Dec. 5, 1967 J. A. URSCHELER 3,356,050

TENSION DEVICES FOR EMBROIDERY MACHINES

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FIG. 1.

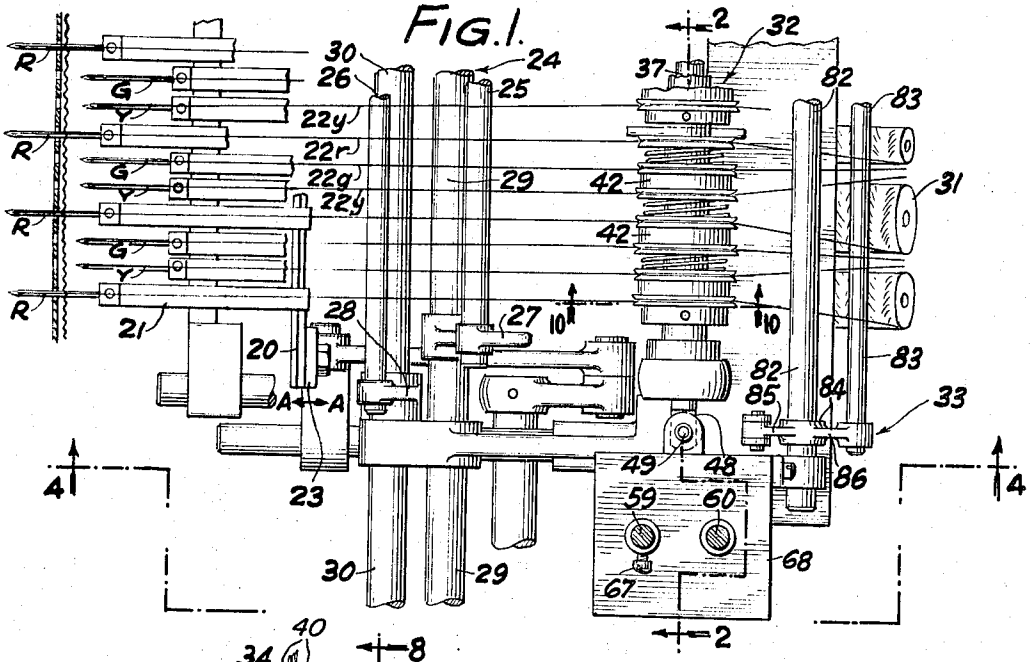


FIG. 7.

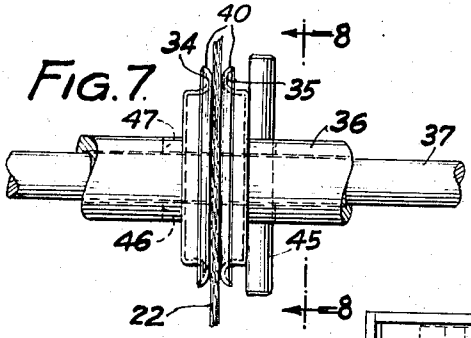


FIG. 8.

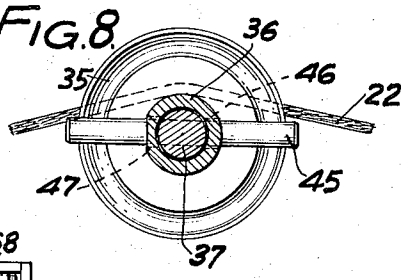


FIG. 3.

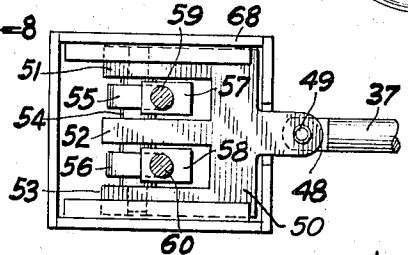


FIG. 2.

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TENSION DEVICES FOR EMBROIDERY MACHINES

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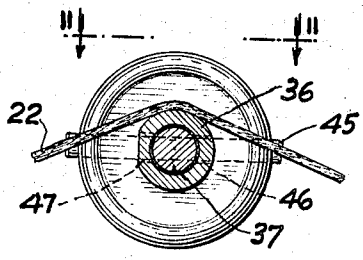


FIG. 10.

FIG. 4.

FIG. 5.

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TENSION DEVICES FOR EMBROIDERY MACHINES

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FIG. 13.

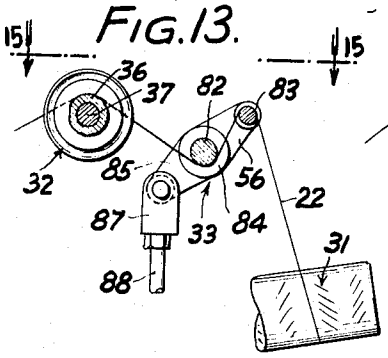


FIG. 14.

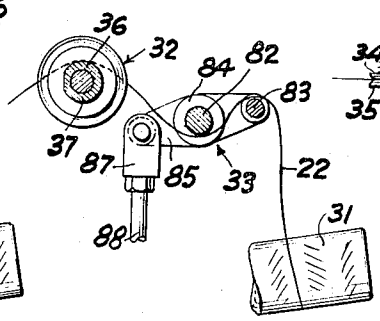


FIG. 15.

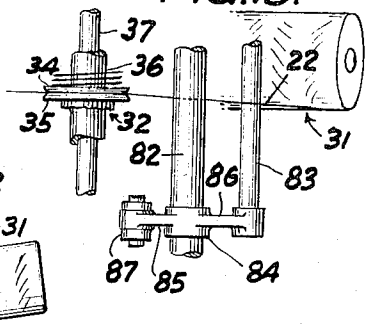


FIG. 9.

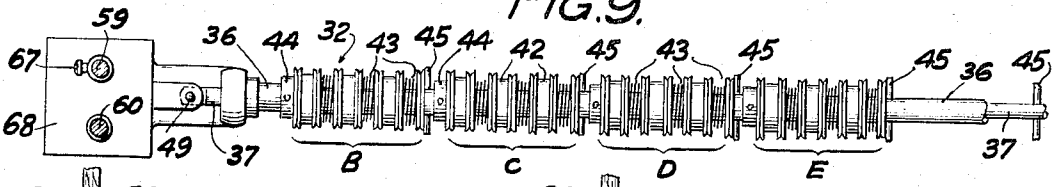


FIG. 11a.

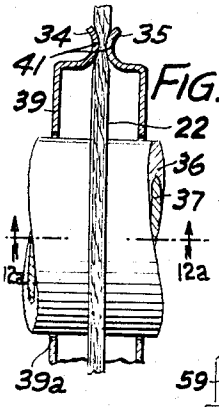


FIG. 12a.

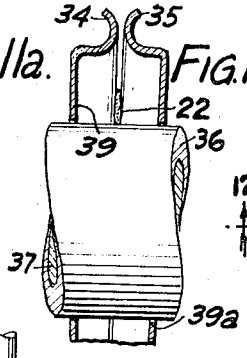


FIG. 11.

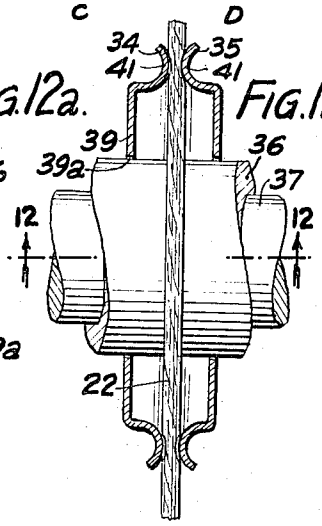
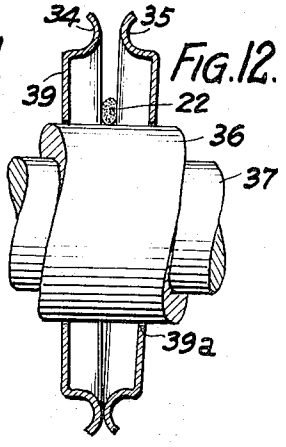


FIG. 12.



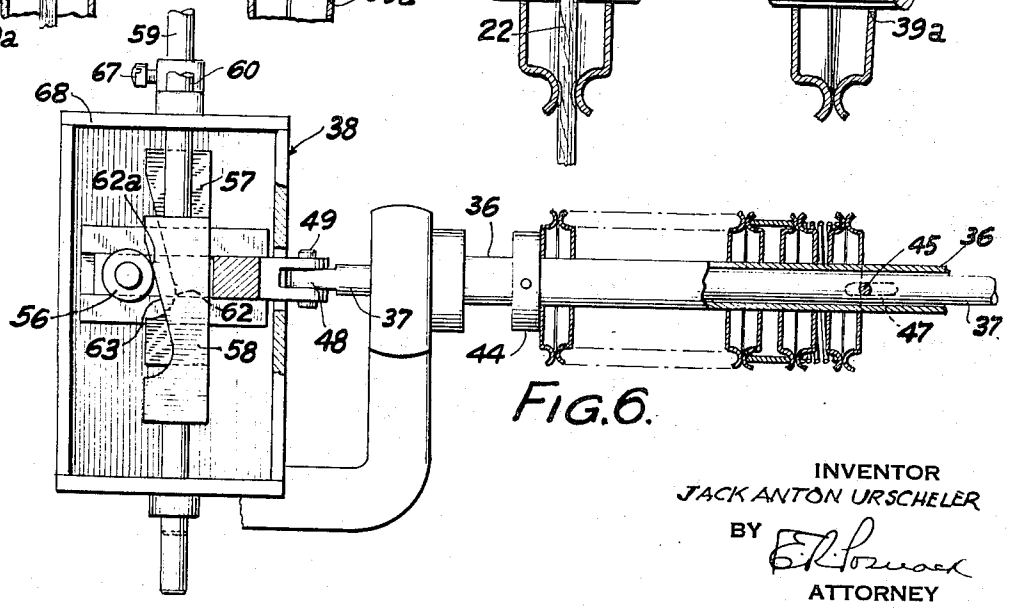


FIG. 6.

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TENSION DEVICES FOR EMBROIDERY MACHINES

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FIG. 16.

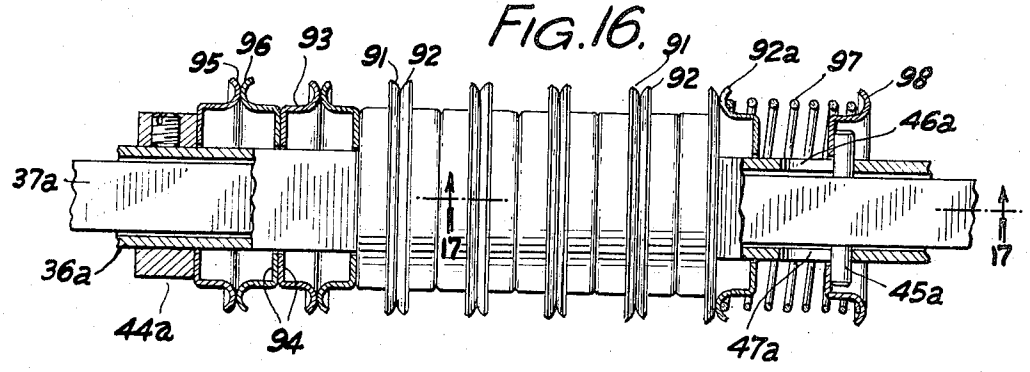


FIG. 17.

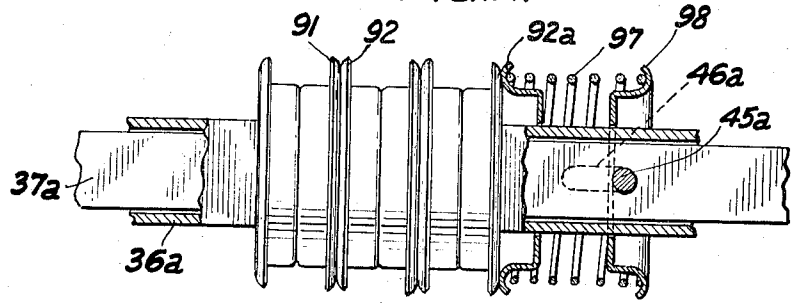
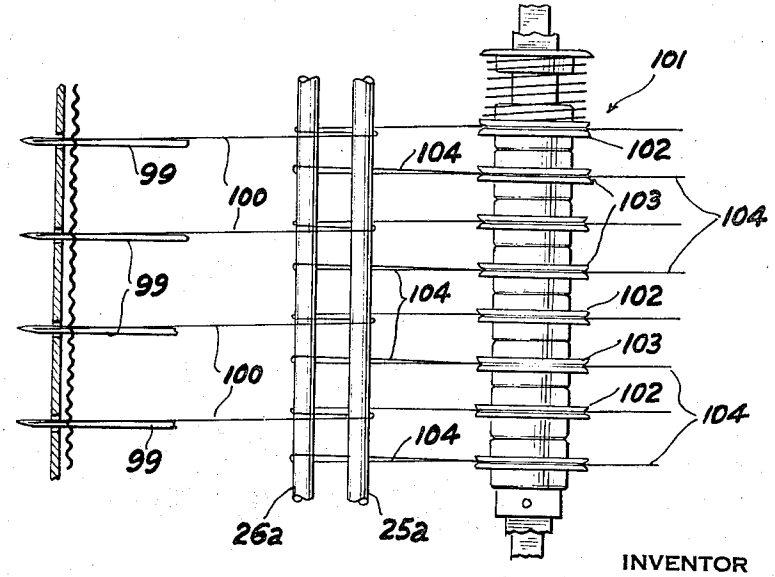


FIG. 18.



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United States Patent Office 3,356,050 Patented Dec. 5, 1967

3,356,050

TENSION DEVICES FOR EMBROIDERY MACHINES

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Filed Dec. 30, 1964, Ser. No. 442,563
5 Claims. (Cl. 112—97)

ABSTRACT OF THE DISCLOSURE

Yarn tensioning means for Schiffli and other types of embroidery machines having reciprocating needles provided with means for drawing threads from spools. The tensioning means have a plurality of longitudinally arranged pairs of tension control discs between the needles and the spools, the two discs of each pair being movable relative to each other to engage and release respective threads therebetween, the pairs of discs being simultaneously actuated between their respective limiting positions in timed relation to the operative movements of the needles.

This invention relates to yarn tensioning means for Schiffli or other types of embroidery machines.

Conventional machines employ a roller—generally called an emery roller—extending lengthwise of the machine, the yarn from appropriate spools at the rear of the machine being fed to the roller and wrapped around it four or five times so as to prevent a slippage of the yarn extending from the roller to the needle. In such apparatus the operative pulls of the threads behind the emery roller cause said roller to rotate in the direction of the pulls, thereby also causing, with each operative rotation of the roller, yarn to be drawn up from the spools by the pull produced by the roller. At one end of the roller there is a brake and locking mechanism to control the operative feeding tension of the yarn from the roller to the needles. The brake, with a felt or leather shoe, has a "dragging" function so that for certain types of stitching the roller permits a feed under a predetermined yarn tension. The said locking mechanism, containing an arrangement of blades which coact with components at the end of the roller, serves to stop its motion momentarily, thereby effecting an intermittent feed required for relatively tight or flat stitching. Both the drag and locking mechanisms are controlled either by a jacquard mechanism or by manual means.

In the above-mentioned conventional construction there are generally a number of friction discs positioned between the roller and the spools, each of these discs consisting of two spring-loaded frusto-conical members yieldably engaging therebetween the yarn being pulled up by the roller from the spool. These are used in an attempt to maintain uniform tension in the yarn being fed from the spools to the roller—the action of these discs being intended to offset the greater tenison in the yarns coming from the heavier spools.

There are a number of disadvantages in the use of the above-mentioned conventional emery roller, perhaps the most outstanding shortcoming being the need manually to wrap the yarn around the rollers—from one to five times, as aforesaid. Since there are between about 700 to 1100 yarns to be wrapped around, this process takes several hours. Another disadvantage of the conventional emery roller arrangement is that it is adapted for use with one color or type of yarn; and if it becomes necessary to change the color or type of yarn, it is required to remove from the machine one color or type before applying the other. If this were not done, the old or non-used yarn

would tend to accumulate around the roller since it is caused to rotate under the operative pulling action of the yarns therebehind. The disadvantage of the use of the conventional tension discs above mentioned, coactively employed with the conventional emery roller, is that since each pair of coactive discs is independent from the others there must be separate, independent manual settings for each pair of discs in accordance with the gauge of the yarns—a time-consuming and costly process. Moreover, after the initial adjustment of the discs, the progressive using up of the yarns causes differences in tension of the yarn extending from the different spools—the heavier or fuller spools resulting in greater yarn tension and tighter stitching than that resulting from the lighter or less full spools.

Among the objects of this invention is the elimination of the shortcomings of conventional Schiffli embroidery machines above mentioned. This is accomplished in part by the elimination of the use of an emery roller or equivalent roller. In lieu thereof there is a tension control device comprising a plurality of sets of coactive friction discs which extend along the entire length of the machine, adjacent pairs of these discs frictionally engaging therebetween threads from the respective spools for feeding action rearwardly to the needles. The arrangement is such that by the operation of a single control the frictional grips applied by the said discs to the respective threads engaged thereby are simultaneously set, without the need for any individual setting and without the need to perform the time-consuming process of wrapping threads around a roller as in conventional machanisms. The tension control discs of this invention are stationary and are not in any way moved by the pull of the yarns as is the case with conventional emery rollers which, as aforesaid, are caused to turn with the operative pulls of the threads. Hence, there is no danger of the accumulation of non-used yarn around the tension control device as occurs with conventional emery rollers where the previous yarn has not been removed. With a change-color Schiffli machine the construction of the present invention is such that there are pairs of tension control discs for the respective needles using the various selected colors of threads. While one selected color or type of thread is operatively connected to the corresponding needles along the entire length of the machine, the other non-selected yarns remain idle and are simply maintained in immovable relation with respect to their respective discs until they are required to be used. There is accordingly considerable flexibility with respect to choice of colors and types of yarn, without the economic waste resulting from the need to employ time-consuming labor in wrapping yarns around or unwinding yarns from the emery roller or in individually adjusting tension control members.

It is another object of this invention to enable it to be used with the same jacquard control mechanisms as are employed in conventional machines, or, if desired, by manual means—but without the employment of the above-mentioned conventional drag and intermittent stop mechanism. The arrangement is such that a simple camming mechanism coacting with an actuating rod varies the frictional grips of all the discs on the respectively engaged yarn in accordance with pre-determined settings. The friction can accordingly be selectively varied to produce yarn tensions for various types of stitches—from relatively light tensions for comparatively loose stitches to flat tight stitches resulting from sufficient gripping force to cause intermittent momentary stopping of yarn movement.

In accordance with another objective of this invention, the yarns drawn from the various spools are all maintained in uniform tension, regardless of the size or weight of the yarn spools. This is effected by an arrangement of rods with which the threads from the various spools are

interengaged, one of the rods being movable towards and away from the tension control device in timed relation to the movement of the shuttles. The arrangement is such as to maintain the yarns directly in front of their tension control discs in untensioned condition during the feeding of the yarn.

Other objects, features and advantages will appear from the drawings and the description hereinafter given.

Referring to the drawings,

FIG. 1 is a fragmentary plan vew of a Schiffli embroidery machine embodying a form of the present invention, the machine being of the type having a change-color mechanism.

FIG. 2 is a somewhat enlarged fragmentary section of FIG. 1 taken substantially along line **2—2**, certain portions being shown partly in elevation and partly in section for clarity, the tension control discs being shown in their initial positions, the yarns being omitted.

FIG. 3 is a section of FIG. 2 taken substantially along line **3—3**.

FIG. 4 is a side sectional elevation of FIG. 1 taken substantially along line **4—4**.

FIG. 5 is a fragmentary front view of the machine looking in the direction of arrows **5—5** of FIG. 4.

FIG. 6 is a view substantially like FIG. 2 but showing the tension control discs in operative gripping and tensioning positions, portions being removed for clarity.

FIG. 7 is a fragmentary plan view of FIG. 2 looking substantially in the direction of arrows **7—7**, portions being removed for clarity, one pair of discs being shown in place engaging a thread.

FIG. 8 is a section of FIG. 7 taken along line **8—8**.

FIG. 9 is a fragmentary plan view of a plurality of sections of tension control discs and associated elements operatively assembled over the disc-actuating control rod connected to coacting cam components.

FIG. 10 is an enlarged section of FIG. 1 taken substantially along line **10—10** showing a section of yarn operatively in place.

FIG. 11 is a top view of FIG. 10 showing the coacting disc elements in their initially set positions with respect to an operatively engaged yarn.

FIG. 11*a* is a view like FIG. 11 but showing the coacting disc elements in their operative gripping positions relative to the engaged yarn.

FIG. 12 is a section of FIG. 11 taken along line **12—12**.

FIG. 12*a* is a section of FIG. 11*a* taken along line **12*a*—12*a***.

FIG. 13 is a side view of the preliminary tension release mechanism of this invention in relation to a yarn spool and the corresponding yarn tension control discs, the parts being shown in their positions during a yarn feeding pull.

FIG. 14 is a view like FIG. 13 but showing the position of the parts just prior to the yarn feeding pull position, showing the yarn in front of the discs in untensioned condition.

FIG. 15 is a plan view of FIG. 13 taken along line **15—15**.

FIG. 16 is a view, partly in section and partly in side elevation, of a modified form of tension control mechanism according to this invention.

FIG. 17 is a section of FIG. 16 taken along line **17—17**.

FIG. 18 is a semi-schematic fragmentary plan view of a Schiffli machine without a color-change mechanism and embodying the yarn tension control means of this invention, showing operative yarns in the needles and non-used yarns held against displacement by corresponding discs.

In the form of this invention illustrated in FIGS. 1 to 15, a Schiffli embroidering machine with a change-color mechanism is shown, there being three sets of needles for forming stitches of three selected colors, the needles R (see FIG. 1) carrying red thread, the needles Y carrying yellow thread, and the needles G carrying green thread. The needles are selectively moved into their respective projected or stitching and retracted or inoperative positions by suitable means a description of which is not necessary for an understanding of this invention. In the form illustrated there is an actuator bar **20** reciprocatingly movable in the directions indicated by the arrows A—A, said bar and the members operatively associated therewith being similar to the needle-actuating means shown in the co-pending patent application Ser. No. 295,700 that matured into Patent No. 3,117,834, although other types of actuators may be used for needles carrying threads coactively associated with the tension control means of the present invention. Suffice it to say for the purpose of this specification that the needles R shown in FIG. 1 are in their operative projected positions, that needles G and Y are in their retracted inoperative positions, that each of the needles is supported by a finger **21** engageable by the said actuator bar **20**, and that all the needles are shown carrying threads, generally identified herein by the reference numerals **22**, disposed along their respective thread paths. Said actuator bar **20** is attached to the member **23** (FIG. 4) connected to reciprocating means not shown but known to those skilled in the art, whereby operative forward and rearward movements are imparted to the actuating bar **20** and transmitted to the selected set of needles, like the needles R—carrying threads **22*r***—all in timed relation to the movement of the shuttles (not shown) and in accordance with a stitching pattern determined by the operation of a coacting jacquard mechanism in known manner. The said threads **22** all extend forwardly to a conventional tension-release and thread pulling mechanism generally designated **24**, often referred to in the trade as a "Fadenleiter," comprising two parallel thread-engaging rods **25** and **25** mounted on the respective arms **27** and **28** which in turn are mounted on and fixedly secured to the respective shafts **29** and **30**, said shafts being operatively connected to operating means not shown but known and understood by those versed in the art. Said shafts **29** and **30** move in predetermined relation to the operative movements of the needles to perform alternate slackening and tightening actions on the thread section **22*a*** during the stitching and feeding movements of the needles and threads. More specifically, the threads from the spools, referred to generally as **31**, at the front of the machine, are looped under the rod **26** and over said rod **25**, the arrangement being such that as the arm **27** operatively moves to the broken line position (FIG. 4), it creates a slack in said thread section **22*a***, said arm **27**, and shaft **25** thereafter returning to the indicated full line position to effect a rearward feeding pull of thread section **22*b***, the operative movement of the arm **28** to the indicated broken-line position at this point adding to the pulling action.

The aspects of the machine to which this invention is particularly directed are the thread tension control device generally designated **32** and the coactively associated preliminary tension release mechanism generally designated **33**. As will appear from the description hereinafter given, the said tension control device **32**, which takes the place of the conventional emery roller hereinabove referred to, engages all the threads from the spools **31** and the said preliminary control mechanism **33**, and frictionally grips and releases the engaged threads, the gripping action being uniform on all the threads in accordance with a predetermined setting, thereby producing predetermined uniform tensions in said thread sections **22*b*** (between the tension control device **32** and the above described tension release and pulling member **24**). In the preferred method of practicing this invention, there is a slight gripping action at the initial or so-called release position, the mechanism being such that the device can be set for a relatively wide range of differential tensions between the initial thread-releasing and the operative gripping positions thereof.

In the embodiment of the tension control device **32** as illustrated in FIGURES 1 to 13, there are a plurality of

pairs of discs 34, 35 slidably and non-rotatably mounted over the sleeve 36 extending substantially along the longitudinal extent of the machine, said sleeve slidably housing therein the control rod 37 operatively connected to the actuating member 38 for imparting reciprocating longitudinal movements to said rod and the associated members, in a manner to be hereinbelow described. The discs have substantially flat walls 39 in planes normal to the longitudinal axis of the sleeve 36, said walls having congruent central apertures 39*a* (see FIGS. 7–12*a*) through which said sleeve 36 extends, the peripheral portions 40 constituting circumferential gripping flanges for frictional engagement with coactively positioned threads. In the form shown, the respective flanges 40 of a pair of discs 34, 35 are inwardly curved towards each other, the respective intermediate portions 41 of said flanges being peripherally engageable. For each needle there is a pair of discs 34, 35 (FIG. 1), the optimum positioning of said pairs of discs being effected by the use of the cylindrical spacers 42 in peripheral engagement with said flanges 40 of the adjacent discs and helical springs 43 positioned over the sleeve 36 and in abutting engagement with the adjacent walls 39 of the respective discs. The spacers and springs are shown alternately arranged although other arrangements may be employed (see FIGS. 16 and 17).

A predetermined number of pairs of discs are arranged in sets, the particular arrangement illustrated having seven pairs in each set, such as sets B, C, D and E shown in FIG. 9. Flanking each set are a holding collar 44 fixedly attached to the sleeve 36 and a push pin 45 fixedly attached to the rod 37, said rod extending through diametrically opposite slots 46 and 47 in the sleeve 36. It is thus apparent that when the rod 37 is operatively moved to the left (see FIGS. 2, 6–9), the pins 45 constituting push members, moving through the sleeve slots 46 and 47, will be brought into pressing and pushing relation to the respective adjacent pairs of discs 34, 35, slidably moving all the discs to the left against the action of the springs, the collars 44 holding the respective adjacent pair of discs against movement. The two discs 34, 35 of each pair are thus brought together with their adjacent peripheral flanges 40 in pressing engagement with the thread 22 operatively extending therebetween, the greater the movement of the rod 37 to the left the greater the frictional grip of the discs upon their respectively engaged threads. Conversely, operative movements of rod 37 to the right will reduce the grip upon the threads, and if moved completely to the right—to the extreme right ends of the said slots 46 and 47—the threads can be entirely free of the gripping action of the discs.

It is particularly important to observe that since there are a plurality of sets of pairs of discs, with a corresponding plurality of collars 44 and pins 45, a single operative movement of the control rod 37 will produce uniform gripping effects upon all the threads operatively extending through the tension control device 32. The setting of the initial and final positions of the coactive gripping discs is made in accordance with the nature of the yarn and the stitching requirements, the tension in the thread sections 22*b* depending upon the pull of said member 24 and the frictional resistance to such pull effected by the tension control device 32. An extremely tight setting could produce complete momentary stoppagge of thread movement, thus producing the effects of the relatively complicated intermittent locking means employed on conventional machines. Lighter settings could produce the dragging actions of conventional brake devices.

In the illustrated method of setting the control rod 37 for operating between predetermined initial and final positions, the camming mechanism at 38 is employed. Referring to FIGS. 2, 3, 8 and 9, it will be seen that the left end 48 of rod 37 is pivotally connected at 49 to longitudinally movable roller carrier 50 having the three parallel arms 51, 52 and 53 supporting the shaft 54 on which are mounted the two rollers 55 and 56. In operative engagement with roller 55 is the cam 57, and in operative engagement with the roller 56 is the cam 58. Cam 57 is connected to the manual initial-setting rod 59, and cam 58 is connected to the automatically operated tension control rod 60, the operation of these rods being hereinbelow set forth.

FIG. 2 shows cam 57 (behind cam 58) in a slightly lower position than cam 58, whereby its operative surface 61 has engaged the roller 55 slightly above its low point 62, the resulting pressure on the roller 55 causing the entire carrier 50 to move slightly to the left in the direction of arrow F. This causes a corresponding movement to the left of the rod 37, resulting in a relatively slight compression of the springs 43 and a correspondingly light initial grip of the discs 34, 35 on the engaged thread 22, as shown in FIGS. 11 and 12. When the rod 60 is operatively actuated downwardly, the cam 58 is brought down to the position shown in FIG. 6 at which the relatively high point 62*a* of the operative surface 63 of cam 58 forces the coacting roller 56 to the left, whereby the entire carrier and the control rod 37 are moved farther to the left than indicated in FIG. 2. This brings the coacting discs 34, 35 into firmer gripping engagement with the thread 22, as indicated in FIGS. 11*a* and 12*a*—these being the final gripping positions of the discs which result in the desired predetermined tension in the thread sections 22*b* leading to the needles.

For setting cam 57 to its said initial position, the handle 64 (FIG. 4) is manipulated so as to either raise or lower the rod 59 to bring the cam 57 to its desired initial setting. Said handle 64, mounted over the shaft 65, is operatively connected to the arm 66 connected to rod 59, the set screw 67 being manipulated to maintain the rod 59 in the set position relative to the casing 68, in known manner.

The setting of cam 58 to the desired operative position, such as that shown in FIG. 6, is effected through the medium of the lever 69 (FIG. 4) pivoted at 70 and connected to the rod 60 at 71, the end 72 of lever 69 being attached to the rod 73 the bottom end 74 of which is adjustably threaded into the fitting 75 connected to the actuating lever 76 pivotally mounted on shaft 77. Said lever 76 carries the roller 78 which is positioned to be engaged by the cam 79 during each rotation of the cam shaft 80 operated in timed relation with the needles by means not shown but known to those skilled in the art. With each engagement of cam 79 with roller 78 the lever is actuated downwardly against the action of spring 81, thereby lowering the rod 73, the lever 69, the rod 60 and consequently the cam 58 to its lower operative position. Upon the operative upward return movement of the lever 76, the rod 73 returns to its upper position, causing the cam 58 to be raised to its inoperative or releasing position shown in FIG. 2, whereupon the springs 43 urge the pins 45, rod 37 and carrier 50 to their retracted positions, as shown in FIG. 3. At this point the discs 34, 35 are in their respective releasing positions with respect to the threads 22.

The said preliminary tension release mechanism 33 (see FIGS. 13–15 and FIG. 1) comprises the rods 82 and 83, the former being stationary and having rotatably mounted thereover the hub 84 carrying the oppositely positioned arms 85 and 86, the latter carrying the said rod 83. The end of arm 85 has the clevis 87 connected to rod 88 the bottom of which is pivotally connected at 89 to the bracket 90 affixed to said actuating lever 76. With each operative movement of the latter lever the rod 88 will be correspondingly moved, to cause operative movement of said arm 86 and the said rod 83 about rod 82. It will be observed that the yarn 22 from the spool 31 extends over the movable rod 83, under the stationary rod 82 and rearwardly to the tension control device 32. When the rod 88 is in its operative lower position shown in FIG. 13, the rod 83 is in its uppermost position, it having drawn yarn

from spool 31 when rising from a previously lower level. When the rod 88 has been moved to its upper position shown in FIG. 14, the shaft 83 is brought to its lower position, causing a slackening of the yarn from the spool to the tension control device 32. Since the lever 76 operates in timed relation with the needle movements, as aforesaid, the operative movement of rod 83 is also in timed relation with the needle movements. The arrangement is such that when the yarn is operatively pulled rearwardly towards the needles, rod 83 is in the position shown in FIG. 14—whereby the pull is against slack yarn, and therefore not affected by the weight of the spool 31.

The preliminary tension release device 33 illustrated in FIGURES 13 to 15 facilitates the smooth operation of the tension control device 32 both in its tension producing and tension releasing functions. The yarns that are not being stitched, such as the yarn sections 22*g* and 22*y* connected to the retracted needles G and Y, are returned to the corresponding discs, the yarn ends being maintained there idly until the yarns are to be brought into operation. It is noteworthy that the idle yarns do not have to be removed from the machine, as in the case of the conventional emery rollers, such idle yarns being in position for immediate use when needed.

A modified form of tension control device is shown in FIGS. 16 and 17 in which the control rod 37*a* and sleeve 36*a* are substantially the same as the respective corresponding members 37 and 36 of the form above described, the sleeve having opposing slots 46*a* and 47*a* through which extends the pin 45*a* attached to said rod 37*a*, there being a collar 44*a* attached to the sleeve 36*a* substantially in the manner above described. In this modified form, however, there are no spacers and springs between the pairs of discs as in the above described form; instead the pairs of discs 91, 92 each has an extended annular wall 93 joined by a flat end wall 94 with an apertured portion 95 slidably embracing the sleeve 36*a*. Adjacent walls 94 are in abutment, the proportions of the said annular walls 93 being such as to position the coacting thread-gripping flanges 95, 96 in proper predetermined relation to the needles. In this embodiment a single spring 97 is employed between the end disc 92*a* and the bearing disc 98 adjacent the pin 45*a*. In operation, the operative pressure exerted by the single spring 97 is determined by the position of the rod 37*a* and the pin 45*a*, all of the coacting discs 91, 92 being yieldably brought into frictional engagement with the threads in the manner aforesaid.

FIGURE 18 shows this invention applied to machines not of the "change-color" type. In this embodiment the needles 99 are all threaded with yarn 100 of a selected color or type, there being no inoperative or retracted needles threaded with other yarn as in the machine first above described. However, there are a plurality of sets of pairs of discs in the tension control device 101 for operatively engaging threads being worked and others that are idle but held ready for subsequent use. Thus, there is a set comprising the pairs of discs 102 operatively engaging the said threads 100, there also being a set comprising the pairs of discs 103 engaging the idle threads 104 of another color or type, the latter being wound over the shaft 26*a* of the above-described conventional tension release and pulling member 24*a* and carried back with the thread ends temporarily positioned within the corresponding coacting disc pairs 103. When it is desired to bring the threads 104 into operation, all that need be done is to remove threads 100 from the needles, remove the threads 104 from their respective discs 103 and bring them into operative engagement with the shafts 25*a* and 26*a* of said member 24*a* and the respective needles, wind the loose end sections of threads 100 over the shaft 26*a* and bring said sections into engagement with the discs 102 in the manner aforesaid. It is thus apparent that with this invention a conventional Schiffli machine could be adapted to receive multi-color or type threads without the need to disengage unused threads as is required in machines equipped with the conventional emery rollers.

In the above description, the invention has been disclosed merely by way of example and in preferred manner; but obviously many variations and modifications may be made therein. It is to be understood, therefore, that the invention is not limited to any form or manner of practicing same, except insofar as such limitations are specified in the appended claims.

I claim:

1. In an embroidering apparatus of the class in which there are a plurality of embroidery needles operatively movable between operative and inoperative positions and provided with means for drawing threads along predetermined thread paths from spool means, thread tension control means interposed between said needles and said spool means, said control means comprising a plurality of pairs of discs arranged in a row extending longitudinally of the apparatus, the two discs of each pair having coacting gripping portions positioned and proportioned to engage therebetween a thread operatively extending from said spool means to one of said needles along one of said paths, said discs of each pair being movable relative to each other between predetermined thread-releasing and thread-pressing limiting position, said discs having apertured portions in longitudinal alignment, a rod disposed longitudinally within said apertured portions and movable between predetermined limiting positions, a push member carried by said rod and operatively adjacent to one of said discs, a stop member in spaced relation to said push member and in operative engagement with another of said discs, spring means between said push and stop members and in engagement with at least one of said discs, and actuating means connected to said rod for moving it, against the action of said spring means, in the direction where its said push member is caused to move towards said stop member and consequently cause a compression of the discs between said push and stop members, whereby the respective coacting discs of all said pairs are simultaneously caused to move towards their respective thread-pressing limiting positions, said actuating means being operatively movable in timed relation to the operative movements of said needles, said actuating means having a movable roller carrier member connected to said rod, cam rollers operatively supported by said carrier, and cam means coactive with said rollers and positioned and proportioned for operatively engaging said rollers and thereby operatively actuating said carrier to move said rod between its said limiting positions.

2. In an embroidering apparatus of the class in which there are a plurality of embroidery needles operatively movable between operative and inoperative positions and provided with means for drawing threads along predetermined thread paths from spool means, thread tension control means interposed between said needles and said spool means, said control means comprising a plurality of pairs of discs arranged in a row extending longitudinally of the apparatus, the two discs of each pair having coacting gripping portions positioned and proportioned to engage therebetween a thread operatively extending from said spool means to one of said needles along one of said paths, said discs of each pair being movable relative to each other between predetermined thread-releasing and thread-pressing limiting position, said discs having apertured portions in longitudinal alignment, a rod disposed longitudinally within said apertured portions and movable between predetermined limiting positions, a push member carried by said rod and operatively adjacent to one of said discs, a stop member in spaced relation to said push member and in operative engagement with another of said discs, spring means between said push and stop members and in engagement with at least one of said disc, and actuating means connected to said rod for moving it, against the action of said spring means, in the direction where its said push member is caused to

move towards said stop member and consequently cause a compression of the discs between said push and stop members, whereby the respective coacting discs of all said pairs are simultaneously caused to move towards their respective thread-pressing limiting positions, said actuating means being operatively movable in timed relation to the operative movements of said needles, said actuating means having a movable roller carrier member connected to said rod, two cam rollers operatively supported by said carrier, two cams operatively engageable with said respective rollers, one of said cams being proportioned and positioned for operatively engaging its coactive roller to actuate said carrier and cause a corresponding operative positioning of said rod to one of its said predetermined limiting positions, the other of said cams being proportioned and positioned for operatively engaging its coactive roller to actuate said carrier and cause a corresponding operative movement of said rod to the other of its said predetermined limiting positions.

3. In an embroidering apparatus of the class in which there are a plurality of embroidery needles operatively movable between operative and inoperative positions and provided with means for drawing threads along predetermined thread paths from spool means, thread tension control means interposed between said needles and said spool means, said control means comprising a plurality of thread-engaging members positioned along said respective paths, each of said members being proportioned to slidably and frictionally engage a thread operatively extending from said spool means to one of said needles, and preliminary tension release means disposed between said spool means and said tension control means, said release means comprising two rods extending longitudinally of the apparatus and positioned and proportioned to slidably engage therebetween threads operatively extending from said spool means to said tension control means, one of said rods being movable between two limiting positions, one of the said positions being more proximate to said spool means than the other, and actuating means operatively connected to said movable rod for moving it between said limiting positions in predetermined timed relation to the operative movements of said needles, whereby there will be alternate tightenings and slackenings of the threads operatively engaged by said rods in said timed relation with said needle movements.

4. In an embroidering apparatus the combination according to claim **16**, one of said rods being stationary, a hub rotatably mounted over said stationary rod, two oppositely positioned arms carried by said hub, one of said arms carrying the said movable rod, reciprocating means operatively connected to the other of said arms, said actuating means being operatively connected to said reciprocating means.

5. In an embroidering apparatus of the class in which there are a plurality of embroidery needles operatively movable between operative and inoperative positions and provided with means for drawing threads along predetermined thread paths from spool means, thread tension control means interposed between said needles and said spool means, said control means comprising a plurality of pairs of discs arranged in a row extending longitudinally of the apparatus, the two discs of each pair having coacting gripping portions positioned and proportioned to engage therebetween a thread operatively extending from said spool means to one of said needles along one of said paths, said discs of each pair being movable relative to each other between predetermined thread-releasing and thread-pressing limiting positions, and actuating means operatively connected to said pairs of discs for simultaneously moving them between their said limiting positions in predetermined timed relation to the operative movements of said needles, preliminary tension release means disposed between said spool means and said tension control means, said release means comprising two rods extending longitudinally of the apparatus and positioned and proportioned to slidably receive over one of said rods and under the other of said rods threads operatively extending from said spool means to all of said pairs of discs, one of said rods being movable between two limiting positions, one of the said positions being more proximate to said spool means than the other, and actuating means operatively connected to said movable rod for moving it between said last-mentioned limiting positions in predetermined timed relation to the operative movements of said needles, whereby there will be alternate tightenings and slackenings of the threads operatively engaged by said rods in said timed relation with said needle movements.

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