

Sept. 8, 1959

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2,902,960

THREAD TENSION RELEASING DEVICES FOR SEWING MACHINES

Filed Feb. 14, 1958

3 Sheets-Sheet 1

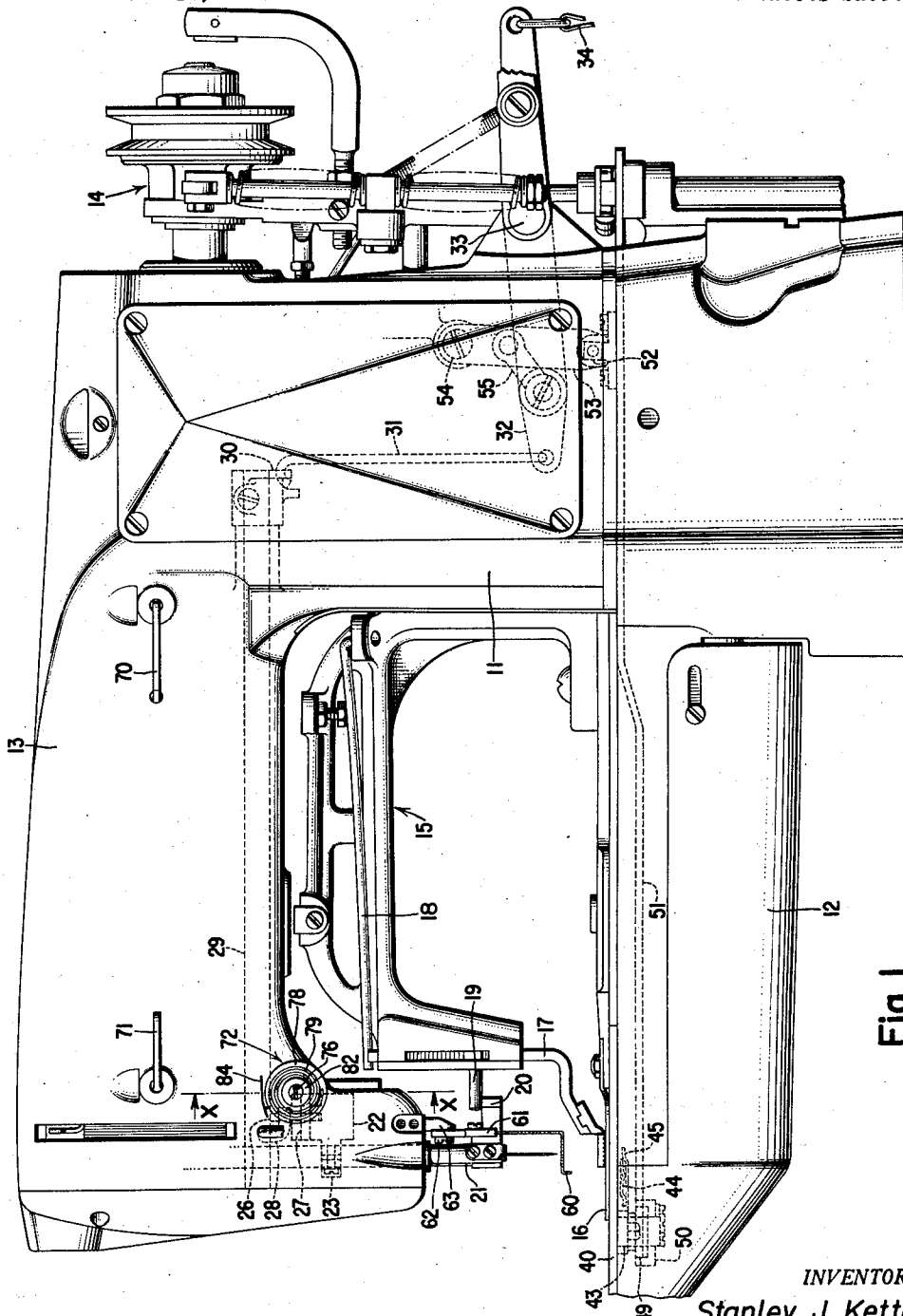


Fig. 1

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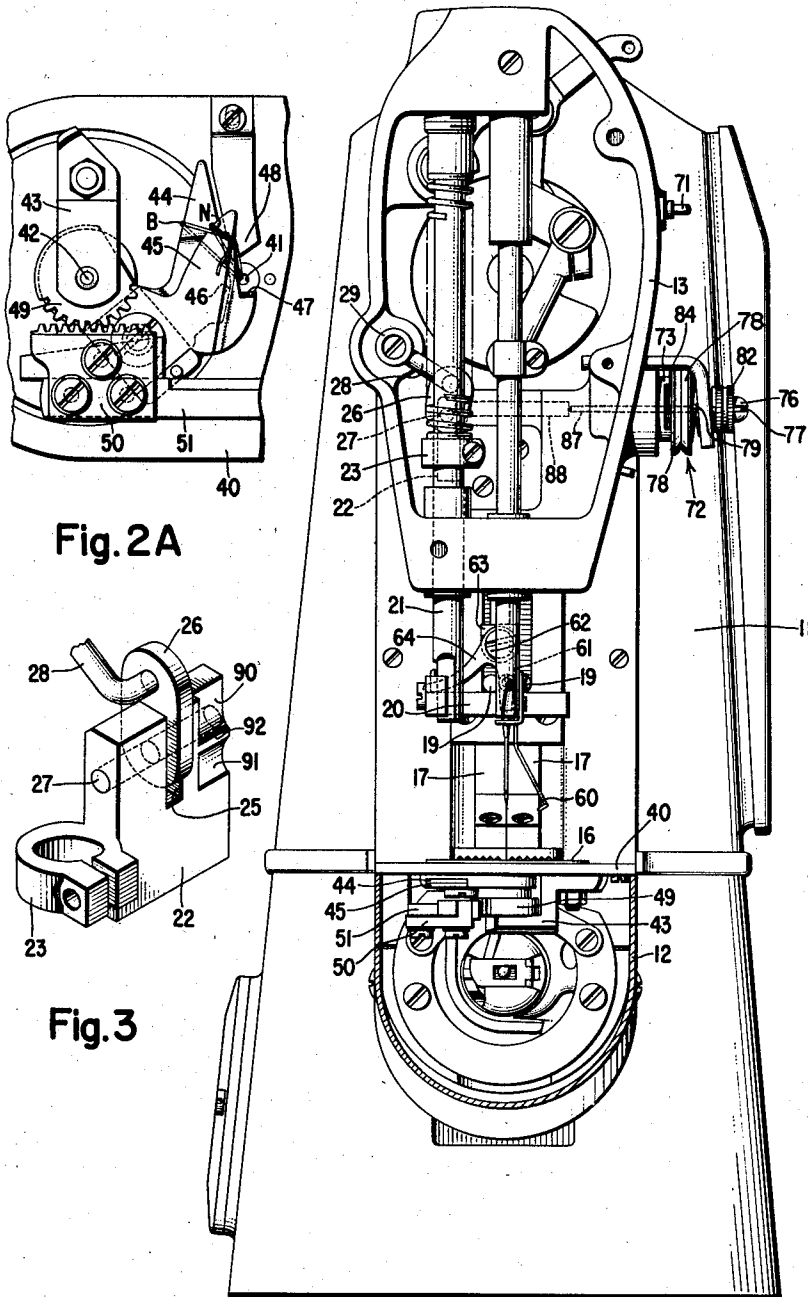


Fig. 2A

Fig. 3

Fig. 2

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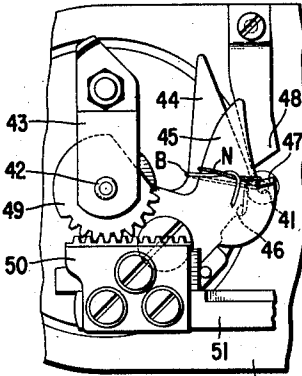


Fig. 4A

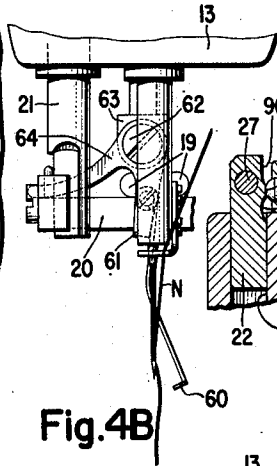


Fig. 4B

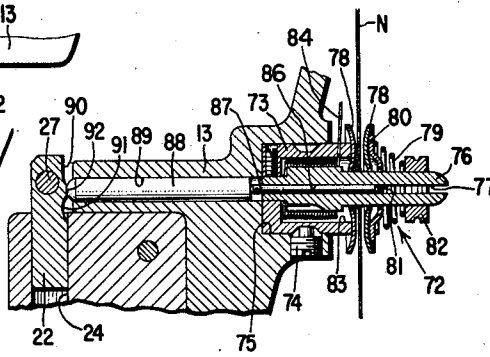


Fig. 4

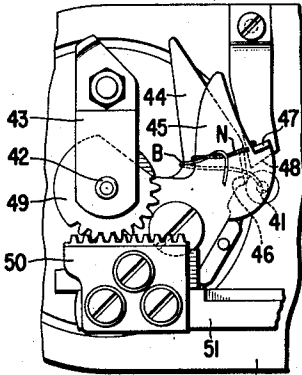


Fig. 5A

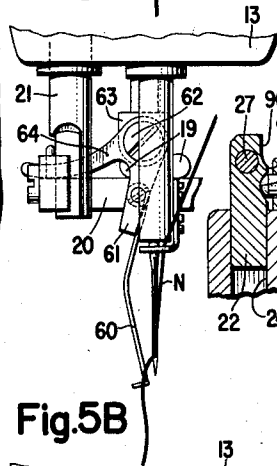


Fig. 5B

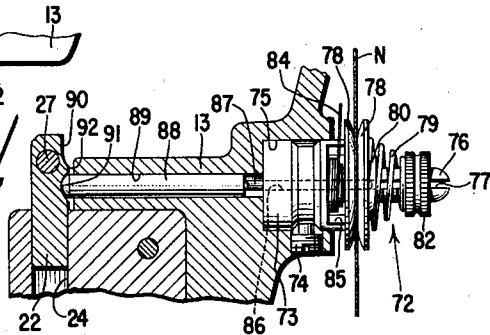


Fig. 5

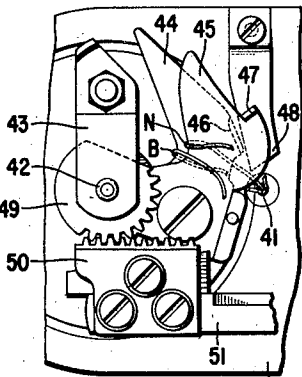


Fig. 6A

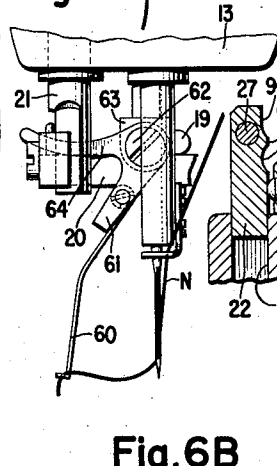


Fig. 6B

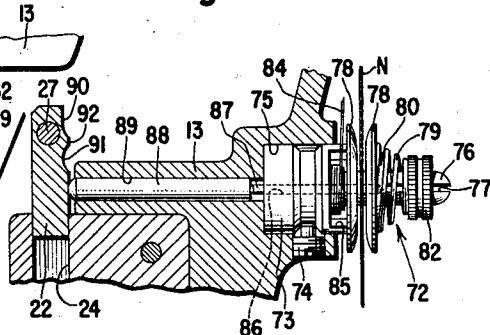


Fig. 6

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2,902,960

## THREAD TENSION RELEASING DEVICES FOR SEWING MACHINES

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Application February 14, 1958, Serial No. 715,378

2 Claims. (Cl. 112—252)

This invention relates to sewing machines, and more particularly, to a releasing mechanism for the needle thread tension device of a lock stitch sewing machine.

It is an object of this invention to provide a thread tension releasing mechanism which operates to release, re-establish, and again release the thread tensioning device during the raising of the usual work clamping member at the termination of the stitching operation.

It is another object of this invention to provide a thread tension release mechanism of the above character which is operated in response to motion of a single member on the the sewing machine.

It is also an object of this invention to provide a thread tension release mechanism capable, during the raising of the work-clamp or the like, of successive releases of a thread tension device in which reestablishment of the tension between successive releases occurs in timed relation with the operation of thread severing and the needle thread wiping instrumentalities so as to ensure that the thread wiper will draw the free end of needle thread out of the work rather than drawing thread from the supply.

With the above and additional objects and advantages in view as will hereinafter appear, this invention comprises the devices, combinations, and arrangements of parts hereinafter described and illustrated in the accompanying drawings of a preferred embodiment in which:

Fig. 1 represents a side elevational view of a sewing machine having the tension release mechanism of this invention applied thereto,

Fig. 2 represents an end elevational view of the sewing machine of Fig. 1 with the end cover plate removed to expose the mechanism therein, and illustrating the position of the parts at the completion of a cycle of stitching operation,

Fig. 2A represents a top plan view of the thread trimming mechanism within the bed of the machine including the needle and bobbin thread thereon in the position of the parts illustrated in Fig. 2,

Fig. 3 is a perspective view of the guide block for the clamp lifting slide rod, illustrating the tension releasing cam track formed thereon.

Figs. 4, 5 and 6 represent enlarged cross sectional views of the thread tension and tension release devices in the bracket arm head of the sewing machine taken substantially along line x—x in Fig. 1 showing in Fig. 4, the first release of the tension; in Fig. 5, the reestablishment of the tension; and in Fig. 6, the final release of the tension,

Figs. 4A and 4B represent, respectively, a top plan view of the thread trimming mechanism and an end elevational view of the thread wiper in the position these parts will occupy when the tension release mechanism is in the position illustrated in Fig. 4,

Figs. 5A and 5B are views similar to Figs. 4A and 4B but with the parts illustrated in the positions occupied when the tension release mechanism is in the position illustrated in Fig. 5 and

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Figs. 6A and 6B are views similar to Figs. 4A and 4B but with the parts illustrated in the positions occupied when the tension release mechanism is in the position illustrated in Fig. 6.

Referring to the drawings, the sewing machine illustrated in Figs. 1 and 2 to which this invention is applied is of the type described in detail in the co-pending U.S. patent application of Hale et al. Serial No. 537,704, filed September 30, 1955, now Patent No. 2,822,771, granted February 11, 1958, to which reference may be had for a complete description thereof. For the purpose of this invention the sewing machine comprises a frame including a standard 11, a work supporting bed 12 and a bracket arm 13 overhanging the bed. The drive of the sewing machine occurs through a stop motion mechanism 14 which renders the operation of the machine cyclic and, therefore, especially suitable for tacking, ornamenting, or article attaching.

The sewing machine is fitted with a work clamp including a frame 15 to which is affixed a lower jaw plate 16 opposed by a pair of upper jaw members 17 carried in the frame 15 and biased downwardly by leaf springs 18. So that the work clamp may be opened to remove and replace work between cycles of sewing operation, each of the upper jaw members is provided with a pin 19 which pins overlie a bracket 20 fast at the lower extremity of a slide rod 21 journaled vertically in the bracket arm 13 of the sewing machine. Clamped to the slide rod within the bracket arm is a guide block, indicated generally as 22, the guide block being preferably formed with a split clamp 23 for this purpose. The guide block extends into a vertical channel 24 formed in the bracket arm and serves in one capacity as a means for preventing turning of the slide rod 21. The guide block as best illustrated in Fig. 3 is slotted, as 25, to accommodate a link 26 which is pivoted to the guide block by a pin 27 and is pivotally connected in turn to the free extremity of a rock arm 28 fast on one extremity of a rock shaft 29 journaled along the bracket arm. A rock arm 30 fast on the opposite extremity of the rock arm is connected by means of a pivoted link 31 to a clamp lifting lever 32 fulcrumed at 33 on the machine standard. A chain 34 connected to the lever 32 may be directed to a treadle, knee shifter, or the like to facilitate opening of the clamp by the machine operator.

The work supporting bed 12 of the sewing machine is fitted with a throat plate 40 provided with a needle aperture 41 as is conventional in sewing machines. A thread trimming mechanism carried by the throat plate is of the type which is substantially similar in construction and manner of operation to that disclosed in the United States Horton Patent No. 807,676, December 19, 1906 to which reference may be had. Pivotally mounted beneath the throat plate on an axle 42 journaled between the throat plate and a bracket 43 are a pair of thread engaging and cutting fingers 44 and 45 which are secured in fixed relation to each other. The finger 44 is disposed between the finger 45 and the throat plate and extends to a position in advance of the free extremity of the finger 45. The finger 44 is formed with a sharpened edge 46 extending substantially circumferentially with respect to the axle 42 and is thus adapted to sever a thread loop which is drawn along the finger 44. The finger 45 is formed with a sharpened edge 47 extending substantially radially with respect to the axle 42 and disposed to cooperate with a ledger blade 48 fixed beneath the throat plate to sever thread therebetween. Fixed on the axle 42 is a gear segment 49 meshing with a rack 50 carried by a slide rod 51 arranged lengthwise in the sewing machine bed. A block 52 is pivoted to the slide rod within the standard 11 is embraced by the bifurcated extremity of a lever 53 fulcrumed at 54 within the machine standard. The lever 53 is actuated to op-

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erate the thread trimming mechanism by means of a link 55 pivoted at one extremity to the lever 53 and at the other extremity to the clamp lifting lever 32.

The sewing machine is fitted with a thread wiper which serves to engage and carry the needle thread out of the work after the thread has been cut at the completion of each cycle of machine operation. The thread wiper comprises a wire thread engaging member 60 extending from one arm 61 of a bell crank lever fulcrumed at 62 to a support block 63 fixed to depend from the bracket arm 13 of the sewing machine. The other arm 64 of the bell crank overlies the clamp lifting slide rod bracket 20 so that the thread engaging wire member 60 will be moved beneath and across the path of the sewing needle when the work clamp is opened.

Referring to Figs. 1 and 2, the bracket arm 13 of the sewing machine is fitted with a pair of thread guides 70, 71 through which a needle thread is directed from a source of supply to a friction disk tension device, indicated generally as 72. The tension device, shown in greater detail in Figs. 4, 5 and 6, comprises a base member 73 fixed by means of a set screw 74 in a bore 75 in the bracket arm. A stud 76 which extends outwardly from the base member 73 is formed with a transverse slot 77 and is externally threaded at its free extremity. Disposed loosely on the stud are a pair of friction disks 78 between which the needle thread is directed. A coil spring 79 on the stud bears against a pressure plate 80 which is seated against the outer friction disk and has a diameter bar 81 extending into the slot 77 of the stud. A nut 82 on the threaded extremity of the stud serves to adjust the spring tension acting to bias the friction disks against the base member.

The tension base member 73 is counterbored, as at 83, to accommodate a check spring 84 which is anchored to the stud 76 and extends outwardly through a radial slot 85 in the base member.

The stud 76 has a bore 86 in which is accommodated a tension release pin 87 which contacts the diameter bar 81 of the pressure plate 80. A plunger 88 disposed in a bore 89 in the bracket arm engages the tension release pin at one extremity and at the other extremity bears against the guide block 22. The guide block is formed with two notches 90, 91 and with a land 92 therebetween, all in the path of engagement of the plunger 88 with the guide block so that when the work clamp is closed, as illustrated in Figs. 1 and 2, the plunger will seat in the notch 90 permitting the tension coil spring to bias the friction disks 78 together. As opening of the work clamp is initiated, and as illustrated in Fig. 4, the plunger being engaged by the land 92 between the notches will release the thread tension by shifting the pressure plate and coil spring away from the friction disks. Continued opening of the work clamp, as illustrated in Fig. 5, will result in the plunger entering the notch 91, again establishing the coil spring pressure on the friction disks of the thread tension device. Finally, as illustrated in Fig. 6, when the work clamp is completely opened, the plunger will be engaged by the guide block beyond the notch 91 and the tension device will be released for the second time and remain so while the work clamp remains opened.

Referring to Fig. 2A, which illustrates the position of the parts of the trimming mechanism at the completion of a sewing cycle, the thread engaging fingers 44 and 45 will have been shifted across the needle aperture by mechanism in the sewing machine not shown in the present drawings but described in the above referred to Horton patent. This initial movement of the thread engaging fingers will occur during the last stitch of each cycle, the finger 44 moving across the needle aperture before needle penetration and thus engaging only the bobbin thread B, and the finger 45 moving across the needle aperture after needle penetration and engaging only the needle thread N.

Figs. 4, 5 and 6 illustrate the thread tension device and tension releasing mechanism in three successive stages during the opening of the work clamp. Figs. 4A and 4B

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illustrate the thread trimming mechanism and the thread wiper, respectively, in the positions occupied when the tension release mechanism is in the stage illustrated in Fig. 4. In a like manner Figs. 5A and 5B correspond in timed relation with Fig. 5 and Figs. 6A and 6B with Fig. 6.

Figs. 4, 4A and 4B illustrate that, when the thread tension device is first released, the threads B and N are not yet severed by the trimming mechanism and the thread wiper 60 has not yet come in contact with the needle thread. The purpose, therefore, of the initial release of the thread tension is to provide for relaxation of the check spring 84. The check spring will thus relax from its stressed stitch setting position by drawing an additional amount of thread through the tension disks from the guides 70 and 71 and thence from the thread supply. Since this relaxation of the check spring occurs before the threads are severed, all possibility of the check spring drawing the severed needle thread back through the eye of the needle is obviated.

As illustrated in Figs. 5, 5A and 5B, the threads B and N are severed before or during reestablishment of the needle thread tension device. The needle thread cutting edge 45 and ledger blade 48, however, will operate to sever the thread in complete independence upon the tension existing in the thread. The purpose of the reestablishment of the tension is to prevent the thread wiper from drawing thread from the supply. As illustrated in Fig. 5B, reestablishment of the tension coincides with the initial engagement of the thread wiper 60 with the needle thread. The tension device thus influences the thread wiper to draw the severed end of needle thread out the work.

At the completion of the clamp opening operation, the parts will be disposed as illustrated in Figs. 6, 6A and 6B with the threads B and N severed, the severed end of the needle thread wiped out of the work and carried to one side by the thread wiper, and the thread tensioning device opened to release the tension on the needle thread so that the sewing machine may if needed be rethreaded.

It is important in proper operation of a cyclically actuated sewing machine that accurate control be maintained of the free length of needle thread extending from the needle eye at the beginning of each cycle. An abnormally long thread length leaves an objectionally long tag end of thread in the succeeding tack of stitches and a short thread length can result in failure to produce stitches in the succeeding cycle. The thread tension releasing mechanism of this invention provides a novel and highly exacting control for the length of needle thread for the beginning of each new stitching cycle. Relaxing of the thread tension check spring is accomplished so that the movement of thread necessary for such relaxation must come from the thread supply and cannot act abnormally to shorten the thread length from the eye of the needle. This tension releasing mechanism cooperates with the thread wiper to insure that the needle thread end will be wiped from the preceding tack thus to prevent the thread end from remaining in the work where it would be in danger of being pulled out to an abnormally long length when the operator removes the work from the sewing machine.

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

1. In a sewing machine having a work support, an endwise reciprocating threaded needle carried on one side of said work support, thread trimming mechanism effective to sever the needle thread at the opposite side of said work support closely adjacent a work fabric being stitched thereby, a thread wiper disposed to act upon the needle thread between the needle and the work fabric, mechanism for actuating in sequence the thread trimming mechanism and the thread wiper, a thread tensioning device arranged to provide frictional resistance to movement of said needle thread toward said needle, a check

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spring operative on said needle thread between said tensioning device and said needle, a tension releasing member shiftably supported with respect to said sewing machine and effective when shifted in one direction to render said thread tensioning device ineffective, cam means disposed to act upon said tension releasing member, said cam means being operatively associated with said mechanism for activating said thread trimming mechanism and said thread wiper, said cam means formed to effect two successive movements of said tension releasing member in a direction to release said thread tensioning device, a first of said successive movements before said thread trimming mechanism is effective to sever the thread, and a second of said successive movements after operation of said thread wiper.

2. In a cyclically operated sewing machine having a work clamp, means for raising and lowering said work clamp, a thread trimming mechanism, a needle thread wiper, mechanism effective upon operation of said means for raising said work clamp for operating in sequence said thread trimming mechanism and said thread wiper,

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a needle thread tensioning device, a needle thread check spring associated with said thread tensioning device, tension releasing means including a cam member carried for movement with said work clamp raising and lowering means, said cam means being formed to provide for two successive releases of said thread tensioning device upon raising of said work clamp, a first of said tension releases occurring before operation of said thread trimming mechanism to relax said check spring, and a second of said tension releases occurring after operation of said thread wiper to insure that the thread will be wiped from the work fabric rather than from the thread supply.

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