Jan. 8, 1952 E. P. TURNER 2,582,211

TENSION RELEASING DEVICE FOR SEWING MACHINES

Filed May 20, 1950 2 SHEETS—SHEET 1

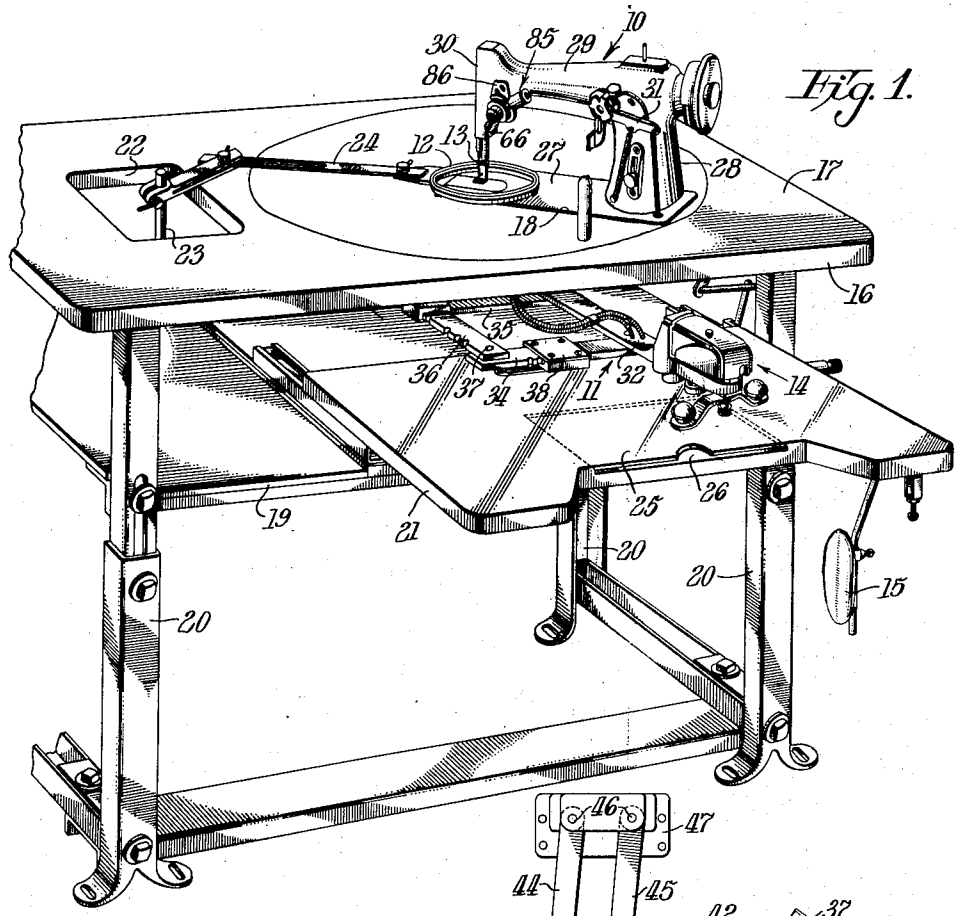

Fig. 1.

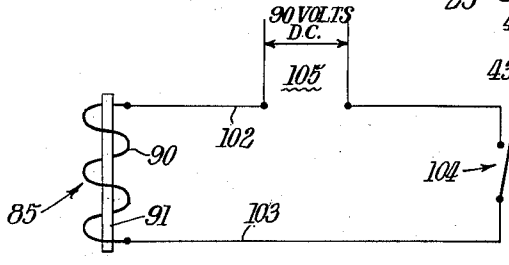

Fig. 2.

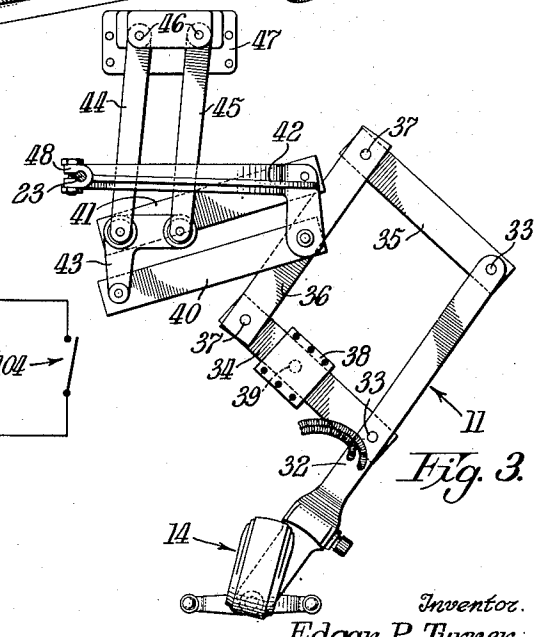

Fig. 3.

Witness
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Fig. 4.

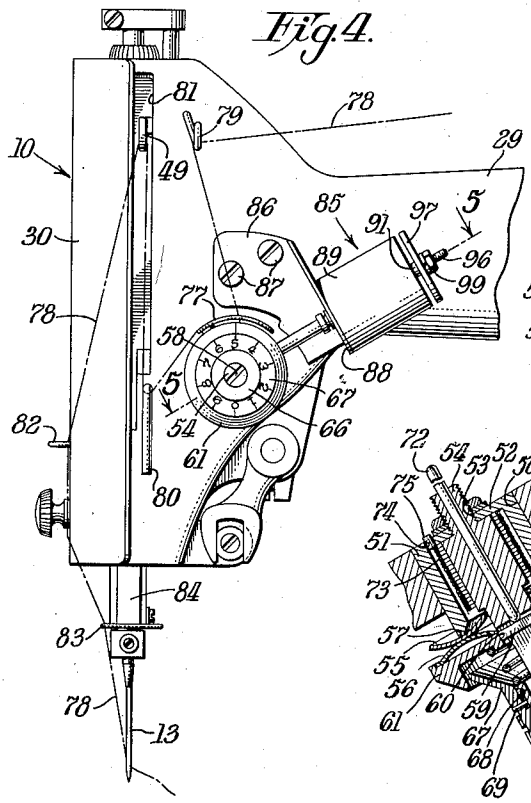


Fig. 6.

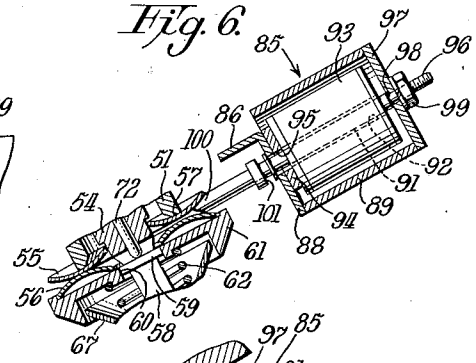


Fig. 5.

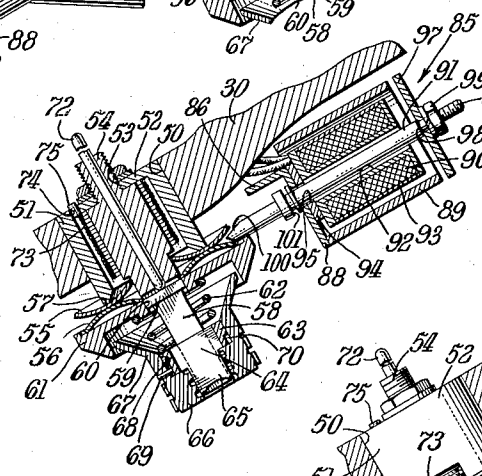
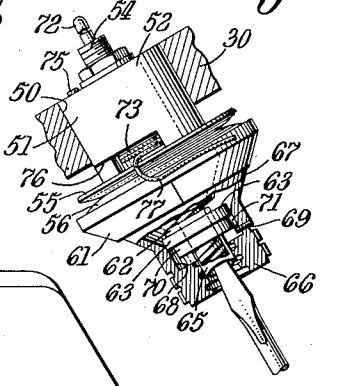


Fig. 7.



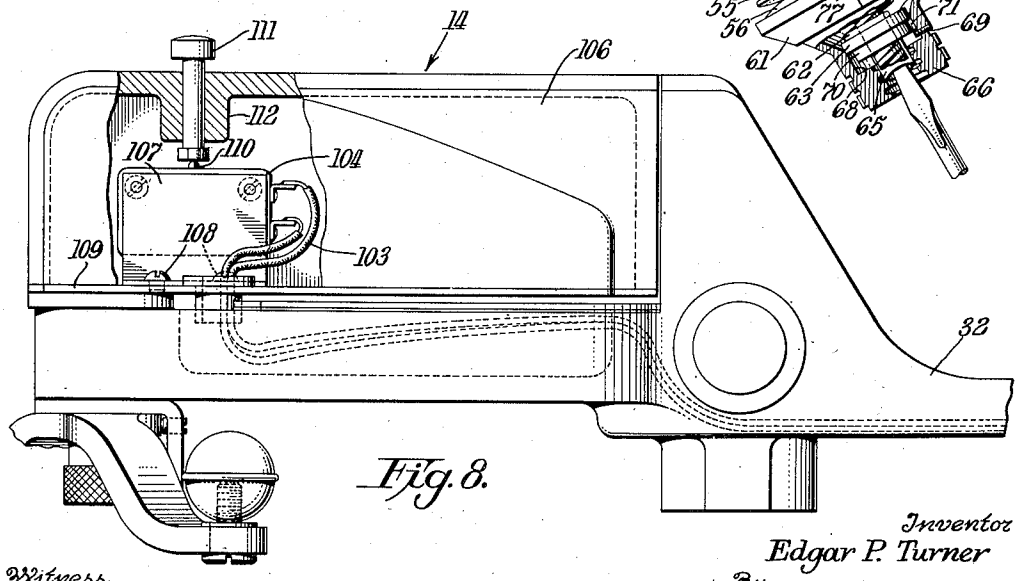


Fig. 8.

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UNITED STATES PATENT OFFICE

2,582,211

TENSION RELEASING DEVICE FOR SEWING MACHINES

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Application May 20, 1950, Serial No. 163,199

3 Claims. (Cl. 112—254)

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This invention relates to sewing machines of the type employing tensioning means for the sewing thread and has for an object to provide an improved device for rendering such tensioning means temporarily ineffective for tensioning the thread.

The further object of the present invention is to provide a sewing machine with a thread tension device having a tension releasing means which is so designed that it may be conveniently operated from a position remote from the sewing machine proper.

A still further object of the present invention is to provide an improved thread tension controlling means for an organized pantograph-equipped embroidering machine of the type which is adapted for placing monograms on sheets, towels, garments and the like goods.

With the above and other objects in view, as will hereinafter appear, the invention comprises the devices, combinations and arrangements of parts hereinafter set forth and illustrated in the accompanying drawings of a preferred embodiment of the invention from which the several features of the invention and the advantages attained thereby will be readily understood by those skilled in the art.

In the drawings:

Fig. 1 represents a perspective view of an embroidering machine in which the present invention is employed.

Fig. 2 represents a wiring diagram for the solenoid which operates the present tensioning device.

Fig. 3 represents a top plan view of a pantograph unit which is employed in conjunction with the present sewing machine.

Fig. 4 represents a fragmentary front elevational view of a sewing machine head on which is mounted the present tensioning device.

Fig. 5 represents, on an enlarged scale, a sectional view taken substantially along the line 5—5 of Fig. 4; which view illustrates the tension releasing device in its inoperative position.

Fig. 6 represents, on an enlarged scale, a sectional view taken substantially along the line 5—5 of Fig. 4; which view illustrates the tension releasing device in its operative position.

Fig. 7 represents, on an enlarged scale, a side elevation view, partly in section, of the present tensioning device as removed from the sewing machine head.

Fig. 8 represents, on an enlarged scale, a view, partly in section, of the stylus head which is em-

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ployed on the present panograph unit illustrated in Figs. 1 and 3.

Referring to the drawings, the present invention may be employed with an embroidery mechanism having a zigzag type sewing machine 10 and a manually controlled pantograph mechanism 11 of which one end portion carries an embroidery hoop 12 for presenting beneath the vibratory needle 13 of the sewing machine the work to be monogrammed. The other end portion of the pantograph mechanism carries a stylus, generally designated by the numeral 14, which the operator employs for tracing a monogram stencil or pattern which may be presented beneath the pantograph. The movements of the embroidery hoop are directly controlled by the operator through the pantograph and thus the monogram formed in the work by the sewing machine corresponds to the stencil or pattern. For a more detailed description of a related pantograph and sewing machine unit, reference may be had to the U. S. patent of Corrall, No. 1,328,821, January 27, 1920.

A knee-shift lever 15 is provided for enabling the operator to vary the amplitude of lateral needle vibration so that the width of zigzag seams may be altered during the stitching operation to the end that the monogram outline may be of divers widths.

Referring particularly to Fig. 1, the present invention is incorporated in a table 16 having a substantially flat upper surface 17 which is provided at one end portion with a conventional sewing macine cut-out 18 for receiving therein the above noted zigzag sewing machine generally designated by the numeral 10.

Mounted directly beneath the table top and upon a shelf 19 carried by the table legs 20, 20 is a horizontally disposed pantograph-supporting apron 21 which extends outwardly from beneath the table top in order to expose the stylus-supporting end of the pantograph unit. This stylus-supporting end of the pantograph mechanism is carried directly upon the outwardly protruding apron 21 while the other end portion thereof is carried by the shelf 19 at a location beneath the table level and in vertical alignment with an opening 22 formed within the table surface. An arm 23 extends upwardly from the pantograph and through the table opening 22 and is provided with a horizontal limb 24 which extends over the table so as to support the embroidery hoop 12 directly over the sewing machine throat-plate and beneath the needle-bar mechanism.

The upper surface 25 of the protruding apron

may be formed from a flat piece of transparent material directly beneath which, and in a rectangular pocket 26 formed in the apron, a pattern or stencil sheet may be positioned. The stylus head 14 provided on the outwardly protruding end portion of the pantograph may be tracked about a given pattern carried in the apron pocket 26 so as to effect a corresponding movement of the embroidery hoop 12 to the end that the sewing machine will produce a monogram of predetermined shape.

As hereinabove noted, the present apparatus includes a sewing machine 10 of the so-called zigzag type which comprises a flat bed 27 affording a work-support and from one end of which rises a hollow standard 28 of a bracket-arm 29 over-hanging the bed-plate and terminating in a needle-bar carrying head 30.

The present sewing machine is of a conventional zigzag type which includes a vertically reciprocatory and laterally vibratory needle 13 which is adapted to form the zigzag stitches in work material. Machines of this type employ means for varying the amplitude of lateral needle vibration from zero to a maximum amount and in the machine illustrated there is provided a lever arm 31 for this purpose. For a more complete description of this zigzag type sewing machine with its accompanying vibratory needle-bar control, reference may be had to the U. S. patent of Eames, No. 2,005,673, June 18, 1935.

The above noted pantograph device 11 comprises a manually movable arm 32 which is pivotally secured by means of pins 33, 33 to a pair of link arms 34 and 35, each of which latter elements are, in turn, pivotally secured to a third link arm 36 by means of pins 37, 37 thereby to form a conventional pantograph structure. Embracing the link arm 34 is a collar member 38 which is pivotally mounted upon the apron by means of a pin 39. From this it will be understood that movement of the main arm 32 will function to shift the various pantograph links relative to each other and the entire unit will pivot about the pin 39 in the usual fashion.

Attached to the above described main portions of the pantograph mechanism is an auxiliary mechanism which includes a pair of parallel arms 40 and 41, each of which is pivotally secured at its one end portion to an arm 42 as by means of appropriate pins. The other end portion of each of the arms 40 and 41 is pivotally secured to one limb of a bell-crank lever 43 by means of an appropriate pin element. The other limb of the bell-crank lever 43 is pivotally secured to the end portions of each of a second pair of parallel arms designated by the numerals 44 and 45, which arms are pivotally secured at their other end portions by means of pins 46, 46 to a block 47 which is fixedly secured to the shelf member 19.

The free end portion of the arm 42 is provided with a suitable clamping mechanism 48 for the purpose of adjustably carrying the above noted upstanding arm 23 which projects upwardly through the table aperture 22 so as to support upon its upper end portion the above noted work-holding member 12.

From the above, it will be readily appreciated that as the stylus head 14, which is carried by the free end portion of the pantograph 11, is tracked about the lines of a pattern drawing disposed within the apron pocket 26, the hoop element 12 will faithfully reproduce the motions of the stylus head all in a conventional manner.

The present stylus head has incorporated therein means for giving the operator a visual indication of the amplitude of lateral needle vibration. Briefly stated, this means produces upon a pattern drawing a light spot in the form of an elongated beam, the length of which is made to vary in accordance with the variations in the needle throw amplitude. Thus, the operator at all times will be advised visually as to the width of the monogram which the sewing machine is producing upon a work-piece. The details of the above described embroidering machine, including the zigzag sewing machine head and the pantograph, along with the pantograph-supporting table, do not form a part of the present invention and thus a detailed explanation of this device is not contained herein. For a more complete disclosure of the present embroidering apparatus, reference may be had to a co-pending United States patent application of Turner and Sailer Serial No. 160,486, filed May 6, 1950, entitled "Design Reproducing Apparatus and Stylus Unit Therefor."

As hereinabove noted, the present embroidering device is adapted to produce on a piece of work material various monograms which the operator produces one by one, and in most cases these monograms are entirely unconnected with each other. Thus, it is necessary for the operator to shift the work relative to the sewing machine before making successive monograms. Those skilled in the art will readily appreciate that the work material cannot be moved relative to the sewing machine head without first releasing the needle-thread tension in order to prevent the moving work from breaking the needle thread or perhaps the needle itself. The present invention contemplates the provision of means whereby the operator may readily release the needle-thread tension before shifting the work. Figs. 4, 5, 6 and 7 particularly illustrate the present tensioning means. Referring first to Figs. 4 and 5, the sewing machine head 30 employs the usual type of reciprocatory needle 13 as well as a conventional reciprocatory needle-thread take-up arm 49. The sewing machine head is formed with an aperture 50 which receives a hollow cylindrical shank 51 of a needle-thread tension device, which shank may be suitably secured within the aperture so as to fix the tension device in working position on the sewing machine head.

The shank 51 is of hollow cylindrical form and has an inner end wall 52 formed with a central aperture 53 through which passes the reduced and threaded inner end portion of a hollow stem 54 which is tightly fixed within the base portion itself. Surrounding the stem 54 are the opposed tension disks 55 and 56, of which the disk 55 rests against the rim 57 of the hollow shank member 51. The outer end portion of the stem 54 is formed with a longitudinal diametrical slot 58 through which passes a diameter bar 59 crossing the central stem-embracing aperture 60 in a shallow base cup 61 which is pressed against the tension disk by a beehive spring 62.

The spring 62 is engaged at its outer end by a ring-shaped member 63 preferably in the form of a washer formed with a diameter bar 64 having a forwardly extending stem portion 65 disposed in the slot 58 of the stem. The washer 63 is engaged or backed by a dial nut 66 having an outwardly flaring conical skirt 67 of which the rim is slightly smaller than and is received within the rim of the base cup 61. The skirt 67 is preferably formed integral with and non-adjustable relative to the screw-threaded head

of the nut and it overhangs and encloses the major portion of the beehive spring **62**. The nut **66** is preferably screw threaded on the split stem **54** and has an inner cylindrical recess portion **68** which receives the washer **63** and into which cylindrical recess portion projects a stop-pin **69** fixed in the nut **66**. (See Fig. 7.) The stop-pin **69** normally works in a clearance groove **70** in the washer **63** and this clearance groove is interrupted at one point in its clearance or circumference by a stop wall **71** (see Fig. 7) which limits the turning movement of the nut to one rotation during which the spring is stressed from minimum to maximum requirement; the strength and stiffness of the spring and the pitch of the screw threads on the stem for the nut being proportioned to attain this result. The washer **63** thus constitutes a stop between the nut **66** and the spring **62** which stop is engaged by the pin **69** of the nut.

There is disposed within the hollow stem **54** the usual presser control tension release pin **72** which engages the diameter bar **59** of the base cup and relieves the tension disks of the pressure of the spring when the usual presser-bar foot, not herein shown, is lifted.

Surrounding the stem **54** within the shank **51** is a check-spring **73** of which one end extends through a slot **74** in the end wall of the shank member and is formed with a loop **75** to anchor it to the shank **51**. The other end of the check-spring extends outwardly through a slot **76** in the rim of the shank **51** and is formed with the usual thread-engaging loop **77**.

The base cup **61** is preferably provided with an index mark and the skirt **67** of the nut **66** is graduated so that when the user has the tension correctly adjusted for a certain grade of work, the figure on the dial may be noted and the desired tension immediately restored whenever desired.

For a more detailed explanation and description of the present tension device, reference may be had to the U. S. patent of D. H. Chason, No. 1,820,119, August 25, 1931.

As may be particularly noted in Fig. 4, the needle-thread, generally designated by the numeral **78**, is led from a source of supply, not herein shown, through a stationary loop member **79** carried by the sewing machine head and then to the tension device in the usual fashion. More specifically, the thread **78** is led between the tension disks **55** and **56** and about the stem **54** and then up through the wire loop **77** before being led downwardly to a second stationary arm **80** carried by the sewing machine head. From this latter arm **80** the thread is led directly to the usual take-up member **49** which projects through a slot **81** provided in the sewing machine head. Thereafter, the thread is directed downwardly through a third stationary loop member **82** and then to a fourth member **83** carried by the needle-bar **84** after which the thread is directed to the needle **13**, all in a conventional fashion. Means, not herein shown, are provided in the sewing machine head for actuating the tension release pin **72** in response to the lifting movements of the usual presser-bar lifter mechanism.

As hereinabove noted, it is a primary object of the present device to provide an improved means, operable from a position remote from the sewing machine proper, for releasing the tension on the needle-thread. Figs. 4, 5, 6 and 8 particularly illustrate this improved device. Briefly stated, the present device comprises a solenoid

which is carried by the sewing machine head and which is adapted to be actuated so as to spread apart the tension disks **55** and **56** thereby to relieve the tension on the needle thread **78**. A switching means is carried within the stylus head **14** and is connected by flexible conductors to a suitable source of electrical energy and to the solenoid so that an operator may energize the solenoid by merely pressing the switch. Thus, the operator, from a position remote from the sewing machine head, may operate the tension release device while operating the stylus head portion of the pantograph.

The present solenoid device is generally designated by the numeral **85** and comprises a bracket **86** which is secured directly to the sewing machine head as by means of screws **87, 87**. This bracket is provided with an ear portion **88** which has suitably secured thereto, as by means of solder, a cylindrical shaped casing **89** which houses the solenoid proper. As may be best seen from Fig. 5, the solenoid includes a wire-wound coil **90** and an armature or tension release pin **91** which is slidingly disposed within a cylindrical aperture **92** provided lengthwise of the wire coil. More specifically, the solenoid coil **90** is carried within a cylindrical casing **93** which is suitably secured to a disk member **94** which, in turn, is secured to the ear portion **88** of the bracket **86** as by means of soldering.

The solenoid armature pin **91** is suitably mounted within an aperture **95** formed both in the ear portion **88** of the bracket **86** as well as in the disk member **94**. The one end portion of the armature pin **91** is provided with a reduced shank, the distal end portion of which is threaded as at **96**. Mounted on this reduced shank of the armature pin is a stop disk **97** which is held against the armature pin shoulder **98** by means of a nut **99** positioned over the threaded end portion of the armature shank. The other end portion of the armature pin is pointed, as at **100**, while an intermediate portion of the pin is provided with a stop shoulder **101**.

Referring particularly to Figs. 4 and 5, it is to be noted that the bracket **86**, carrying the solenoid **85**, is so disposed relative to the above described tension device that its armature pin **91** is located at right angles to the stem **54** of the tension device. Furthermore, the pointed end portion **100** of the armature pin is normally disposed between the outer flange portions of the two tension disks **55** and **56**. As may be noted in Fig. 5, the beehive spring **62** of the tension unit is sufficiently strong normally to force the tension disks together and thereby preclude the entrance of the armature pin therebetween. However, whenever the solenoid is electrically energized, the armature pin **100** will be forced toward the tension device, thereby to open the two tension disks and release the needle thread. Fig. 6 illustrates the tension disks as being forced open by means of the armature pin **100**, which, when the solenoid is energized, is forced toward the shank **54**. From this figure, it will be observed that the disk **97**, carried by the right-hand end portion of the solenoid armature pin, acts as a stop which prevents the armature pin from moving beyond a predetermined amplitude.

Referring particularly to Fig. 2, there is shown a wiring diagram which illustrates the solenoid coil **90** and the shiftable armature pin **91**. This solenoid coil is adapted to be connected to a suitable source of electrical energy, such as 90 volts D. C., by means of suitable conductors **102**

and 103. A switch 104 is connected between one leg of the electrical supply source 105 and the solenoid coil in a conventional fashion for the purpose of selectively energizing and de-energizing the solenoid.

As hereinabove noted, the switch 104 for energizing the solenoid is, in the present invention, carried in the stylus head of the pantograph unit in a manner as may be best observed from Fig. 8. Briefly stated, the manually movable arm 32 of the pantograph carries the stylus head 14 which includes a hollow box-like member 106 in which the switch for energizing and de-energizing the solenoid is mounted. This switch member 104 may be of a conventional design and is mounted within a case 107 secured by screws 108 directly to the platform portion 109 of the stylus head. Projecting upwardly through the switch case 107 is a spring-biased actuating pin 110 which is adapted to be engaged by a control pin 111 which is in the form of a cylindrical member slidingly mounted within a boss 112 provided in the stylus head cover.

The main actuating pin 110 of the switch is, in a conventional fashion, designed to be spring biased upwardly so that the solenoid is normally de-energized. From this, it will be appreciated that as soon as the operator depresses the pin 111 the switch actuating pin 110 will be likewise depressed to the end that the switch 104 will be closed for the purpose of connecting the solenoid coil 90 to the source of electrical energy. As soon as the solenoid is thus energized, the armature pin 91 will be forced outwardly so that its pointed end portion 100 will project between the disk elements 55 and 56 of the tension unit to the end that the tension will be removed from the needle thread. As hereinabove pointed out, as soon as the tension is removed from the needle thread, the operator may maneuver the pantograph mechanism so as to shift the work relative to the sewing machine head preparatory to producing another monogram. Of course, during this maneuvering of the work material, the operator keeps the pin 111 depressed so that the tension will be relieved during the entire maneuvering operation. However, as soon as the work is repositioned beneath the sewing machine needle the pin 111 may be released so that the solenoid will be de-energized to the end that the tension device will again exert a proper pressure upon the needle thread.

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

1. A thread-tension device for sewing machines comprising a pair of thread-engaging elements, spring means for normally biasing said thread-engaging elements together so as to apply a tension upon a thread trained between such elements, an electrical solenoid including a coil and an armature shiftable lengthwise within said coil, said armature being disposed adjacent said thread-engaging elements and being adapted to be forced to move endwise of itself in opposition to the action of said spring means in response to the energization of said solenoid thereby to relieve the pressure between said thread-engaging elements, and a switch connected to said solenoid and adapted to be connected to a source of electrical energy so as to be capable of selectively energizing and de-energizing said solenoid.

2. A thread-tension device for sewing machines comprising a pair of thread-engaging elements, spring means for normally biasing said thread-engaging elements together thereby to apply a tension upon a thread trained between such elements, an electrical solenoid including a coil and an armature shiftable within said coil, said armature being disposed adjacent said thread-engaging elements so as to be shiftable directly therebetween in opposition to the action of said spring means whenever said solenoid is energized, and a switch connected to said solenoid and adapted to be connected to a source of electrical energy so as to be capable of selectively energizing and de-energizing said solenoid.

3. In a sewing machine tension device, a shank, a pair of apertured thread-engaging disks slidably mounted upon and lengthwise of said shank, a tension-release pin shiftably mounted within and lengthwise of said shank, a spring surrounding said shank for biasing said disks together and for biasing said tension-release pin in a direction lengthwise of said shank, an electrical solenoid including a coil and an armature shiftably mounted within said coil, said armature being disposed substantially at right angles to the longitudinal axis of said shank and in alignment with the plane of separation between said disks so that whenever the coil is energized the armature will be shifted lengthwise of itself and between said disks, and a switch connected with said coil and adapted to be connected to a source of electrical energy so as to be capable of selectively energizing and de-energizing said coil.

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