ABSTRACT
A self-contained thread tensioning unit is disclosed which may be preassembled and secured within a sewing machine frame and which includes not only thread engaging tension applying means, but also includes provision for guiding the thread from the tension applying means to a check spring means on the assembly and a tension adjusting regulator which projects from the sewing machine frame in a location particularly suitable for convenient operator access.

4 Claims, 4 Drawing Figures
NEEDLE THREAD TENSIONING MODULE FOR
LOCK STITCH SEWING MACHINES

BACKGROUND OF THE INVENTION

Prior known thread tensioning devices for the needle thread of a lock stitch sewing machine have been constructed with separate supporting means for the various elements which must engage and direct the thread to the thread tensioning instrumentalities and to the other thread influencing elements associated therewith such as the check spring and thread guiding devices for insuring desired exit of the thread from the tensioning device.

Moreover, in prior thread tensioning devices, the operator influenced regulator is usually located immediately adjacent to the thread tensioning elements and such location is often not convenient for operator access.

SUMMARY OF THE INVENTION

It is an object of this invention to provide a thread tensioning module construction for a lock stitch sewing machine in which all the thread manipulating instrumentalities associated with the thread tensioning function of a sewing machine may be preassembled on a single supporting bracket for installation within the sewing machine frame. This object of the invention is obtained by an arrangement on a single supporting bracket of not only the thread tensioning discs, but also the spring means for applying resilient biasing force to the thread tensioning discs, the linkage for transferring the spring force to the thread tensioning disc and tension adjusting means including a slidably adjustable fulcrum for adjusting the tension to be applied to the thread and as well as an operator influenced dial for influencing tension adjustments, a tension release linkage and a thread guide means for directing thread from the tension engaging discs to a remote check spring which also defines the exit guide for thread which leaves the thread tensioning unit and is directed to the sewing machine take-up arm and thence to the needle. The thread tensioning module of this invention is adapted to be accommodated within the frame of the sewing machine and is constructed in such a fashion that the thread may be properly introduced to the tensioning unit through a slot in the machine frame without visual observation of the threading process by the sewing machine operator. In addition, this invention provides for a location of the operator influenced tension regulator at a point remote from the tension discs and in a particularly accessible location beneath the sewing machine bracket arm.

DESCRIPTION OF THE DRAWINGS

In the accompanying drawings of a preferred embodiment of this invention:

FIG. 1 is a perspective view of a portion of a sewing machine frame having the thread tensioning device of this invention applied thereto,

FIG. 2 represents a head-end elevational view of the sewing machine of FIG. 1 with the sewing head portion removed and the top cover illustrated in vertical cross-section,

FIG. 3 is a disassembled perspective view of the thread tensioning module of this invention viewed from the front of a sewing machine as the module would be secured therein, and

FIG. 4 is an assembled perspective view of the thread tensioning module of this invention as viewed from the rear of a sewing machine as the thread tension module is mounted therein and a with a fragment of the supporting bracket of the tension module broken away better to illustrate the operative parts thereon.

Referring to FIG. 1 of the drawings, 11 indicates the bed of a conventional sewing machine to which the thread tension module of this invention may be applied. Indicated at 12 in FIG. 1 is a bracket arm which overhangs the bed and terminates in a sewing head 13 in which an endwise reciprocable needle is supported together with a presser bar 15 carrying a presser foot 16 for pressing work fabrics against a throat plate 17 on the bed against the thrust of the needle. The top of the sewing machine bracket arm 12 is closed by a cover member 20 upwardly through which projects a pressure regulating dial 21 for the presser foot 16. The cover 20 is also formed with a clearance aperture 22 for a needle thread take-up arm 23 which may be of known construction including a thread manipulating eyelet 24 and a thread introduction groove 25 leading to the eyelet. The cover 20 is formed with a transversely extending slot 26 which is along side of and merges with the take-up accommodating aperture 22. The thread accommodating slot 26 is continued downwardly along the front of the sewing machine bracket arm as shown in FIG. 1 and is joined at the bottom by a narrow thread conducting passageway 27 which extends to the bottom of the bracket arm at the juncture with the sewing head 13. Hinged along the rear edge of the sewing machine bracket arm is a lid 28 which may be opened to expose the cover member 20 as shown in FIG. 1. The lid is formed with a clearance aperture 29 accommodating the needle thread take-up arm 23 when the lid is closed.

As illustrated in FIG. 2, a thread spool unwinder 30 is carried rearwardly on the sewing machine bracket arm from which a thread "T" is directed to a thread guiding post 31 substantially axially of the thread spool unwinder from which the thread is directed over a wear protecting wire 32 which spans the thread accommodating slot 26 and thence transversely into the slot 26. Within the sewing machine frame is supported a needle thread tensioning module 40 which is positioned so as to influence the needle thread introduced transversely through the slot 26 in a manner as will be described in detail herein below. From the thread tensioning module the needle thread is directed to the eyelet 24 of the thread take-up arm thence downwardly along the slot 26 through the thread conducting passageway 27 and then to the needle 14. The description which will now be given will explain how the needle thread tension module 40 of this invention may be threaded by a simple sweeping motion of the operator's hand introducing the needle thread through the slot 26 in one downward motion.

Referring to FIGS. 3 and 4, the thread tensioning module is unitized by a common supporting bracket 50 which is formed with a mounting flange 51 secured by screws 52 to a web 53 within the sewing machine bracket arm. The mounting flange 51 is offset from one branch 54 of a body portion of the bracket from which the other branch 55 extends substantially at right angles. A hollow stud 56 which is secured in an extension
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57 of the branch 55 on the bracket accommodates thereon three thread engaging tension discs 58, 59 and 60 of which the center disc 59 is of appreciably larger diameter than the discs 58 and 60 at each side. A pin 61 extending through the hollow stud 56 is formed with a head 62 by which it engages a washer 63 adjacent the outer disc 60. A very light coil spring 64 is arranged on the stud against the washer 63 and is constrained in compression by an additional washer 65 which is maintained on the stud 56 by a threaded retaining nut 66. The light coil spring 65 applies a constant light pressure urging the tension discs together against the bracket 50 and this light pressure may be augmented by force applied axially along the pin 61.

At the opposite side of the bracket extension 57 the pin 61 is formed with a head 70 by which it is interlocked with a force transmitting lever 71 by means of a spring clip 72 which constrains the headed pin in a notch 73 formed in the lever 71. A stud 75 which is threadedly engaged in bifurcated arms 76 formed on the branch 54 of the bracket 50 constrains and regulates the reciprocating motion of a spring 77 against the opposite extremity of the force transmitting lever 71 from the point of connection with the pin 61. Slidable along the force transmitting lever 71 is a fulcrum defining arm 78 of a slide member 79 which are fulcrum fingers 88 carried on formed with a notch 80 embracing a crank pin 81 carried on a tension adjusting dial 82 pivoted at 83 on the branch 54 of the bracket 50. The dial 82 may be formed with a mark 84 cooperating with indicia 85 carried on a fixed indicia plate 86 secured to the bracket 50 so as to indicate the relative position of the fingers 88 along the force transmitting lever 71. By this arrangement the proportion of the force exerted by the heavy coil spring 77 which is applied to the pin 61 may be regulated; when the fulcrum is arranged directly opposite the spring all of the force of the spring 77 will be removed from the tension discs, and as the fulcrum is moved toward the tension discs the force applied thereto by the heavy spring 77 will be increased.

The tension adjusting dial 82, as shown in FIG. 1 is arranged to project beneath the sewing machine bracket arm at the juncture of the sewing head preferably through a clearance aperture (not shown) in the machine frame. FIGS. 3 and 4 illustrate the construction which permits the dial 82 to be located remote from the tension discs.

Threadedly engaged on the extremity of the stud 56 is a washer 90 formed with external threads 91 accommodating an internally threaded spacing disc 92 formed with an annular groove 93. The annular groove accommodates a slotted portion 94 of a first partition member 95 which is arranged at the outside of the tension disc 60 and extends generally radially outward beyond the tension discs and serves to direct the thread generally to the tension discs when the thread is introduced transversely through the slot 26. The first partition member 95 is additionally secured to the bracket 50 by a fastening screw 96 and extends downwardly to an out-turned free extremity 97 which as shown in FIGS. 1 and 2 preferably projects slightly outwardly through the slot 26 thereby defining a thread directing element about which thread introduced in the slot 26 may be looped around and beneath the first partition member 95. Inside of the out-turned free extremity 97, the first partition member is formed with a concave substantially circular segment 98 in which a circular recess 99 is formed.

Secured by a pivot screw 100 to the bracket 50 is a coil spring 101 formed with a radially extending free extremity 102 adapted to be accommodated in the recess 99. The coil spring 101 serves as a check spring for imparting cushioning influence to the manipulation of the needle thread by the take-up eyelet 24. To this end the recess 99 at the upper extremity terminates in a generally radial abutment 103 which limits the upward movement of the free extremity 102 of the check spring. A wire 104 of wear resisting material may be set into the first partition member 95 in the path of the thread as the thread is directed from the check spring to the take-up eyelet 24.

A second partition member 110 may be arranged at the opposite side of the tension discs 58, 59 and 60 from the first partition member 95. The second partition may be secured on the stud 56 and may also be held in place by the fastening screw 96 which secures the first partition member in place. The second partition member is preferable because it increases the control of the disposition of the thread when introduced into the slot 26. The second partition, however, does not provide any essential thread positioning function and, therefore, it may be eliminated if desired from the assembly.

As best shown in FIGS. 2 and 4, the thread tensioning module of this invention includes a linkage serving to release the tension applied to the thread by the discs 58, 59 and 60 when the presser foot is elevated by a presser lifting lever 120. The presser lifting lever is pivoted on a pin 121 and when swung upwardly engages a block 122 on the presser bar 15. A lateral pin 123 is formed on the presser lifting lever and arranged in such a position that when the presser lifting lever is swung up to complete elevation of the presser foot, the lateral pin 123 will engage and turn a follower lever 124 which is fulcrummed on a pin 125 secured in the bracket 50. The lever 124 is connected by a wire link 126 with a bell crank lever 127 fulcrummed at 128 to an ear 129 which is bent out from the mounting flange 51 of the bracket 50. An abutment block 130 which is adjustable secured by a clamp screw 131 to the bell crank lever 127 serves to engage the force transmitting lever 71 when the presser foot is elevated by the presser lifting lever and to cause the transmission of force from the heavy spring 77 to the tension discs to be discontinued. By means of the adjustable abutment block 130 a nicety of correlation between these parts may be obtained whereby the tension may be relieved from the discs only when the presser foot has been elevated to its uppermost position by the presser lifting lever.

To introduce thread from the thread spool unwinder to the needle and in so doing to properly direct the thread to the necessary thread manipulating instrumentality of the sewing machine becomes a very simple task using the thread tensioning module of this invention. From the guide post 31 the thread from the spool is simply directed over the wear wire 32 and downwardly into the slot 26 in the cover and bracket arm of the sewing machine frame. Because of the partitions 95 and 110 the thread will automatically be directed between two adjacent ones of the tension discs 58, 59 and 60. The thread is then drawn downwardly in the slot and brought under the out-turned free extremity 97 of the first partition member 95 and the drawn upwardly
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in the slot 26 and over the needle thread take-up arm 23. In so doing the thread will be directed to the check spring 101 and over the wear wire 104. After the thread has been looped over the needle thread take-up arm it is again drawn downwardly in the slot 26 and through the thread conducting passage 27 and in so doing thread will automatically be drawn into the thread introduction groove 25 in the take-up arm into the eyelet 24 thereof. From the thread conducting passage 27 to the needle 14 the path of the thread may follow a conventional path.

When twin needle sewing is to be performed with the sewing machine and two separate needle threads are required to be separately tensioned, the increased diameter of the center tensioning disc 59 in the present construction facilitates introduction of the two separate needle threads one between the discs 58 and 59 and the other between the discs 59 and 60. Such disposition of the separate threads is advantageous in that two threads if introduced between the same discs may interfere one with the other and result in the uneven tension being applied thereto, whereas when the threads are introduced between separate discs the tension will be applied uniformly to each of the threads. As shown in FIG. 1, the large center disc 59 protrudes slightly in the slot 26 to the extent that it is visible to the operator and no difficulty will be encountered in directing the separate threads on opposite sides thereof.

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

1. A needle thread tensioning module for a lock stitch sewing machine having a frame including a bracket arm formed with an upwardly and forwardly open slot through which a length of thread may be introduced transversely, said thread tensioning module comprising a bracket adapted to be secured within said sewing machine frame, a plurality of thread tensioning discs, means adapted for supporting said thread tensioning discs on said bracket on an axis transversely of said slot, means on said bracket for applying spring pressure to bias said discs together, an operator influenced regulator for said spring pressure applying means shiftably supported on said bracket and arranged to project outwardly through a clearance slot beneath said sewing machine bracket arm, a partition member secured on said bracket and extending from a position adjacent to one side of said thread tensioning discs to a free extremity disposed radially outwardly thereof, a check spring shiftably supported on said bracket in spaced relation to said partition member, said check spring including a free extremity extending into a recess formed in said partition extremity, and stop means for limiting movement of said check spring toward said thread tensioning discs so that said thread tensioning module may be threaded simply by insertion of a thread transversely into said sewing machine frame slot over said tensioning discs and then beneath said partition extremity.

2. A needle thread tensioning module as set forth in claim 1 in which said means for applying spring pressure biasing said discs together includes a spring, a lever for transmitting the force of said spring to said tensioning discs, a shiftable fulcrum for said lever carried on said bracket, and in which said operator influenced regulator comprises a dial pivoted on said bracket and operatively connected to said shiftable fulcrum for adjusting thread tension.

3. A needle thread tensioning module as set forth in claim 1 in which a second partition member is pivoted on said bracket parallel to and at the opposite side of said tensioning disc from said previously mentioned partition member thereby defining a thread path to said thread accommodating slot in said sewing machine frame.

4. A needle thread tensioning module as set forth in claim 1 in which a thread tensioning releasing linkage is provided on said bracket and is operatively connected with said means on the bracket for applying spring pressure biasing said discs together.

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