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[54] **RAILWAY SEWING MACHINE**
14 Claims, 7 Drawing Figs.

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[51] Int. Cl. D05b 3/00
[50] Field of Search 112/2,
121.11, 121.14, 121.12, 121.15, 102, 67;
137/625.69

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ABSTRACT: A railway sewing machine having an automatic thread cutoff and automatic carriage return for seaming a fabric clamped adjacent the path of travel by means of a fluid or electrically operated clamping arrangement. A variable speed transmission and controls therefor are provided to enable plural speeds during sewing and a high speed return of the carriage. The fabric clamping arrangement is provided with a semiautomatic cloth tensioning device and the clamping arrangement releases automatically at the end of the seaming operation.

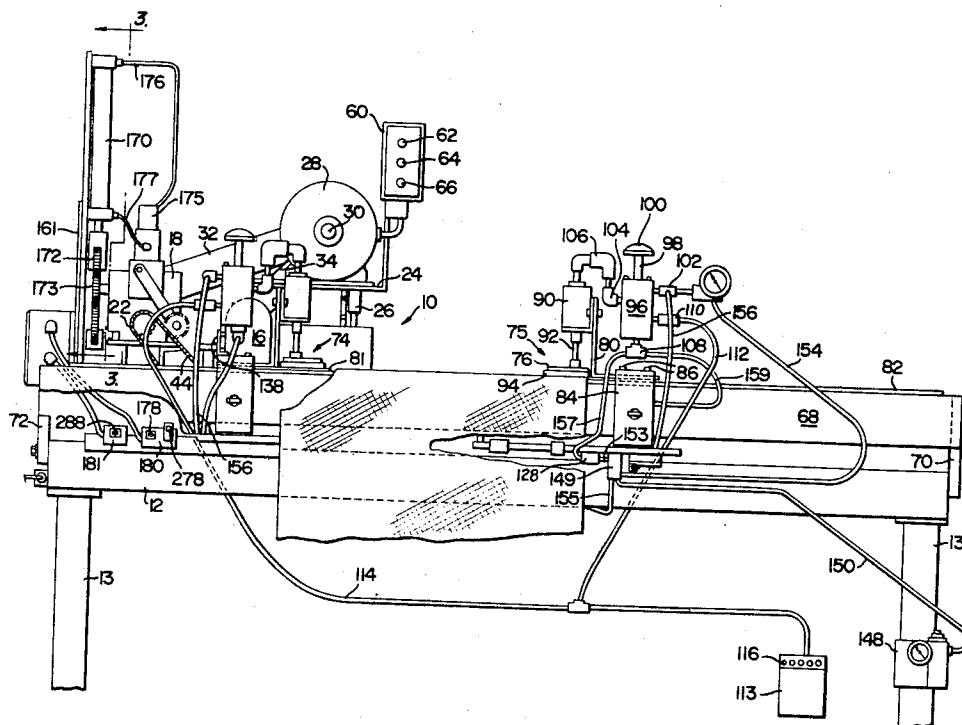
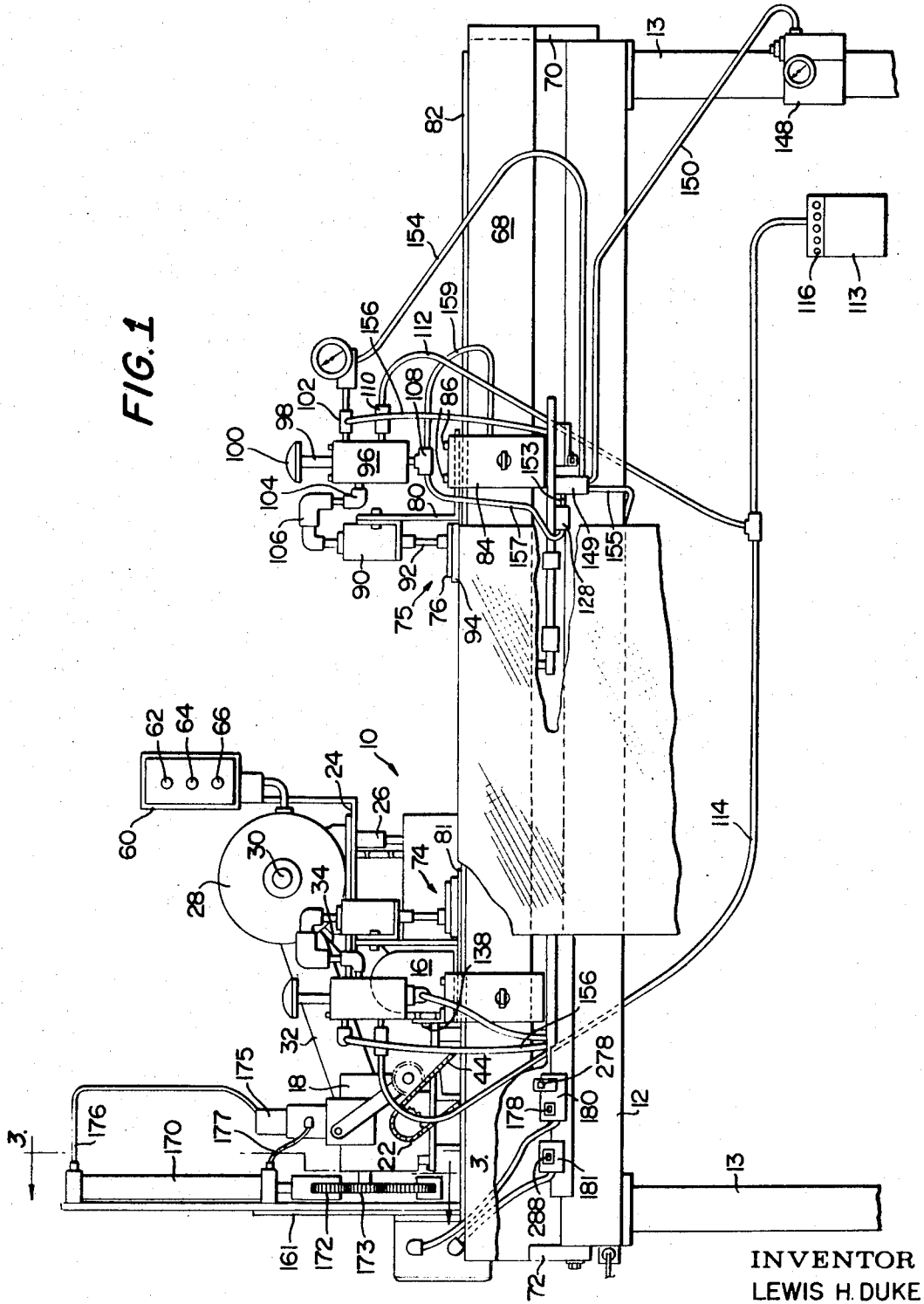
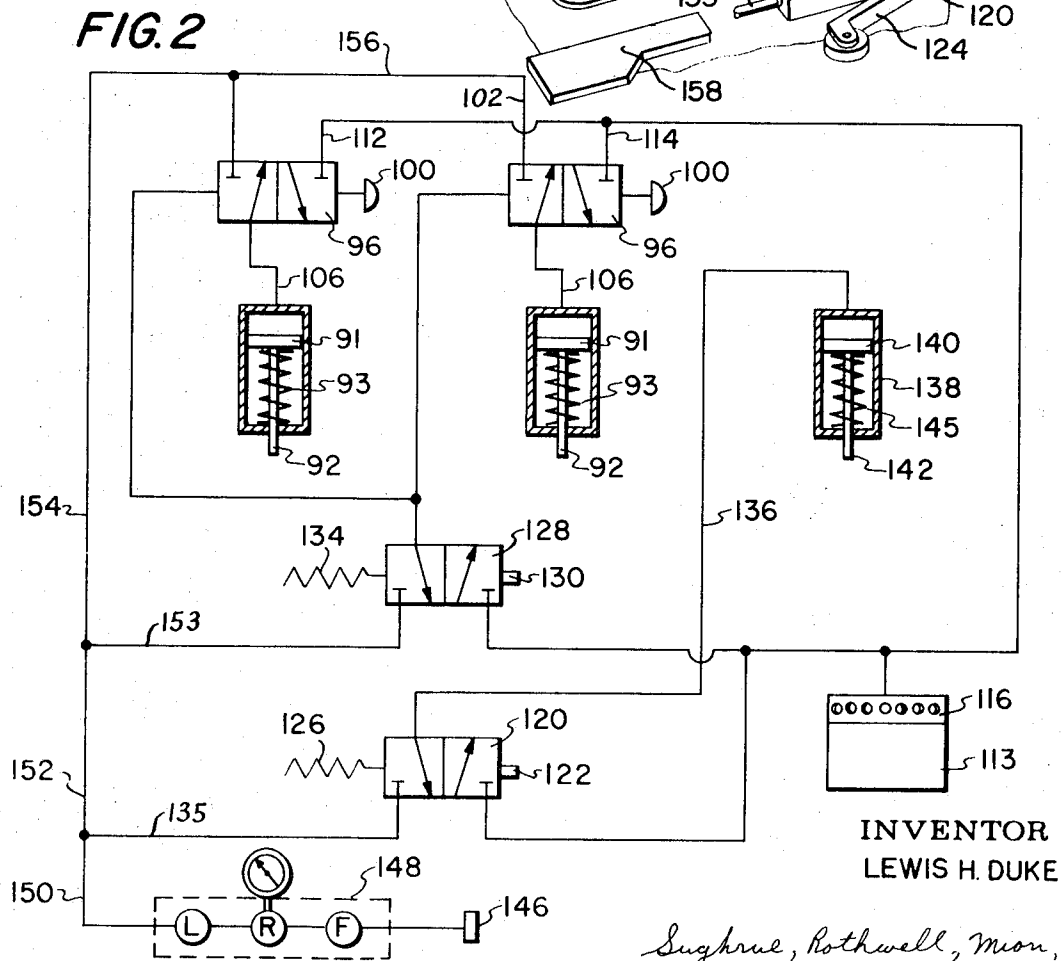
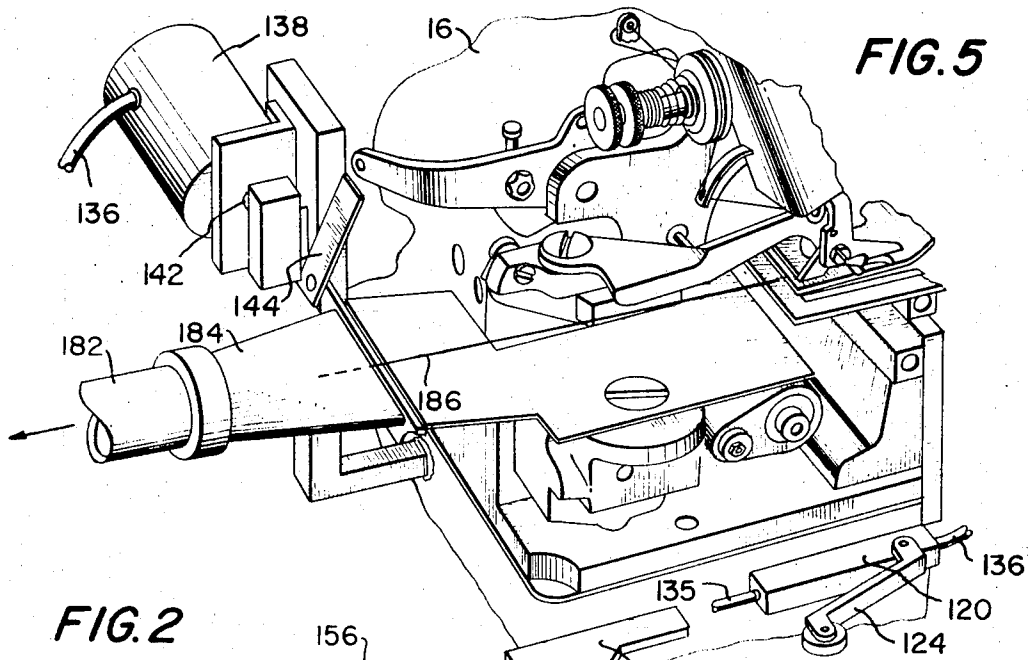


FIG. 1

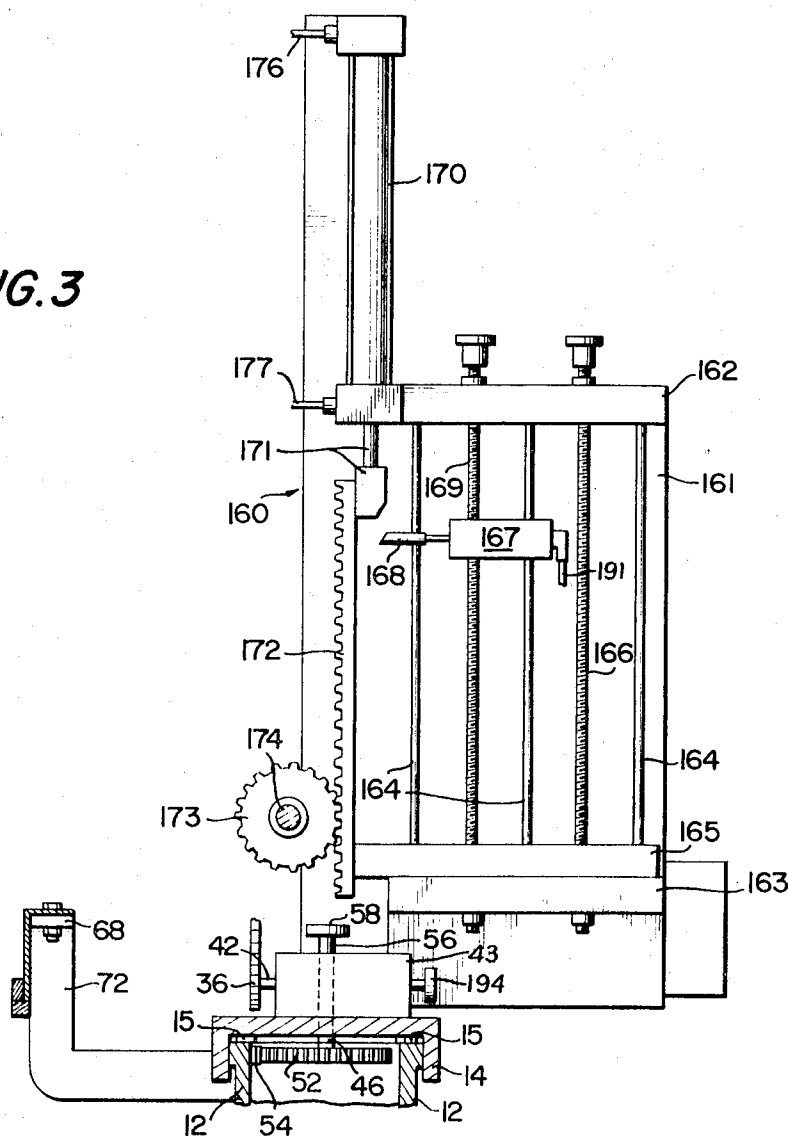


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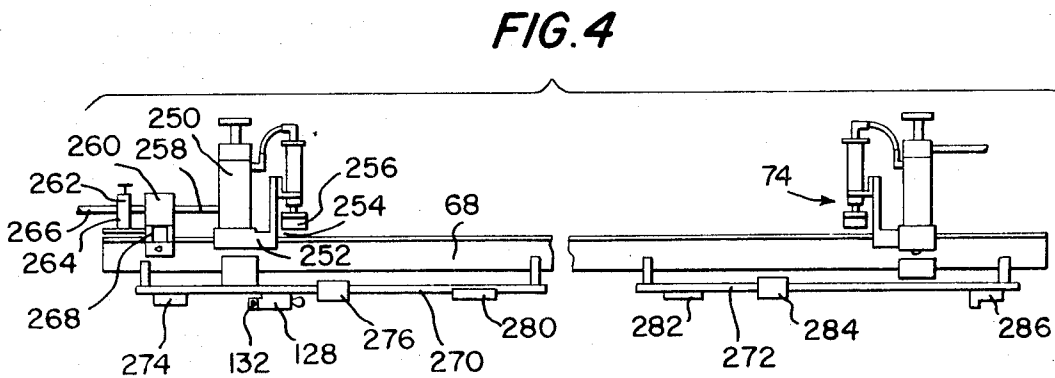
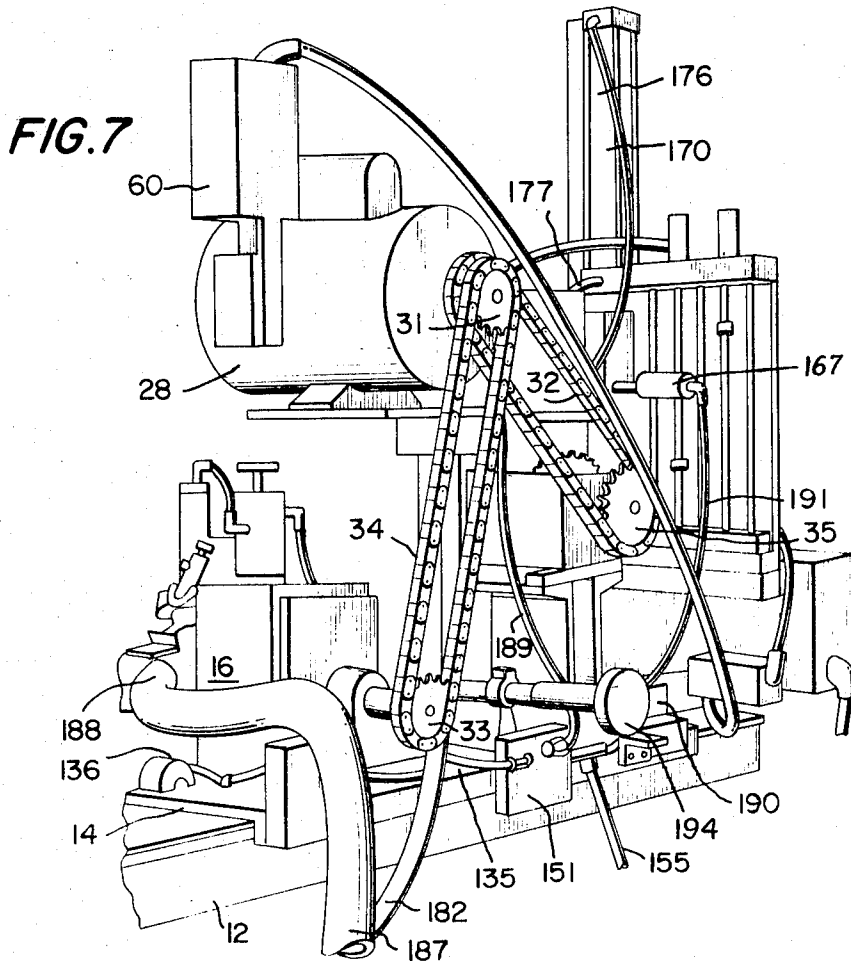
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FIG. 3



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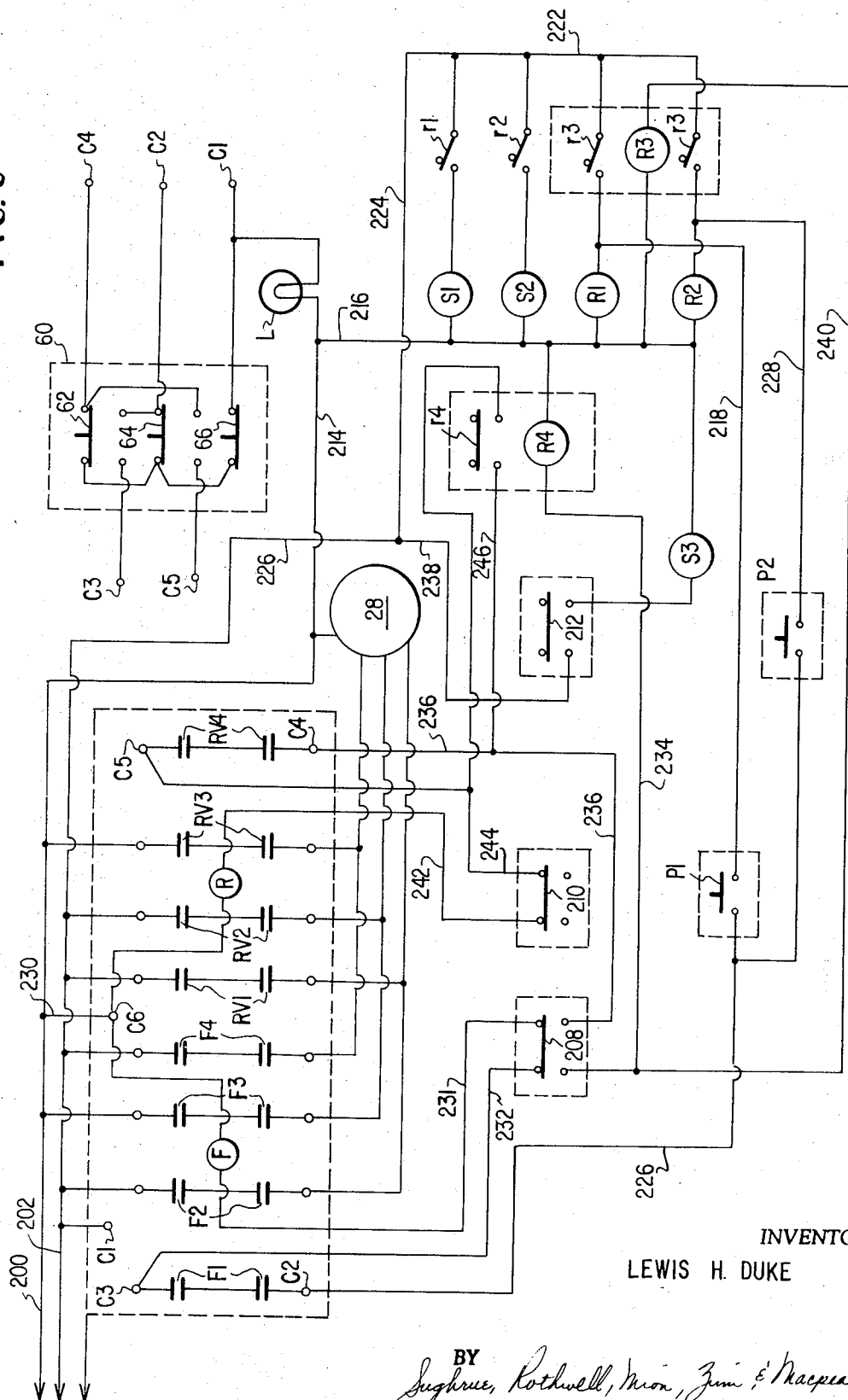
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FIG. 6



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RAILWAY SEWING MACHINE

RELATED APPLICATION

This application is a continuation-in-part of application Ser. No. 615,184, filed Feb. 10, 1967, and now abandoned.

BACKGROUND OF THE INVENTION

In prior art machines of this nature, the fabric was held for seaming by means of a plurality of pins which were either rigidly or movably affixed to the bed of the machine. It was necessary for the operator to impale the fabric upon the pins and such an operation frequently resulted in injuries to the operator's fingers. Those machines having a movable bar with a plurality of pins thereon which would be moved to impale the cloth would sometimes also impale the hand of a careless operator.

The movable carriage as disclosed in prior art machines, usually made only a single traverse of the fabric to be seamed at a constant speed. It was then necessary for the operator to manually cut the thread, manually unclutch the drive mechanism and manually return the carriage to its starting point. Although some later machines were provided with a power-driven return, such return movement was unduly slow and it was still necessary for the operator to initiate the return movement by means of a pushbutton. It was usually necessary to remove the fabric from the pins by means of a separate manual operation.

According to the present invention, a clamping arrangement is provided which is quick, efficient, and safe to the operator. Each clamp of the present invention may be operated individually to enable maximum adjustment of the fabric prior to clamping a particular portion of the fabric and one of the clamps may be movably mounted to enable fabric tensioning subsequent to clamping. Each of the clamps is provided with a soft resilient clamping surface so that even if an operator is careless enough to leave her hands under the clamp, no injury will result due to the resilient clamping surfaces. All of the clamps are automatically and simultaneously released, allowing the fabric to fall away at the end of the seaming operation thereby eliminating many of the time-consuming operations necessary with the prior art machines. Furthermore, each clamp may be individually released in case of emergency or if a repositioning of the fabric becomes necessary.

Also in accordance with the present invention, the drive means for the sewing machine and carriage enable the carriage to be driven from its starting position to an end position at a plurality of speeds while the sewing machine is run at a constant speed to seam the fabric. A cutter is provided to trim the thread at the beginning of the seaming operation and when the machine carriage reaches the end of its traverse. The cutter will automatically be actuated to sever the thread. After a predetermined time delay, during which the clamps are opened to allow the fabric to fall away, the machine will return to its initial position at a high speed. During this time, the operator may be preparing a second piece of fabric to place under the clamps for a subsequent stitching operation, from the start of the sewing cycle.

SUMMARY OF THE INVENTION

A railway sewing machine comprising frame means, carriage means movably mounted on said frame means for traversing movement thereof, sewing means mounted on said carriage, reversible variable speed drive means mounted on said carriage for driving said sewing machine and said carriage along said frame in a forward and reverse direction, control means mounted on said frame and positioned to cooperate with said carriage to automatically vary the traversing speed of the carriage and to cause said drive means to reverse upon reaching a predetermined limit of forward travel, clamping means adjustably mounted on said frame adjacent the path of travel of said carriage, each of said clamping means adapted to

be actuated individually to the clamping position and control means cooperatively mounted on said carriage and on said frame to actuate all of said clamping means to the released position simultaneously.

Other features of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose by way of example, the principles of the invention and the best mode which has been contemplated of applying those principles.

BRIEF DESCRIPTION OF THE DRAWINGS.

FIG. 1 is a front elevational view of the railway sewing machine showing a length of fabric clamped in place thereon;

FIG. 2 is a schematic view of the fluid circuitry associated with the fluid-operating clamps shown in FIG. 1;

FIG. 3 is a side elevational view, partly in section, of the speed control means;

FIG. 4 is a rear elevational view of the clamping rail and limit switch cams with one of the clamps being modified to provide for fabric tensioning;

FIG. 5 is a perspective view of the sewing head and cutter and one of the suction devices associated therewith;

FIG. 6 is the schematic diagram showing the electrical circuitry for operating a modified form of drive means and clamping means; and

FIG. 7 is a perspective rear view of a portion of the railway sewing machine.

DETAILED DESCRIPTION OF THE INVENTION

Turning now to the drawings in detail, the railway sewing machine of the present invention is generally designated by the numeral 10 in FIG. 1. The frame of the machine is comprised of a crossmember 12 which may be supported by any suitable means such as a pair of legs 13 disposed at opposite ends of the crossmember 12. A carriage 14 is mounted for traversing movement along the length of the crossmember 12 and is provided with a plurality of rollers 15 or the like which may roll on the upper surface of the member 12. Mounted directly on the upper surface of the carriage is a sewing machine 16 of any suitable type. Since the details of the operation of the sewing machine are unnecessary for a proper understanding of the present invention, it will not be necessary to set forth a detailed description of the sewing machine and its operation at this time. Also mounted on the upper surface of the carriage 14 is a variable speed transmission 18 for driving the carriage 14 at variable speeds. Since the internal details of the transmission are not critical to the present invention, it is not deemed necessary to go into a detailed operation of same. Also mounted on the carriage 14 is a platform 24 which is mounted upon the carriage 14 by means of support legs 26. A motor 28 is mounted on the upper surface of the platform 24 and is provided with an output shaft 30 having a double sprocket 31 mounted thereon as best shown in FIG. 7. The sewing machine is also provided with an input shaft having a sprocket 33 and a third sprocket 35 is mounted on the input shaft of the transmission 18. The sprocket 31 on the shaft 30 of the motor 28 is operatively connected to the sprocket 35 on the input shaft of the transmission 18 by sprocket chain 32. A second sprocket chain 34 drivingly connects the sprocket 31 on the shaft 30 of motor 28 with the sprocket 33 on the input shaft to the sewing machine 16. The output shaft of the transmission 18 is provided with a sprocket 22 which is connected to sprocket 36 (FIG. 3) on the input shaft 42 of a gear reduction mechanism 43 by means of sprocket chain 44. The output shaft 46 of the gear reduction 43 extends downwardly through the carriage 14. A gear 52 is secured to the lowermost end of the shaft 46 and is in mesh with a rack 54 secured to the cross member 12 of the frame. Thus, when the motor 28 is running, a drive will be imparted to the gear 52 through the transmission 18 and the gear reduction mechanism 43 causing the gear 52 to rotate and move along the rack 54 causing the carriage 14 to traverse the length of the crossmember 12. The drive

from the gear reduction mechanism 43 to the gear 52 may be interrupted by any suitable coupling mechanism 56 which may be operated by the hand wheel 58. The carriage 14 may be indexed manually by means of the hand wheel 194 which is secured to the input shaft 42 of the gear reduction mechanism 43. The motor 28 is provided with a control box 60 having a forward button 62, a reverse button 64 and a stop button 66.

Turning now to the fabric clamping mechanism, an elongated fabric supporting bar 68 extends parallel to the crossmember 12 but is spaced upwardly and outwardly from the crossmember 12 by means of end brackets 70 and 72. This enables the portion of the carriage carrying the controlling limit switches, cams and valves to extend under the bar 68 for cooperation with suitably located valves and cam abutments extending from bar 68, as will be more fully explained hereinafter. According to the embodiment of the invention shown in FIG. 1, a pair of clamping devices, generally designated as 74 and 75, are adjustably mounted on the bar 68. It is to be understood, however, that any number of clamping devices could be secured to the bar 68 or that a single elongated clamping member could be secured between the two clamping devices 74 and 75 to provide a clamping force across the entire width of the fabric 63.

Since each of the clamping devices is substantially identical, only clamping device 75 will be described in detail at this time. An L-shaped support bracket 80 having a fabric support plate 81 secured to the horizontal leg thereof rests on the upper surface of the bar 68 and may be provided with a suitable friction surface on the underside thereof to cooperate with the roughened friction surface 82 on the top of the bar 68. The upper surface of the fabric support plate 81 may also be provided with a roughened friction surface similar to 82. The horizontal leg of the support bracket 80 extends under a U-shaped attaching bracket 84 and is bolted thereto by means of bolts 86. The attaching bracket 84 is held at any desired adjusted position by means of a thumbscrew 88 mounted in one side thereof. The thumbscrew is adapted to bear against the side of the bar 68 to draw the clamping bracket tightly against the bar 68 to hold it in adjusted operating position. A cylinder 90 is secured to the vertical leg of the support bracket 80 and is provided with a spring-loaded piston 91 (FIG. 2) to which the piston rod 92 is attached. The clamp 76 is secured to the lower end of the piston rod 92 by any suitable means and the undersurface of the clamp 76 is provided with a soft resilient pad 94 of sponge rubber or other suitable material which will provide the necessary friction characteristics as well as a cushion to protect the fingers and hand of the operator. A three-way valve 96 is mounted on the opposite side of the vertical portion of the supporting bracket 80. A valve control rod 98 extends upwardly from the valve body and is provided with a hand-operated knob or mushroom button 100. The button 100 may be located at a remote location, such as under the table for knee operation and connected to rod 98 by any suitable means, such as a Bowden cable. The valve body 96 is provided with a fluid input fitting 102 which is adapted to be placed in fluid communication with the fluid output fitting 104 when the pushbutton 100 is depressed. When the button 100 is depressed, the fluid under pressure will, therefore, flow from the input fitting 102 through the valve body 96 to the output fitting 104 and then through the connecting conduit 106 to the cylinder 90 to actuate the clamp 76 to the clamped position. A second fluid input fitting 108 is secured to the bottom of the valve body 96 and when fluid under pressure enters through the input fitting 108 the depressed valve control rod 98 will be shifted upwardly to shut off the flow of fluid under pressure to the cylinder 90. As the spring 93 (FIG. 2) within the cylinder 90 returns the piston thereby lifting the clamp 76 from the fabric, the fluid within the cylinder 90 will be expelled through the conduit 106 and the valve body 96 to the output fitting 110. The fluid outlet line 112 which is connected to the fitting 110 connects with a similar outlet line 114 from the other clamping device and leads to a combination sump 113 and exhaust device 116. When air is used as the fluid for actuating

the clamping arrangements it is often necessary to lubricate the air and if the air from the operating cylinders 90 were to exhaust in the area of the fabric it is possible that the fabric would become soiled and spotted. For this reason, the exhaust air is lead to a remote sump 113 and exhaust device 116 which may be mounted on the legs 13 or any other suitable remote support. A cam support rail extends below and parallel to the fabric support bar 68 adjacent clamping device 75. A second valve 128 is mounted on the cam support rail 270 (FIG. 4) and is provided with a plunger 130 adapted to be operated in one direction by a cam 158 on the carriage 14 contacting the lever 132 and moved in the opposite direction by means of the spring 134.

A control valve 120 for controlling the operation of the cutter 144 is mounted on the underside of the movable carriage 14 with the operating lever 124 disposed in the path of a pair of cams mounted beneath the fabric supporting bar 68. The two control cams are disposed for actuating the cutter at the beginning and the end of the sewing operation to cut off leading and trailing ends of the thread immediately adjacent the edges of the fabric piece being seamed. Line 135 leads from the distributor 151 (FIG. 7) to valve 120 and line 136 leads from the valve 120 to a cylinder 138 having a piston 140 therein. The piston 140 is provided with a piston rod 142 which is adapted to contact and operate the pivoted cutter 144 secured to the side of the sewing machine. A spring 145 is provided to return the piston 140 or in the alternative a return spring (not shown) may be secured between the sewing machine and the cutter to return the piston 140 to its initial position.

The operation of the fluid-operated clamps as shown in FIGS. 1 and 2 and described above, will now be set forth in sequence. A source of pressurized air 146 may be secured to the fitting 148 which may include a filter F, a regulator R and lubricator L and air under pressure is then directed to a four-way distributor 149 through the flexible conduit 150. The input side of the control valve 128, the input fitting 102 for the three-way valve 96 of the right-hand clamping arrangement as viewed in FIG. 1 and the distributor 151 are connected to the distributor 149 by means of conduits 153, 154 and 155, respectively. The input side 102 of the right-hand three-way valve 96 is connected to the input side of the left-hand three-way valve 96 by means of the flexible conduit 156. Thus, upon depression of the left-hand pushbutton 100 the fluid pressure will be applied through the three-way valve to the cylinder 90 to actuate the piston 91 to move the clamp 76 into clamping position after the fabric has been properly adjusted thereunder. When the fabric has been properly adjusted under the second or right-hand clamp, the button 100 associated therewith may be depressed to admit pressurized fluid to the cylinder 90 to move the second clamp into clamping position.

When the carriage 14 reaches the end of travel from left to right as viewed in FIG. 1, cam 158 secured to the carriage 14 will contact arm 132 to depress plunger 130 of control valve 128. Fluid under pressure will then be allowed to pass through flexible conduits 157 and 159 to shift each of the depressed control rods 98 upwardly to shut off the flow of fluid under pressure to the cylinders 90. The springs 93 within each cylinder 90 will shift the piston in each cylinder and simultaneously lift both clamps from the fabric allowing the fabric to fall away.

FIG. 4 is a rear view of the clamping bar 68 shown in FIG. 1. The left-hand clamping member as viewed in FIG. 4 has been modified to the extent that the clamping member is movably mounted to tension the fabric properly after it has been clamped. The control valve 250 is identical to the valve 96 in FIG. 1 but is mounted directly on the saddle member 252 which is slidably disposed on the upper surface of the fabric support bar 68. A fabric support plate 254 extends from the saddle member 252 under the movable clamping member 256. An air cylinder 260 having a movable piston therein is mounted on bracket 268 which in turn is adjustably secured to bar 68. A control valve 264 having a push button 262 is also

mounted on bracket 268 to control the flow of fluid under pressure through line 266 to the air cylinder 260. A piston extension 258 is connected to the valve 250. The piston in cylinder 260 is so arranged that upon the application of fluid pressure thereto, the entire saddle assembly will move to the left as viewed in FIG. 4 thereby tensioning the fabric clamped by the two clamping devices.

Also shown in FIG. 4 are cam rails 270 and 272 which are disposed below and parallel to the bar 68. On rail 270 cam 274 is adapted to engage arm 124 of thread cutter control valve 120, cam 276 is adapted to operate limit switch arm 278 on control box 180 to stop the forward movement of the carriage 14 and energize a time delay relay and cam 280 is adapted to operate speed control switch arm 178 which is also mounted on control box 180. On rail 272, cam 282 is adapted to engage arm 124 of thread cutter control valve 120, cam 284 is adapted to contact speed contact switch arm 178 and cam 286 is adapted to contact reverse stop limit switch arm 288 on control box 181.

The control means for controlling the variable speed transmission 43 are generally designated by the numeral 160 in FIG. 3. A support plate 161 is rigidly mounted on the upper surface of the carriage 14 and a pair of parallel laterally extending flanges 162 and 163 are mounted on one side of the support plate 161. A plurality of guide rods 164 extend between the flanges 162. A lower limit bar 165 is slidably mounted on the guide rods 164 and is disposed in threaded engagement with the adjusting rod 166 which is rotatably mounted in the upper and lower flanges 162 and 163. By rotating the control rod 166, the lower limit bar may be raised or lowered to any predetermined position. An air cylinder 167 having a movable piston 168 is provided with a pair of brackets (not shown), one of which is threadably engaged with adjustable control rod 169 which is journaled for rotation in the upper and lower flanges 162 and 163. The other bracket is slidably disposed with the middle guide rod 164 to properly support and prevent rotation of the air cylinder 167 with the control rod 169. A speed control air cylinder 170 is mounted on the upper surface of the flange 162 and is provided with a piston 171 extending downwardly therefrom. A gear rack 172 is secured to the lower end of the piston 171 and is disposed in meshing engagement with the gear 173 secured to the control shaft 174 of the variable speed transmission 18.

The upper and lower ends of the speed control air cylinder 170 are connected to a four-way solenoid controlled valve 175 by means of air hoses 176 and 177. In this manner, when the air valve 175 is operated to connect the hose 176 to a source of pressure, the piston 171 will be moved downwardly as viewed in FIG. 3 to rotate the control shaft 174 of the variable speed transmission 18 so as to progressively adjust the transmission for a slower output speed. The piston 171 will move downwardly until it abuts against the lower limit bar 165 in its adjusted position. When the piston 171 is in contact with the lower limit bar 165, the carriage 14 will traverse along the length of the cross members 12 at a slow speed.

As mentioned previously, the conduit 155 supplies fluid under pressure from the distributor 149 (FIG. 1) to the distributor 151 (FIG. 7). From distributor 151 the fluid under pressure is directed to cutter control valve 120 through conduit 135 and to the four-way solenoid controlled valve 175 through conduit 189. A branch of conduit 155 adjacent the distributor 151 leads to solenoid controlled valve 190. Conduit 191 leads from the valve 190 to air cylinder 167.

Ordinarily, the piston 168 of the air cylinder 167 will be in its retracted position, allowing the free movement of the piston 171 in its up and down path. However, if air under pressure is applied to the cylinder 167, the piston 168 will be extended into the path of the piston 171 to provide an intermediate speed position for the rack 172 and thereby the carriage 14 will be driven at an intermediate speed. When air under pressure is supplied through the hose 177, the piston 171 will be moved upwardly and if the piston 168 is retracted, the piston 171 will move upwardly into engagement with the

upper flange 162 which acts as an upper speed control limit. Thus, when the piston 171 engages the flanges 162, the transmission 18 will be adjusted to operate at its fastest speed.

In the operation of the machine of the present invention, it is desirable to place a larger number of stitches adjacent the edges of the fabric pieces being seamed and a lesser number of stitches intermediate the edges of the fabric. Since the sewing machine 16 is driven at a constant speed, the variable number of stitches is achieved by varying the speed at which the carriage 14 traverses along the length of the cross member 12. It is also desirable to reverse the movement of the carriage 14 to its initial starting position at the left as viewed in FIG. 1 at the fastest possible speed which is higher than the fastest speed desired during the stitching traverse.

Furthermore, the sewing machine 16 utilized to perform the stitching is a chain stitch machine which simultaneously joins together the superimposed fabric edges and trims the edges. A chain of previously formed stitches will form a tail at the leading edge or left side of the cloth as viewed in FIG. 1 and as the seaming operation is completed, a tail of stitches will be formed at the trailing edge on the right side of the cloth as viewed in FIG. 1. Thus, it is necessary to operate the cutter 144 closely adjacent the leading and trailing edges of the cloth to sever the tails of stitches to prevent these tails from being wound up with the cloth, causing the same to wrinkle and wind up in an uneven manner.

A vacuum tank (not shown) is provided for collecting the stitched tails and the trimmings from the edges of the pieces of fabric being seamed together. A first hose 182 (FIG. 5) is connected to the tank and is provided with a nozzle 184. The nozzle 184 is mounted on the carriage 14 immediately adjacent cutting blade 144. The air being pulled into the nozzle 184 pulls the tail of stitches represented schematically at 186 into the nozzle thereby straightening the chain of stitches 186 to facilitate accurate cutting thereof closely adjacent the edge of the cloth at the leading edge. A second hose 187 is provided with a nozzle 188 mounted on the head 16 adjacent to and below the stitching and trimming zone whereby the trimmings will be sucked into the nozzle 188.

A complete cycle of operation will now be described. The goods are positioned between the fabric clamp 76 and the plate 81 of left-hand clamp assembly 74 in FIG. 1. The button 100 is then actuated and the cloth is clamped in position. If it is desired to reposition the cloth for any reason whatsoever, it is only necessary to pull button 100 upwardly and the clamp 176 will accordingly be raised. The goods are then positioned under the right-hand clamp assembly in FIG. 1 and clamped in the same manner. The right-hand clamp assembly may be provided with an automatic tensioning arrangement as shown and described in FIG. 4. With such an arrangement, once the fabric has been clamped between the clamp 256 and the slidable plate 254, the button 262 is depressed to allow air into the cylinder 260 which will cause the entire clamping assembly to be shifted away from clamp assembly 74 to place the fabric under tension. The amount of tension can be regulated by regulating the air pressure supply to the air cylinder 260.

Once the fabric has been clamped in the proper position, the sewing head with the needle in the raised position is then introduced to the goods. The entire carriage 14 including the sewing head 16 may be indexed manually into the proper position at the left-hand starting edge of the goods by rotating the hand wheel 194 which is secured to the input shaft 42 of the gear reduction 43. With the sewing head 16 properly positioned with respect to the goods, a speed control switch arm 178 is actuated by cam 284 thereby energizing the four-way solenoid controlled valve 175 thereby supplying air through conduit 176 to the upper end of the speed control cylinder 170. Since the limit stop 168 is normally in the retracted position, the piston 171 will be shifted downwardly a predetermined stroke until it makes contact with the lower limit stop 165. Since the rack 172, which is attached to the piston 171, is in mesh with the gear 173 mounted on shaft 174 of the variable speed transmission 18, the gear 173 will rotate to ad-

just the transmission so that it will operate at a relatively low speed. The friction clutch hand wheel 58 is then tightened and the pushbutton 62 is depressed to initiate forward operation of the carriage. Upon pushing button 62 solenoid controlled valve 190 is also energized admitting air under pressure to cylinder 167 through conduit 191 thereby extending the piston 168 into the path of the piston head 171. The piston 168 will stay in the projected position throughout the entire forward travel portion of the cycle and at the end of forward travel will be deenergized and retracted into its normal position. Pushbutton 62 also energizes the vacuum tank to apply a suction at nozzles 188 and 184. The motor 28 is also energized and rotates the input sprocket 35 of the variable speed transmission 18 by means of the sprocket chain 32. The output sprocket 22 of the variable speed transmission then drives the input sprocket 36 of the gear reduction 43 through sprocket chain 44. The output shaft 46 of the gear reduction rotates the gear 52 which meshes with the rack 54 on the frame 12 thereby causing the carriage 14 to begin its traverse at a relatively slow speed. The motor 28 is also driving the sewing head 16 by means of sprocket chain 34 extending between the sprocket 31 and the sprocket 33.

Thus, the stitching cycle begins for a predetermined distance after which the control arm 124 of the thread cutter control valve 120 comes in contact with the thread cutter cam 282 allowing air to flow through the valve 120 into the thread cutter air cylinder 138. The piston 142 will be extended thereby pivoting the cutter 144 downwardly to cut the chain of stitches 186 closely adjacent the edge of the fabric. The excess thread will be drawn into the thread-collecting nozzle 184. Throughout the entire forward movement, the trimmings from the fabric goods are drawn into the trimming collecting suction nozzle 188.

When the speed control lever switch arm 178 rides off the cam 284 the solenoid operated valve 175 will be actuated to reroute the air to the speed control cylinder 170 through the conduit 177 thereby shifting the piston head 171 upwardly until it comes into contact with the extended piston 168. The variable speed transmission 18 will be adjusted accordingly by means of a connection between the rack 172 and gear 173 and the carriage will now traverse in the forward direction at a relatively higher speed. Since the carriage is now travelling at a higher speed and the sewing machine is operating at a constant speed throughout, a fewer number of stitches per inch will be placed in the fabric. The carriage proceeds at the relatively higher speed until the speed control lever switch arm 178 rides up on the cam 280 thereby activating the solenoid controlled valve 175 to shift the air under pressure from the conduit 177 to the conduit 176 thereby moving the piston head 172 downwardly until it engages the lower limit stop 165. As before, the carriage will now traverse at a slower speed and a larger number of stitches per inch will be placed in the fabric. The carriage will continue its advance for a short distance at the slow speed until such time as the arm 124 of the thread cutter control valve 120 is actuated by the cam 274 to energize the cutter 144 and cut off the chain of stitches closely adjacent the trailing edge of the fabric. Immediately after energization of the cutter, the limit switch arm 278 comes in contact with the cam 276 stopping the forward motion of the carriage, shutting off the sewing machine, deenergizing solenoid controlled valve 190 to allow the piston 168 to retract and energizing a time delay relay. Simultaneously, with the operation of the limit switch arm 278, the cam 158 on the carriage 14 will actuate the arm 132 of control valve 128 to simultaneously release both clamps and since the chain of stitches has already been cut, the fabric will fall away from the clamps as they are opened.

After a predetermined time delay, the time relay will operate to automatically reverse motor 28 to drive the carriage 14 in reverse. Since the speed control lever switch arm 178 is still in contact with the cam 280, the carriage will begin its traverse in the reverse direction at the slow speed. However, as soon as the arm 178 rides off the cam 280, the sole-

noid controlled valve 175 will operate to direct the air under pressure through the conduit 177 to shift the piston head 171 upwardly. Since the piston 168 is retracted, the piston head 171 will move all the way up into engagement with the limit stop 162 and the variable speed transmission 18 will be adjusted to run at the highest possible speed. Thus, the carriage will traverse in the reverse direction at a high speed until such time as the lever arm 178 rides up on the cam 284 to change the ratio of the variable speed transmission and slow the traversing movement of the carriage down. The carriage will then traverse at a slow speed until the limit switch 288 engages the cam 286 to shut off the power to the motor 28. During this reverse movement of the carriage, the sewing machine will not be activated due to the presence of a one-way clutch assembly (not shown) between the input sprocket 33 and the drive shaft of the sewing machine.

Although the embodiment of the clamping arrangements shown in FIGS. 1 and 4 are directed to pneumatically operated clamping devices, it is readily apparent that with slight modifications a hydraulic system could be used with equal facility.

A modified form of the invention and the controls therefor is shown schematically in FIG. 6. In this modification, the variable speed transmission is not utilized and the drive for the carriage 14 is directly from the motor to the speed reduction mechanism 43. Thus, the machine is only arranged for sewing at one forward speed and an automatic reversing arrangement in the circuitry is provided.

According to this further modification of the present invention, the power cylinders 90 and 138 could be replaced by manually depressed clamps which may be latched in the clamping position by detent means and released by means of solenoids. The motive means for operating the cutter may also be a solenoid. FIG. 6 is a schematic circuit diagram for such a modification and also shows the circuitry involved for providing an automatic reverse of the electric motor to return the carriage to its starting point following a stitching operation. The solenoid released clamps would be mounted on the support bracket 80 in the same manner in which the power cylinders 90 are mounted in FIG. 1. The pushbuttons P1 and P2 may be mounted adjacent the solenoids similar to the manner in which the pushbuttons 100 are mounted with respect to the power cylinders 90 or may be mounted in a remote location, such as under the frame for knee operation.

The power for operating the motor 28 is supplied on lines 200 and 202 which may be on the same cable with the ground wire 204. The forward relay F and reverse relay R may be physically enclosed in a unit designated by the numeral 206 and shown in dotted lines in FIG. 6. The connection points C1, C2, C3, C4 and C5 in the unit 206 are directly connected to the respectively labeled connection points of the control panel 60 by means of a cable (not shown). The limit switches for controlling the forward and reverse movement of the carriage, the operation of the cutter and the release of the clamps are designated as 208, 210 and 212. The solenoids for releasing the clamps are designated as S1 and S2 and the solenoid for actuating the cutter is designated as S3. The limit switch 208 may be mounted on the bar 68 adjacent the right side of the fabric piece as viewed in FIG. 1 and a limit switch 210 may be mounted on the same bar adjacent the left edge of the fabric. It is also possible to mount the limit switches on the carriage 14 and have the switches cooperate with abutments placed on the bar 68. The limit switch 212 may be mounted on the carriage 14 to cooperate with abutments on the bar 68 adjacent both edges of the cloth so that a cutting of the chain of stitches may take place at both edges of the fabric. All of the above-mentioned limit switches and abutments may be adjustably secured to either the carriage or the fabric-supporting bar so that the timing of the various operations may be varied in accordance with the width of the piece of cloth being stitched.

With the carriage 14 disposed in the position shown in FIG. 1, the operator would position the cloth under the left-hand clamp and depress the plunger which would then be held

depressed by a detent latch mechanism. If it is necessary to raise the clamp individually to reposition the cloth or because of an emergency, the operator would close switch P1 to complete the following circuit; line 200, line 214, line 216, relay 1, line 218, switch P1, line 220, connecting point C2, switch 64, switch 66, connecting point C1 and line 202. Energization of the relay R1 would close the relay contact r1 to complete the circuit to the solenoid S1 as follows; line 200, line 214, line 216, solenoid S1, switch r1, line 222, line 224, line 226 and line 202. The operator may then position the other edge of the fabric under the clamp which is releasable by the solenoid S2 and manually depress the clamp. Upon depression of the switch P2, the following circuit will be provided for the energization of relay R2 and subsequent release of the clamp; line 200, line 214, line 216, relay R2, line 228, switch P2, line 220, connecting point C2, switch 64, switch 66, connecting point C1 and line 202. Energization of the relay R2 will close the switch r2 to complete the circuit through the solenoid S2 similar to the circuit described above for S1.

With the fabric clamped into position, the operator may then push the forward button 62 of the control box 60 to close the circuit between C2 and C3 and complete the following circuit; line 200, line 230, connecting point 6, forward relay F, line 231, limit switch 208, line 232, connecting point C3, switch 62, switch 64, switch 66, connecting point C1 and line 202. Energization of the forward relay F closes the contacts F1, F2, F3 and F4 to drive the motor 28 in the forward direction with the contacts F1 providing a holding circuit between C3 and C2 so that the switch 62 may be released. The carriage will then be driven along the support bar 12 and the sewing machine will stitch the edge of the fabric pieces clamped in the solenoid releasable clamps. When the carriage reaches the limit switch 208, the circuit to the forward relay will be open thereby opening the contacts F1, F2, F3 and F4 to stop the motor and consequently the movement of the carriage along the support bar. The limit switch 208 will now move to the other position to complete the circuit through the time delay relay R4 as follows; line 200, line 214, line 216, relay R4, line 234, limit switch 208, line 236, connecting point C4, switch 62, switch 66, connecting point C1 and line 202. The contact r4 of relay R4 will not close immediately to provide the necessary time for the cutting operation and the lifting of the clamps prior to the return of the carriage. The relay 212 is operated simultaneously with the relay 208 and completes a circuit to the cutter solenoid S3 as follows; line 200, line 214, line 216, solenoid S3, limit switch 212, line 238, line 226 and line 202. The shifting of the limit switch 208 also completes the circuit to the relay R3 as follows; line 200, line 214, line 216, relay R3, line 240, limit switch 208, line 236, connecting point C4, switch 62, switch 66, connecting point C1 and line 202. Energization of relay R3 closes the contacts r3 to energize relays R1, R2 which in turn closes contacts r1 and r2 and energizes the solenoids S1 and S2 which release the clamps from their clamped position thereby allowing the fabric to fall away. Since the operation of the cutter and the raising of the clamps takes only a few seconds, it is only necessary to provide a two or three second time delay on the relay R4. After this period of time, the contacts r4 will close to complete the following circuit to the reverse relay R; line 200, line 230, connecting point C6, reverse relay R, line 242, limit switch 210, line 244, contact r4, line 246, line 236, connecting point C4, switch 2, switch 66, connecting point C1 and line 202. Energization of the reverse relay R closes the contacts Rv1, Rv2, Rv3 and Rv4 to energize the motor 28 for rotation in the opposite direction with the contacts Rv4 providing a holding circuit bypassing the contact r4 of the relay R4. The carriage will then traverse along the support bar 12 in the opposite direction until the carriage contacts and operates the limit switch 210 to open the circuit to the relay R and discontinues the movement of the carriage. The motor 28 may be connected to the sewing machine through a one-way drive connection so that during the reverse movement of the carriage the sewing machine will not be energized. A signal lamp

L is also provided to indicate when power is on for the system and is energized through the following circuit; line 200, motor 28, line 214, lamp L, connecting point 1 and line 202.

If desired, a two-speed solenoid operated transmission could be provided for operation in conjunction with the gear reduction mechanism 43 and would be arranged with respect to the gear reduction mechanism in the same manner in which the variable speed transmission is located with respect to the gear reduction mechanism 43. The solenoid would be operated by a limit switch and an elongated abutment on the fabric support bar which would extend substantially but less than the entire width of the fabric to be stitched. When the solenoid is deenergized the gear box will drive the carriage along the track at a reduced speed so that a large number of stitches will be placed in the fabric adjacent the salvage ends thereof. When the limit switch actuates the solenoid the gear box will drive the carriage at a higher speed thereby providing a fewer number of stitches per inch through the middle portion of the fabric. As the limit switch rides off the abutment near the far end of the fabric the solenoid operated clutch will become disengaged and the machine will place an increased number of stitches adjacent the salvage edge.

Obviously, many modifications and variations of the present invention are possible in the light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

I claim:

1. A railway sewing machine comprising frame means, carriage means movably mounted on said frame means, sewing means mounted on said carriage, drive means mounted on said carriage for driving said sewing means and moving said carriage means relative to said frame means at a plurality of different speeds, fluid-operated clamping means comprised of a plurality of clamping units adjustably mounted on said frame adjacent the path of travel of said carriage for holding a workpiece in position for sewing by said sewing means and control valve means including a manually operable member associated with each of said units to control clamping and releasing of each unit individually and automatically operable means for operating said control valve means to release said clamping means simultaneously.

2. A railway sewing machine as set forth in claim 1 wherein each of said clamping units includes bracket means for adjustably mounting said units on said frame and having a sliding cloth-supporting plate secured thereto, power cylinder means having a piston movable therein secured to said bracket means, a clamping member secured to said piston and positioned with respect to said plate to clamp a workpiece therebetween, and control valve means for controlling the movement of said clamping member to and from clamping position.

3. A railway sewing machine as set forth in claim 2 wherein each of said clamping members is provided with resilient pad means secured to the workpiece engaging surface and said plate is provided with a friction surface to assist in holding the workpiece between said clamping member and said plate.

4. A railway sewing machine as set forth in claim 2 further comprising power-operated tensioning means mounted on said frame adjacent at least one of said clamping units, means connecting said tensioning means to said one unit for moving relative to the other of said clamping units to tension the cloth workpiece clamped thereby.

5. A railway sewing machine as set forth in claim 2 further comprising limit valve means secured to said frame in the path of movement of said carriage means, connecting means between said limit valve means and each of said control valve means whereby upon actuation of said limit valve means fluid pressure may be applied to each of said control valve means to shift each of said control valve means to a position for enabling said clamping members to be shifted from clamping position simultaneously.

6. A railway sewing machine as set forth in claim 1 wherein each of said units is comprised of bracket means for adjustably mounting said units on said frame and having a sliding cloth-supporting plate secured thereto, solenoid controlled clamping means secured to said bracket means, power supply means, manually operable switch means for operating said solenoid controlled clamping means individually and limit switch means adapted to be operated by said movable carriage to control said solenoid-controlled clamping means simultaneously.

7. A railway sewing machine as set forth in claim 1 further comprising thread-cutting means secured to said sewing means, power means for actuating said cutter means and limit means adapted to be actuated by said movable carriage means to control the actuation of said power means near the beginning and end of movement of said carriage to cut off leading and trailing threads closely adjacent the edges of the workpiece.

8. A railway sewing machine as set forth in claim 7 wherein said power means is a solenoid having an armature adapted to engage said cutter means and said limit means is an electric switch for energizing said solenoid.

9. A railway sewing machine as set forth in claim 7 wherein said power means is comprised of a piston and cylinder arrangement and said limit means is a valve operated by the movement of said carriage to control the movement of said piston.

10. A railway sewing machine as set forth in claim 1 wherein said drive means includes a variable speed transmission having a rotatable speed control shaft extending therefrom and control means having a plurality of adjustable limit stop means for rotating said control shaft to vary the speed ratio of said transmission.

11. A railway sewing machine comprising frame means, carriage means movably mounted on said frame means, sewing means mounted on said AC carriage, drive means mounted on said carriage for driving said sewing means and moving said carriage means relative to said frame means at a plurality of different speeds, clamping means adjustably mounted on said frame adjacent the path of travel of said carriage, for holding a workpiece in position for sewing by said sewing means and

control means manually operable to control clamping by said clamping means and automatically operable to release said clamping means, said drive means including a variable speed transmission having a rotatable speed control shaft extending therefrom and control means having a plurality of adjustable limit stop means for rotating said control shaft to vary the speed ratio of said transmission, wherein said control means is comprised of a reciprocable gear rack having abutment means thereon and disposed in meshing engagement with a gear on said control shaft, means for reciprocating said rack, first limit means disposed adjacent the path of reciprocation of said abutment means to define a high speed position, second adjustable limit means disposed adjacent the path of reciprocation of said abutment means to define a low speed position and movable abutment means intermediate said first and second limit means disposed adjacent the path of reciprocation of said abutment means and adapted to be moved into said path to define an intermediate speed position.

12. A railway sewing machine as set forth in claim 11 wherein said means for reciprocating said rack includes a fluid-operated piston and cylinder arrangement and further comprising an additional piston cylinder arrangement for moving said movable abutment means.

13. A railway sewing machine as set forth in claim 12 further comprising additional control means for controlling the flow of fluid to said piston and cylinder arrangements and a plurality of operating means for said additional controls operable upon relative movement of said frame means and said carriage means whereby said carriage means will travel at a low speed near the beginning and end of each traverse, at an intermediate speed along the midportion of the forward traverse and at a high speed along the midportion of the reverse traverse.

14. A railway sewing machine as set forth in claim 1 further comprising first and second vacuum means mounted on said carriage means adjacent said sewing means, a said first vacuum means being mounted and adjusted to straighten out a trailing chain of stitch to facilitate cutting and disposal thereof and said second vacuum means being mounted and adapted to remove cloth trimmings adjacent the stitching zone.

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