officer

C.MARSHALL DANN
Commissioner of Patents

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