Oct. 31, 1961 E. C. PFEFFER, JR 3,006,802

AUTOMATIC STAY FUSING DEVICE

Filed April 13, 1959 4 Sheets-Sheet 1

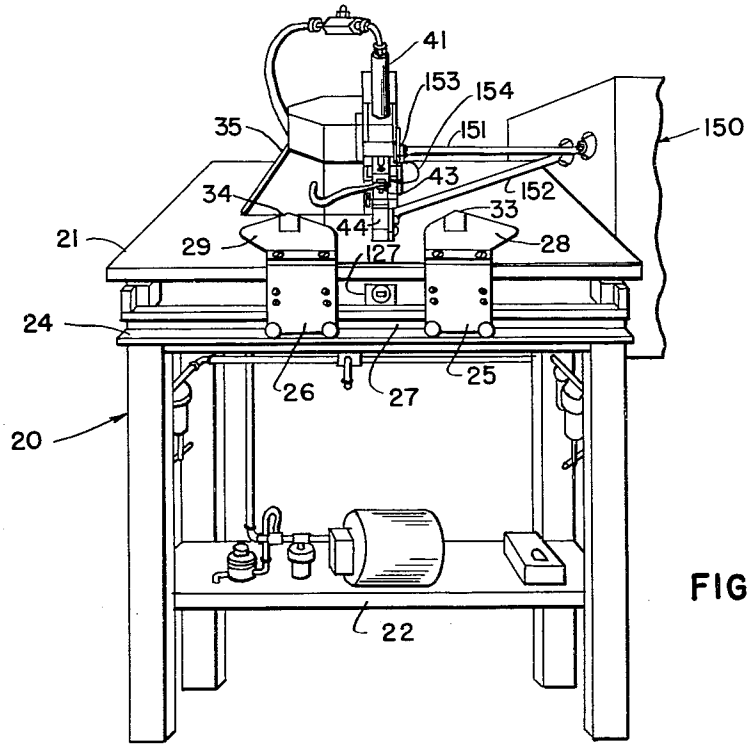


FIG. 1

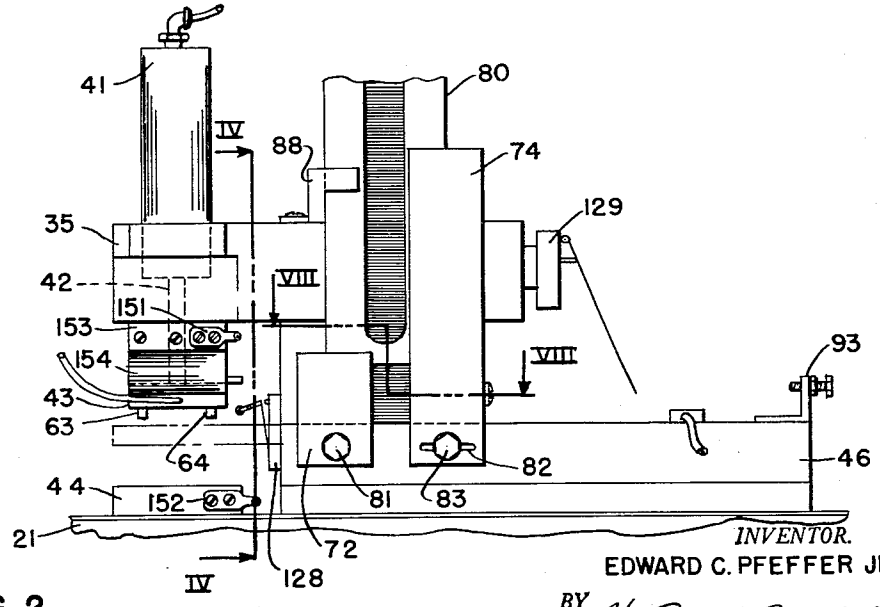


FIG. 2

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AUTOMATIC STAY FUSING DEVICE

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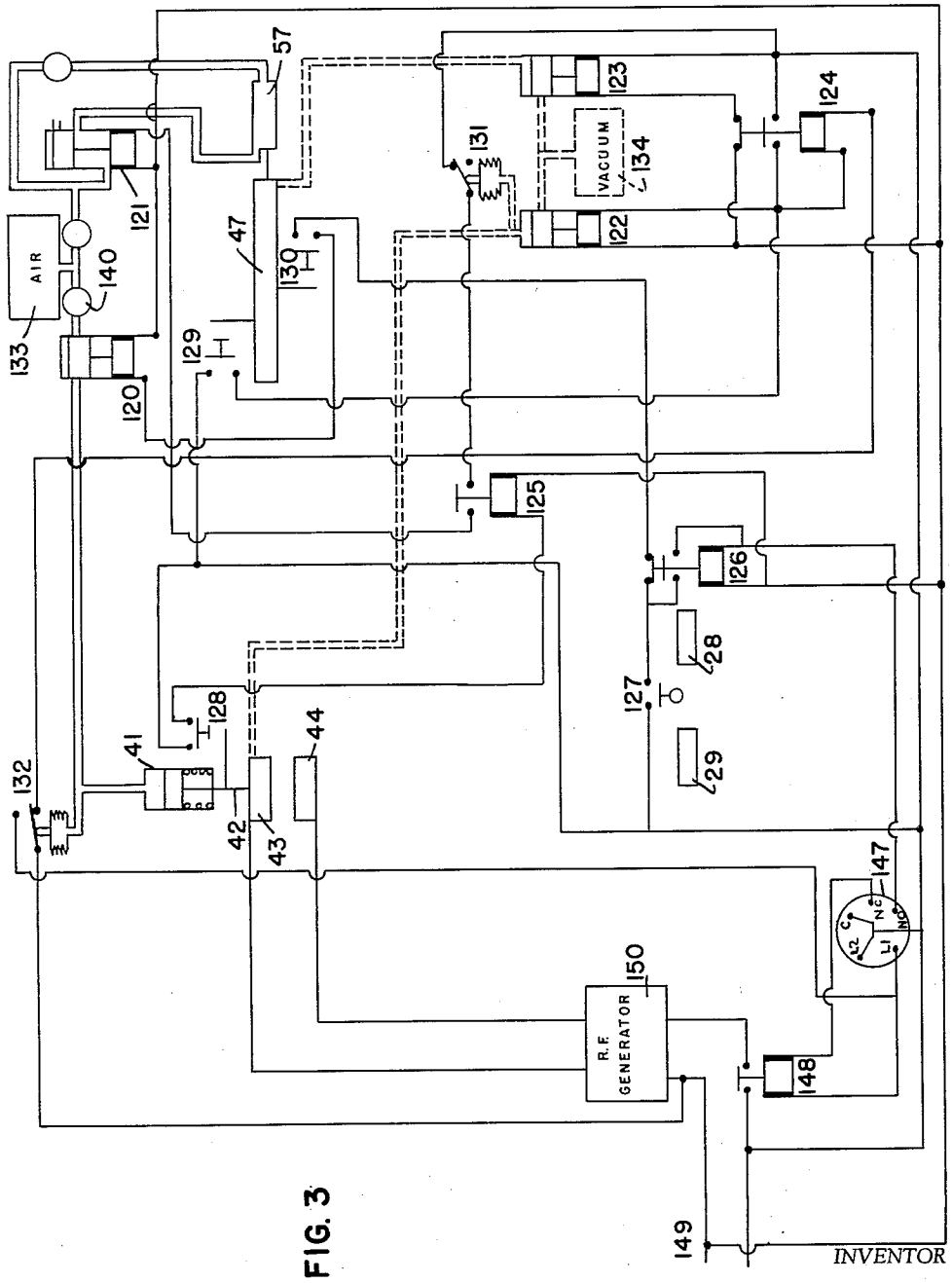


FIG. 3

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AUTOMATIC STAY FUSING DEVICE

Filed April 13, 1959 4 Sheets-Sheet 3

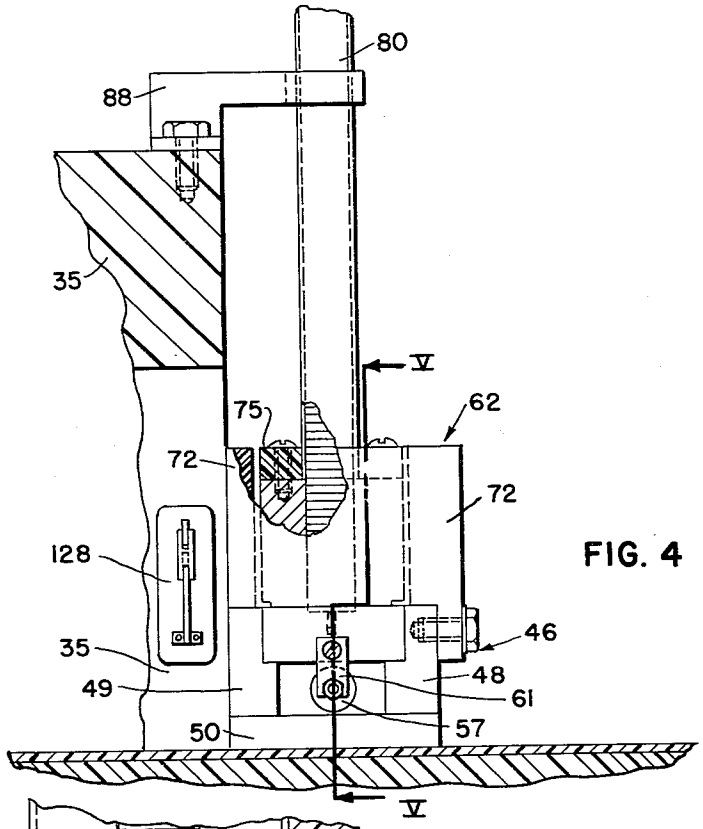


FIG. 4

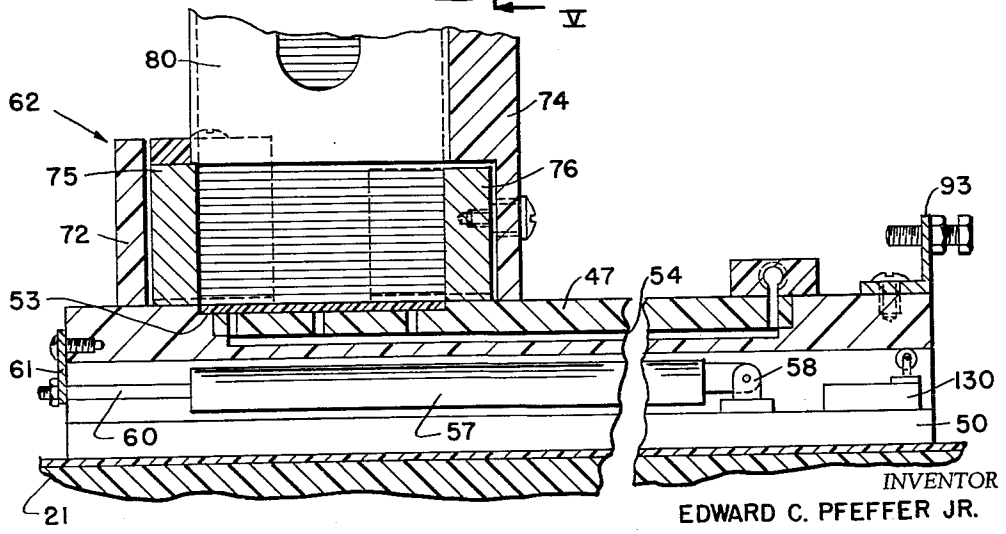


FIG. 5

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AUTOMATIC STAY FUSING DEVICE

Filed April 13, 1959 4 Sheets-Sheet 4

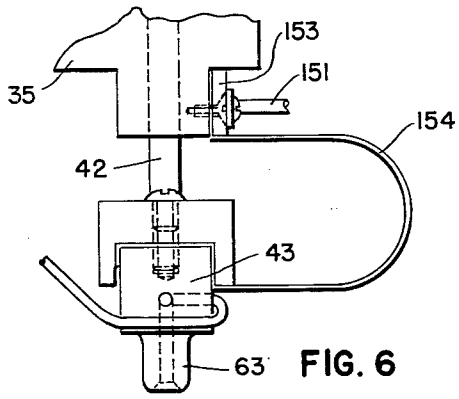


FIG. 6

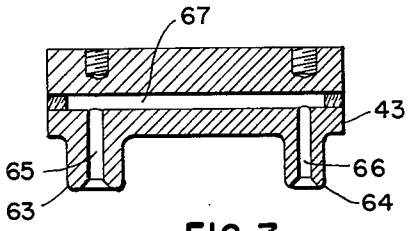


FIG. 7

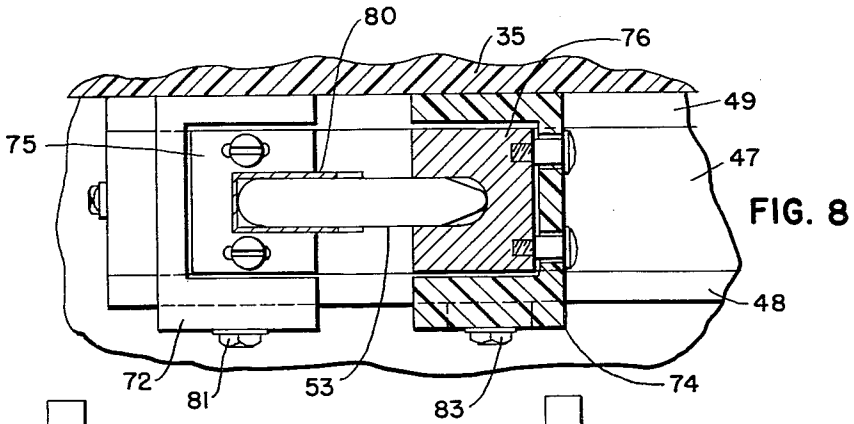


FIG. 8

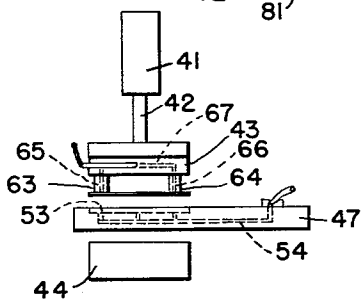


FIG. 10

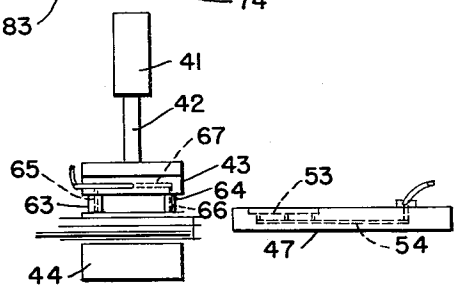


FIG. 11

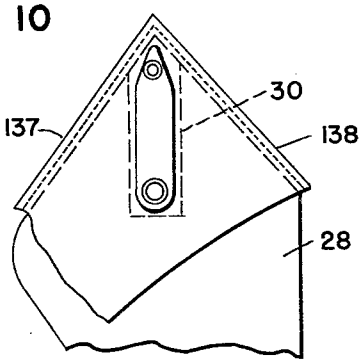


FIG. 9

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Patented Oct. 31, 1961

3,006,802

AUTOMATIC STAY FUSING DEVICE

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Filed Apr. 13, 1959, Ser. No. 806,100
4 Claims. (Cl. 156—380)

This invention relates to an automatic fusing device for thermoplastic strip stays, and more particularly to an automatic device for positioning and fusing a strip thermoplastic collar stay to the cape portion of a shirt collar.

The problem solved by the present invention is that of automatically selecting a single strip of formed sheet thermoplastic material which is small and difficult to handle, and then accurately positioning and fusing the strip to a fabric part. In a preferred embodiment, thermoplastic strip stays are fed, one at a time, from a stack of the stays to an electrode of a high frequency device. Thereafter, a platen accurately positions the cape portion of a collar between the electrodes and actuates the fusing of the stay to the collar fabric.

With the trend toward soft collars in men's shirts, stiffening devices or strip stays have been attached to the cape portion of a collar to prevent the points of the collar from curling and to provide a neater appearance. Such stays have heretofore been attached to the collar by first forming a pocket into which the stay is inserted.

In my co-pending application S.N. 685,926, I have taught that thermoplastic stays may be fused directly to the collar fabric to provide a mechanical attachment thereto by high frequency heating. Attachment by this method is possible without any damage even though the fusing or melting temperature of the thermoplastic is above the scorch temperature of the fabric. This arrangement has the advantage to the manufacturer of eliminating the need for forming a pocket for the stay with a consequent reduction in labor costs; and it has the advantage to the purchaser of the shirt of being completely washable and ironable in its attached position.

However, if in attaching the stay to the collar it is necessary to position each stay on the collar by hand, it is difficult for the operator to attain any degree of accuracy or speed. Therefore, the present invention permits a fuller realization of the advantages of the fused stay by increasing the speed and accuracy with which the stays may be fused to the collar fabric.

According to the present invention, the strip stays are supplied in a stacked position above a transfer slide. The transfer slide includes a depression accurately machined to receive a single stay at a time from the bottom of the stack. In order to hold the stay tightly in the depression and to assist in breaking the stay from the rest of the stack, a vacuum holding means is provided in the bottom of the depression. A piston is attached to the slide for moving the slide along a travel carrying the single stay from beneath the stack to an accurately oriented position beneath an upper terminal of a high frequency heating device. The upper terminal is provided with vacuum holding on the bottom surface thereof. At its forward reach, the slide operates a transfer for the vacuum from the depression to the upper electrode to transfer the stay to the electrode. This condition signals the retraction of the slide to receive another stay for transfer subsequently to the electrode upon receiving a signal to do so.

Upon positioning the cape portion of a collar onto a collar platen, the collar is moved by an operator into an oriented position between the terminals of the high frequency heating unit. This action, through automatic means, lowers the upper electrode and stay onto the top ply of the positioned collar and starts the high frequency generator for a set timed period to fuse the stay to the collar. Upon lapse of the time period, the generator is cut off automatically and the upper terminal rises. The platen is then moved by the operator from between the terminals with the thermoplastic stay firmly fused to the collar fabric. The automatic sequence then positions the next stay onto the upper electrode for repeating the cycle.

It is therefore an object of the present invention to provide an automatic fusing device for thermoplastic strip stays.

Another object of the present invention is to provide a device for accurately positioning a strip stay and for attaching it to the cape portion of a collar by high frequency fusing.

A further object of the present invention is to increase the speed and accuracy with which strip stays may be fused to a collar fabric.

Other objects and advantages of the present invention will be apparent to those skilled in the art from the following description and drawing, in which:

FIG. 1 is a pictorial view of the stay fusing device of the present invention;

FIG. 2 is a side view of the device shown in FIG. 1;

FIG. 3 is an electrical diagram with a schematic showing of the pneumatic systems;

FIG. 4 is a front view along line IV—IV of FIG. 2 showing the front support for the stay carton with a partial section showing the stay feed more clearly;

FIG. 5 is a sectional view of the slide and stay feed taken along line V—V of FIG. 4;

FIG. 6 is a front view of the upper terminal;

FIG. 7 is a sectional view of the upper terminal;

FIG. 8 is a sectional view taken along line VIII—VIII of FIG. 2;

FIG. 9 is an enlarged view of a portion of one platen with a collar point and fused stay thereon;

FIG. 10 is a view illustrating the transfer of a stay from the slide to the upper terminal;

FIG. 11 is a view illustrating the upper terminal in fusing position against a collar positioned on a platen.

Referring first to FIG. 1, the automatic fusing device of the present invention is shown mounted on a work bench 20. The upper surface 21 of the bench 20 is inclined and, if desired, may be made with provision for adjustment of the angle at which it is inclined to suit an operator.

The work bench 20 also includes a lower surface 22 on which is mounted pneumatic pumps and control devices to be explained more fully hereinafter. A track 24 extends across the front of the bench 20 and is located below and in front of the upper surface 21. A pair of carriages 25 and 26 are mounted on the track 24 and may easily be moved along the track 24 by an operator. The carriages 25 and 26 are connected by a bar 27 so that they are guided together in their movement along the track 24.

Attached to the carriages 25 and 26 and extending over the upper surface 21 are platens 28 and 29, respectively. The platens 28 and 29 are formed mainly of an electrical non-conductive material and are shaped to a desired configuration to receive and orient a garment part, such as a semi-finished collar of a shirt with the point portions 33 and 34, respectively, receiving the points of a semifinished collar 136.

Positioned on the upper surface 21 of the work bench 20 is a mounting block 35. The mounting block 35 supports an air cylinder 41 with the piston arm 42 arranged to extend downwardly in a vertical direction.

An upper terminal 43 is attached to the lower end of the piston arm 42 and electrically insulated therefrom in a suitable manner. A lower terminal 44 is positioned

directly beneath the upper terminal 43 on the upper surface 21 of the bench 20. The lower terminal is suitably insulated electrically from the upper surface 21.

As the carriages 25 and 26 are moved along the track 24 by an operator, the platens 28 and 29 are carried alternately to positions between the upper terminal 43 and the lower terminal 44. Suitable stops, not shown, limit the travel of the carriages in either direction to position a garment part on the platens 28 and 29 accurately between the terminals 43 and 44.

The platens 28 and 29 are provided with electrical and heat conductive inserts 30, seen in FIG. 9, which refine the area of the collar to which the stay is to be attached by fusing. When a platen is positioned between the terminals, the insert 30 in the platen functions as an extension of the lower terminal to reduce the gap between the terminals and thereby lower the power consumption of the device.

Positioned adjacent to the mounting block 35 is a guide 46 for a transfer slide 47, seen more clearly in FIG. 4. The guide 46 includes a first member 48 and a second member 49 which are separated by a base member 50. The members 48 and 49 support the slide 47 for movement along a travel between a retracted position and an extended position.

The slide 47 includes a depression 53 which is machined to accurately receive a single strip stay. The stay may be any suitably formed strip of thermoplastic, and is shown as a collar stay for a collar. A suitable duct 54 extends from the bottom surface of the depression 53 to the end of the slide 47 for connection to a vacuum source 134. The duct 54 may be formed in the slide in any well-known manner and the vacuum source 134, shown in FIG. 3, provides a sufficient vacuum on the lower surface of the depression 53 to securely hold a single strip stay in the depression.

An air cylinder 57, arranged between the first member 48 and the second member 49 of the guide 46, is provided for moving the slide 47 along the guide 46. The air cylinder 57 is secured at one end 58 to the base member 50. A piston arm 60 of the air cylinder 57 is secured to the end of the slide 47 by means of a brace 61. A suitable air pressure source 133, shown in FIG. 3, is provided to operate the piston arm 60.

A holding means 62 supports a stack of strip stays within a carton 80 above the depression 53 of the slide 47 when the slide is in its retracted position. This holding means 62 includes a forward positioning block 72 and a rear positioning block 74 . Both the forward and rear positioning blocks 72 and 74, are supported on the members 48 and 49 and are secured by bolts 81 and 83. The blocks 72 and 74 may be made adjustable, as by slots 82 and 84, to permit adjustment of the holding means 62. The blocks 72 and 74 bear against the side of the mounting block 35 for further support and alignment.

The forward block 72 is generally C-shaped, and is fitted with a float 75 in its center position. The float 75 also is C-shaped with the center position large enough to permit the stays to move downwardly from the carton 80 to the depression 53 and be guided thereby. The rear block 74 is similarly constructed with a float 76 in its center portion. With a properly adjusted spacing between the blocks 72 and 74, the carton 80 will be supported on the floats 75 and 76 and the stays will be fed from the bottom of the carton 80. The carton 80 has a cut out side portion for visual inspection of the supply of stays feeding to the slide 47.

The purpose of the floats 75 and 76 which ride on the transfer slide 47 is to provide means for separating one stay from the next in the stack. It has been found that a small amount of play between the floats and the positioning blocks (exaggerated in FIGS. 4, 5 and 8 for clarity) effectively prevents jamming whereas an edge of a stay is more apt to override the edges of the depression 53 as the slide 47 moves forward and backward when a rigid construction is used.

The forward block 72 is shown as extending vertically only a short distance along the side of the carton 80 whereas the rear block 74 extends vertically a substantial distance along the carton 80. The shorter block 72 permits the carton 80 to be replaced easier and faster when the stack of stays has been exhausted. When this construction is used, it is desirable to provide a bracket 88 to hold the upper portion of the carton 80. The bracket 88 may be attached to the mounting block 35 in a suitable manner.

A high frequency generator 150 is mounted adjacent to the work bench 20 and provides a source of current at approximately 100 megacycles. Leads 151 and 152 extend from the generator to the connector 153 on the mounting block 35 and to the lower terminal 44, respectively. A flexible conector 154 extends from the connector 153 to the upper terminal 43. The flexible connector 154 permits movement of the upper terminal 43 through the travel of the piston arm 42.

The upper terminal 43 is formed with fusing tips 63 and 64 of a desired configuration. As shown in FIGS. 6 and 7 the fusing tips 63 and 64 may be cylindrical members depending from the body of the terminal. Extending through the fusing tips 63 and 64 are ducts 65 and 66, respectively, which connect to a duct 67. The duct 67 is connected to a source of vacuum 134 in a well-known manner and for the purpose which will be explained with the operation of the device.

At an intermediate step in the formation of a collar, the collar includes two face plies and a liner ply sewn together in an inverted position by a line of stitching extending along the outer edge of the collar, but not along the edge which is to later attach the collar to the neckband. The operator of the present stay fusing device manually positions one tip of the partially formed collar in its inverted position on to one of the platens, for example platen 28, as seen in FIG. 9. The ply to which the stay is to be fused, for example the back face of the collar, is positioned on the top of the platen 28 and the other face ply and liner ply are positioned at the bottom side of the platen. The platen 28 is shaped to engage the edges 137 and 138 of the collar and thereby position the collar with respect to the terminals 43 and 44.

The operation of the device will now be explained with reference to FIG. 3. Since in the normal rest position of the device a stay is positioned on the fusing tips 63 and 64 of the upper terminal 43, the sequence of operation of the stay fusing device will be described starting at that point in the cycle.

As the operator moves the carriages 25 and 26 along the track 24, the platen 28 moves until it hits a stop. At this point, the platen 28 accurately positions the collar point between the upper terminal 43 and the lower terminal 44. In this position, the platen 28 also engages a limit switch 127. As the stay slide 47 is in a retracted position with the depressions 53 beneath the stack, the limit switch 130 located beneath the slide 47, see FIG. 5, is in a closed position. Therefore, the closing of the limit switch 127 completes a circuit from a source of electrical current 149, and including a normally closed contact on the relay 126, to energize and operate the air solenoid valve 120. The solenoid valve 120 admits high pressure air from the source 133 through a pressure regulating valve 140 to the upper portion of the air cylinder 41. This high pressure air lowers the piston arm 42 and the upper terminal 43. The collar stay positioned on the terminal 43 thus is lowered on to the fabric of the positioned collar. The high pressure air from the source 133, upon building up, additionally operates the pressure relay 132 to energize a relay 148 through the timer 147 to complete a circuit from the source 149 to the high frequency generator 150, and

thereby energize the terminals 43 and 44 for fusing the stay to the fabric.

The pressure relay 132, in operating, breaks a circuit including relay 124 and solenoid valve 122. The release of the solenoid valve 122 shuts the vacuum off from the source 134 to the upper terminal 43 to release the stay. This permits the vacuum relay 131 to assume its normally closed position. The relay 124, upon opening, completes a circuit from the source 149 to energize the solenoid valve 123 providing a vacuum from the source 134 to the ports in the depression 53 to the slide 47.

Upon lapse of the predetermined period of time, the timer 147 breaks the circuit to the relay 148 which in turn disconnects the radio frequency generator 150 to terminate the fusing of the thermoplastic stay to the fabric. The timer 147 further completes a circuit to energize the relay 126 which locks in preventing recycling of the machine until the platen 28 has been moved from between the terminals as indicated by the opening of the limit switch 127. The relay 126, upon operating, breaks the circuit to the solenoid valve 120 which then closes and cuts air off from the source 133 to the cylinder 41 and to the air pressure relay 132. This action raises the upper terminal 43 and reverses the pressure relay 132. The reversal of the relay 132, however, does not actuate relay 124 and solenoid valve 122 immediately because the circuit to the source 149 is not completed at this time, both sides of the relay 124 and solenoid valve 122 being connected to a common wire.

The upper terminal 43 upon rising actuates a limit switch 128 which completes a circuit from the source 149 to energize a relay 125. The relay 125, in turn, completes a circuit from a source 149 to the air solenoid valve 121 actuating the valve 121 shutting off the flow of high pressure air from the source 133 to the return side of the cylinder 57 and venting the return side to atmosphere. A reduced supply of air is supplied from the source 133 to the forward side of the cylinder 57 which causes the piston arm 60 and the slide 47 to move forward. The piston arm 60 carries the slide 47 in its advance to a position such that the stay held in the depression 53 by the vacuum is accurately positioned beneath the upper terminal 43. The slide 57, upon reaching the end of its forward motion, operates a limit switch 129 which completes a circuit from the source 149 to the solenoid valve 122 and relay 124, thereby energizing them and switching the vacuum from the slide 57 to the upper terminal 43. The limit swtich 129 is shown in FIG. 2 mounted on the rear of the mounting block 35. A bracket 93 on the slide 47 operates the limit switch as the slide 47 reaches its forward travel.

With the transfer of the vacuum from the slide 47 to the upper terminal 43, the stay is transferred from the depression 53 to the fusing tips 63 and 64. This transfer is signaled by the vacuum relay 131 which, upon operating, breaks the circuit for the solenoid valve 121. The solenoid valve 121 upon closing permits high pressure air to flow again to the return side of the cylinder 57. The higher pressure on the return side of the cylinder 57 counters the lower pressure on the other side and causes the slide attached to the piston arm 60 to be returned to its retracted position. Unless the vacuum relay 131 signals the transfer of a stay to the upper terminal, the stay slide will not return and will thereby stop the automatic operation until the trouble has been cleared.

As the slide 47 reaches the end of its return travel, it operates the limit switch 130 to return the circuit to its initial condition ready for recycling by the closure of the limit switch 127 as either of the platens 28 or 29 is moved into position between the terminals 43 and 44.

The movement of the carriage 25 or 26 opens switch 127 and breaks the holding circuit to reset the relay 126. The timer 147 is reset by the release of the pressure relay 132.

It will be seen that the present device will automatically and accurately position a collar stay on the upper terminal of a high frequency generator following each fusing cycle. This stay is then accurately fused to the collar fabric which is positioned between the terminals by the operator. Although I have only illustrated one embodiment of my invention, it will be obvious to those skilled in the art that the automatic fusing device herein described and shown may be used for attaching thermoplastic strip stays to other types of garments as well.

I claim:

1. A device for the automatically positioned fusion of a thermoplastic collar stay to a fabric collar comprising a table having a track means connected along one edge thereof, a block mounted on said table and having a laterally extending end spaced above said table, a high frequency electrical source including a first electrode stationarily mounted on said table beneath said laterally extending end of said block and a second electrode mounted on said laterally extending end of said block for reciprocating movement toward and away from said first electrode means for positioning a thermoplastic stay on said second electrode while said electrode is in its raised position, and a platen shaped to receive a collar thereon in an orientated position, said platen being slidably disposed on said track means and adapted to be moved with a collar in position thereon to a predetermined position along said track means to accurately position said collar between said electrodes and relative to the thermoplastic stay in position on said second electrode.

2. The device as claimed in claim 1 wherein individual collar stays are fed to said second electrode on a slide which is slidably mounted in said block and which slide when extended positions a stay below said second electrode for transfer of the stay from the slide to said second electrode responsive to vacuum pressure applied through said second electrode.

3. The device as claimed in claim 1 wherein said platen extends in close proximity above said first electrode and has an electrically conductive insert forming an extension of said first electrode.

4. A device for positioning a thermoplastic stay on a garment part for the subsequent fused attachment of said stay to the garment part comprising an upper electrode and a lower electrode positioned with face portions in opposing relation, the face portion of said upper electrode having a plurality of ports therein, a stack of thermoplastic stays, transfer means having a depression therein for receiving a single thermoplastic stay, motor means attached to said transfer means for moving said transfer means between a first position with said depression beneath said stack for receiving a stay and a second position beneath said upper electrode, a vacuum source operatively connected to the ports in the face portion of said upper electrode and having sufficient suction to lift said stay from said depression and to hold said stay accurately oriented on the face portion of the upper electrode, a platen movable from a first position adjacent the lower electrode to a second position extending over said lower electrode, said platen being shaped to receive a garment part thereon in an orientated position and adapted to be moved with a garment part in position thereon to its said second position to accurately position said garment part between said electrodes and relative to the thermoplastic stay in position on said upper electrode, and motor means for moving said upper electrode downwardly to position said thermoplastic stay onto said garment part.

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