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Newman

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[54] **PROGRAMMED COLOR STITCHING MECHANISMS FOR SEWING MACHINES**

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[52] **U.S. Cl.** **112/254**

[51] **Int. Cl.** **D05b 47/00**

[58] **Field of Search** ..... 112/254, 255, 241, 242, 243, 112/248, 79 A, 157, 121.11, 121.13

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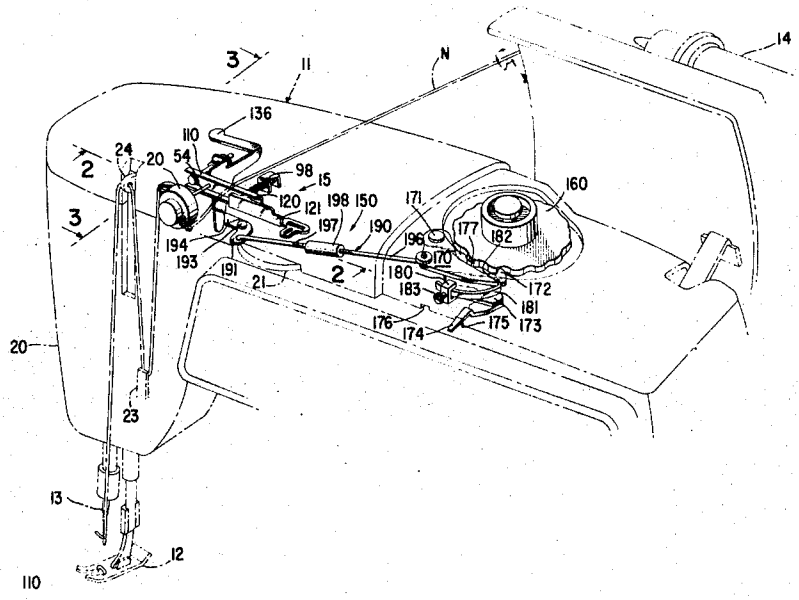
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[57] **ABSTRACT**

A pattern cam influenced mechanism for changing the tension which is applied to one or more of the sewing threads being concatenated by a sewing machine between successive stitches or between successive stitch groups. Where a plurality of threads of different color are used in the stitch formation, the arrangement of this invention can result in a pattern cam control of the color of the stitches appearing on the exposed face of the work fabric.

8 Claims, 4 Drawing Figures



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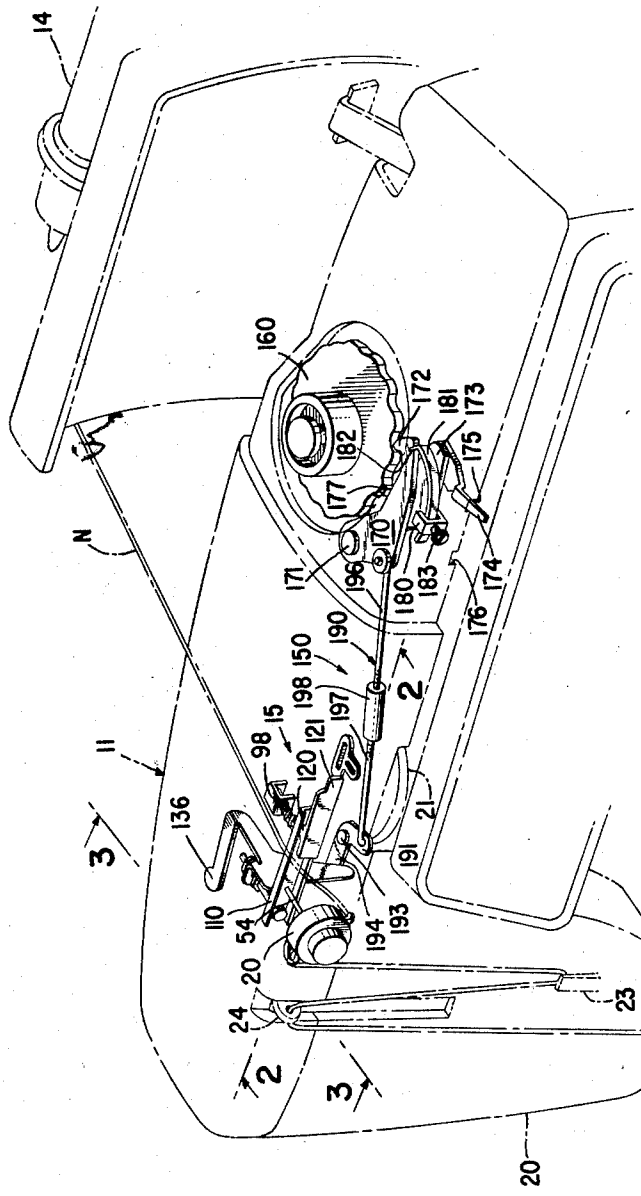


Fig. 1

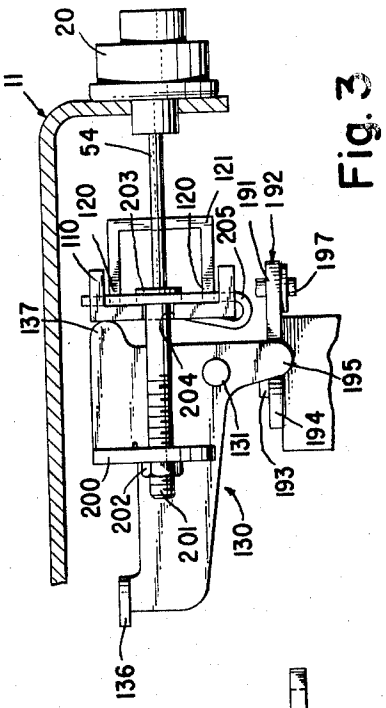


Fig. 3

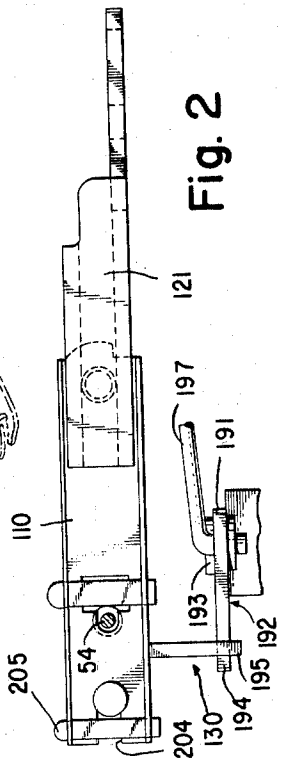


Fig. 2

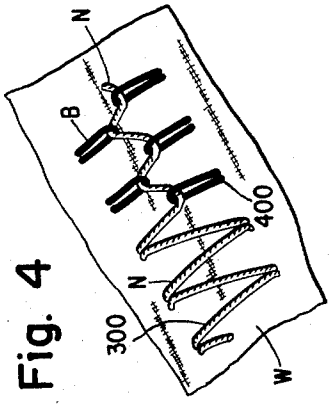


Fig. 4

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PROGRAMMED COLOR STITCHING MECHANISMS FOR SEWING MACHINES

BACKGROUND OF THE INVENTION

It has been well known to provide sewing machine thread tensioning devices with releasing mechanism which operates during each stitch as by a cam or eccentric drive to assist in proper thread concatenation, to cooperate with thread pull-off devices or in connection with thread metering devices. The applicant is unaware, however, of any prior sewing machine in which the setting of the thread tensioning device is varied in accordance with a predetermined program between successive stitches. In particular, no prior thread tension controls are known which provide for a predetermined variation in the color of stitches appearing on an exposed face of a work fabric.

SUMMARY OF THE INVENTION

The objects and advantages of this invention are attained by including together with a conventional thread tensioning device for a sewing thread of a sewing machine, a preselected patterning means driven by said sewing machine and effective to change the tension applied to the thread between successive stitches.

The above characterized control of a tensioning device in accordance with a preselected pattern, when utilized to influence one sewing thread of a sewing machine which concatenates a plurality of sewing threads of different color, can provide for a programmed control of the color of the resulting stitches on an exposed face of a work fabric. Color control of the stitches as described herein is particularly effective when lockstitches are being formed using differently colored needle and bobbin threads, and when zig zag stitches are being sewn.

DESCRIPTION OF THE DRAWING

In the accompanying drawing of a preferred embodiment:

FIG. 1 represents a front perspective view of a sewing machine in phantom lines, with a needle thread tensioning device together with a pattern cam control mechanism for the tension device shown in solid lines.

FIG. 2 is an enlarged cross sectional view of the thread tensioning device taken substantially along line 2—2 of FIG. 1.

FIG. 3 is an enlarged cross sectional view of the thread tensioning device taken substantially along line 3—3 of FIG. 1, and

FIG. 4 is a perspective view of a line of zigzag lockstitches on an exposed face of a work fabric showing the result of a programmed change of needle thread tension.

In the drawing, a conventional sewing machine **11** is illustrated in phantom lines including a presser foot **12** for supporting work fabrics against the thrust of a thread carrying needle **13**. The needle thread N is shown in FIG. 1 proceeding from a supply spool **14** to a thread tensioning device indicated generally at **15**. Specifically, the thread is influenced by a thread engaging head **20** of the tensioning device from which the needle thread proceeds through a guide member **23**, through the take up **24**, and then to the needle **13**.

The needle thread tensioning device **20** may be constructed substantially as disclosed in the co-pending U.S. patent application of Illes et al., Ser. No. 75,430 filed Sept. 25, 1970, now U.S. Pat. No. 3,667,414 which is incorporated herein by reference. The above incorporated patent application may be referred to for a detailed description of the tensioning device. For an understanding of the present invention, however, the following brief description of the salient aspects of the tensioning device will suffice, with parts similar to those of the referenced patent application being denoted by the same reference characters as used therein.

Pressure derived from a coil spring **98** is applied to tensioning disks (not shown) in the thread engaging head **20** by way of a lever **110** and a tension rod **54** from the lever **110**. A slide member **121** which is shiftable in response to movement of an operator influenced dial **21** carries projections **120** which define the fulcrum for the lever **110** so that by shifting the slide member **121** the pressure exerted by the spring **98** on the needle thread may be regulated manually.

A tension releasing lever **130** fulcrummed at **131** in the machine frame includes an arm **136** by which the lever **130** may be turned clockwise as viewed in FIG. 3 in response to lifting of the presser foot as described in detail in the above referenced patent application. A lever arm **137** abutting the lever **110** serves, when the presser foot is lifted, to disrupt transmission of force from the spring **98** to the thread engaging head and thus to release the tension on the thread N.

For providing a programmed control of the tension which is applied to the thread N, this invention provides a mechanism generally indicated at **150** which is responsive to a pattern cam **160** driven by the sewing machine. This invention may be used with any conventional pattern cam arrangement of the type ordinarily used to influence patterned zig zag stitching, and particularly advantageous use of this invention is in instances wherein the pattern cam **160** for tension control is used simultaneously with a different pattern cam or other mechanism effective to influence zig zag stitch control. The pattern cam **160** and the location and driving arrangement of the pattern cam in the sewing machine may be in accordance with the co-pending U.S. patent application of Marsh et al. Ser. No.827,867, filed May 26, 1969, now U.S. Pat. No. 3,585,876 to which reference may be had.

As shown in FIG. 1, a follower lever **170** is fulcrummed on a pin **171** secured on the sewing machine frame and formed with a follower finger **172** disposed for tracking the pattern cam **160**. Also pivoted on the fulcrum pin **171** is a lever **173** having a flexible extension **174** which projects outwardly of the machine frame and can be positioned selectively into either of two notches **175**, **176** in the sewing machine frame. An upturned throw-out lug **177** is formed on the lever **173** and is arranged when the flexible extension **174** is seated in the notch **175** to permit the follower finger to track the pattern cam. The lug **177** is arranged to restrain the follower finger out of engagement with the pattern cam when the extension **174** is seated in the notch **176**.

An upstanding arm **180** on the lever **173** supports a leaf spring **181** which is seated in a notch **182** in the fol-

lower lever 170. The arm 180 and the notch 182 trap the spring 181 in place so that the spring can serve to bias the follower finger 172 toward the pattern cam. A screw 183 threaded through the arm 180 provides for adjustment of the force with which the spring biases the follower lever 170.

A link 190 is pivoted to the follower lever 170 and is also pivoted to one arm 191 of a bell crank lever 192 fulcrummed on a pin 193 in the machine frame. A second arm 194 of the bell crank lever 192 abuts a lever arm 195 depending from the tension release lever 130. The link 190 is preferably formed in two parts 196 and 197 each formed with threads of the opposite hand and threadedly engaged by a threaded sleeve 198 to serve as a turnbuckle.

The cam follower mechanism 150, therefore, can impart turning movement to the tension release lever 130 only in a direction opposite that which the lever 130 is turned to release the tension when the presser foot is raised.

A laterally offset arm 200 projecting from the lever 130 is apertured to accommodate a bolt 201 which carries a nut 202 threaded thereon at the side of the arm 200 which is opposite the lever 110. The bolt is formed with an enlarged head 203 and is accommodated in a slot 204 formed in the extremity of the lever 110 which transmits spring force to the thread engaging head 20. A spring clip 205 which may be snapped in place on the lever 110 spanning the slot 204 constrains the bolt 201 in the slot.

When the cam follower lever 170 is rendered effective to track a pattern cam 160, therefore, the cam follower mechanism 150 will, in response to a tracking of a depression in the pattern cam, apply to the lever 110 a force from the leaf spring 181 in addition to the force exerted by the coil spring 98. It is possible for the amount of additional force exerted by the mechanism 150 to be influenced by the depth of the depression of the pattern cam 160 which is tracked by the follower. The pattern cam, therefore, can control not only the application of additional tension to the thread but depending on the cam shape can program the amount of such additional tension.

It is preferable, however, for the cam 160 to be formed with only two different radius portions, i.e., a large radius for throwing the mechanism 150 completely out of operation, and a small radius which cannot be tracked by the follower, leaving the follower disengaged and the full force of the spring 181 applied to the tension device. In this case, the screw 183 provides the only adjustment of the additional force applied to the tension device by the spring 181.

FIG. 4 illustrates a fragment of work fabric W as viewed from the exposed face, i.e., the top surface into which the sewing machine needle penetrates. Indicated at 300 are zigzag stitches which are formed with a conventionally acceptable degree of needle thread tension so that only the needle thread N is visible on the exposed surface. The stitches 300 are such as would be formed using only the influence of the coil spring 98 on the tension device 15 with the dial 21 set appropriately for zig zag stitching and the pattern cam 160 presenting a lobe or large radius portion of its track for engagement with the follower finger 172.

Indicated at 400 is a group of zigzag stitches which are formed with an increased needle thread tension as when the follower 172 tracks a depression in the pattern cam 160. It will be noted that the increased tension in the needle thread N will draw limbs of a bobbin or underthread B into appearance onto the exposed face of the work fabric. Where the bobbin thread B is chosen to be a different and contrasting color from that of the needle thread, operation of the pattern cam control of this invention can result in control of the color of the resulting stitches on the exposed face of the work.

Having thus set forth the nature of the invention, what is claimed herein is:

1. In a sewing machine for concatenating threads into successive stitches in a work fabric, a thread tensioning device on said sewing machine for imposing resistance to passage of a sewing thread to the stitches being concatenated, a preselected patterning means driven by said sewing machine in a recurring period spanning a plurality of successive stitches, and mechanism operatively connected to said thread tensioning device and responsive to said patterning means for varying the resistance which the tensioning device imposes to passage of a sewing thread.

2. In a sewing machine as set forth in claim 1 in which said thread tensioning device includes a first force generating means, mechanism for applying force from said first force generating means for imposing resistance to passage of a sewing thread to the stitches being concatenated, and means for manually regulating said first force generating means, and in which said mechanism responsive to said patterning means includes a second force generating means, and mechanism for adding force from said second force generating means to the force applied from said first force generating means.

3. Mechanism for automatically regulating the color of a lockstitch seam produced by a lockstitch sewing machine having differently colored needle and bobbin threads as the seam appears on an exposed face of a stitched work fabric, said mechanism comprising: a primary needle thread tensioning means, manually influenced means for regulating said primary needle thread tensioning means to produce lockstitches in which only the needle thread appears on an exposed face of a stitched work fabric, an auxiliary needle thread tensioning means for applying additional tension to said needle thread for drawing differently colored bobbin thread into view on the exposed face of a stitched work fabric, and programmed control means driven by said sewing machine for selectively rendering said auxiliary needle thread tensioning means effective.

4. Color regulating mechanism as set forth in claim 3 in which said primary and auxiliary needle thread tensioning means are effective to apply frictional resistance to passage of the needle thread toward the stitched work fabric by way of a thread engaging head of a single thread tensioning device.

5. Color regulating mechanism as set forth in claim 4 in which said primary and auxiliary needle thread tensioning means each includes a spring, and means for transmitting a force from said springs to the thread engaging head of said thread tensioning device, and in which said programmed control means renders selectively effective the transmitting means for the spring force of the auxiliary thread tensioning means.

6. Color regulating mechanism as set forth in claim 3 in which said programmed control means comprises a pattern cam driven by said sewing machine, and a cam follower actuated linkage responsive to said pattern cam for rendering said auxiliary needle thread tensioning means effective.

7. Mechanism for automatically regulating the color of a lockstitch zigzag seam produced by a lockstitch zigzag sewing machine having differently colored needle and bobbin threads as the seam appears on an exposed face of a stitched work fabric, said mechanism comprising a primary needle thread tensioning means, manually influenced means for regulating said primary needle thread tensioning means to produce zigzag stitches in which only the needle thread appears on an exposed face of a stitched work fabric, an auxiliary needle thread tensioning means for applying additional tension to said needle thread for drawing differently colored bobbin thread into view on the exposed face of a stitched work fabric, and programmed control means driven by said sewing machine for selectively rendering said auxiliary needle thread tensioning means effective.

8. Color regulating mechanism as set forth in claim 7 in which zig-zag pattern cam means driven by said sewing machine is provided for producing repetitive groups of zig-zag stitches, and in which said programmed control means is driven by said sewing machine in timed relation with said zig-zag pattern cam means for rendering said auxiliary needle thread tensioning means effective only on preselected ones of said repetitive groups of zig-zag stitches.

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