Nov. 21, 1950 L. ROSEMAN 2,530,841

DEVICE FOR INDICATING VARIATIONS IN THREAD TENSION IN SEWING MACHINES

Filed Oct. 31, 1947 4 Sheets-Sheet 1

Fig. 1

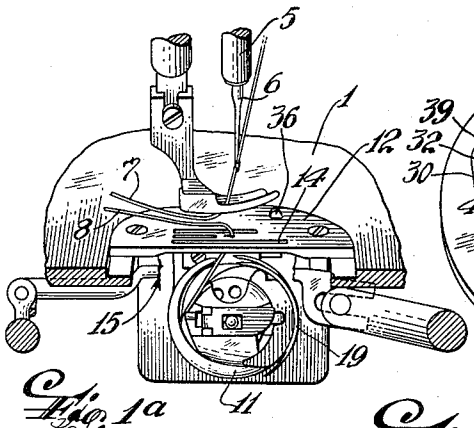


Fig. 5

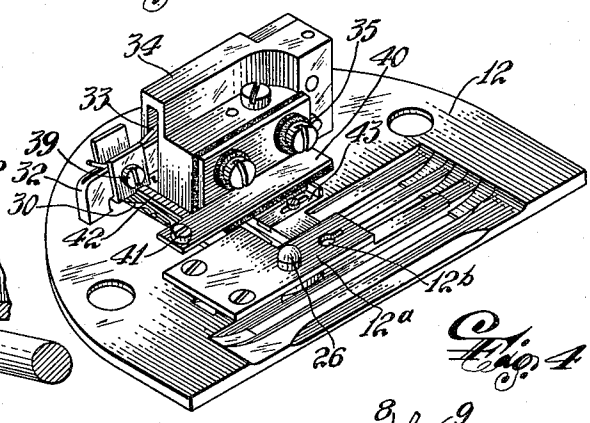


Fig. 1a

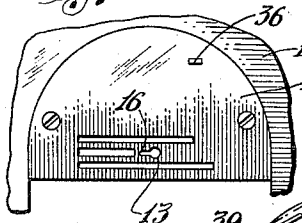


Fig. 6

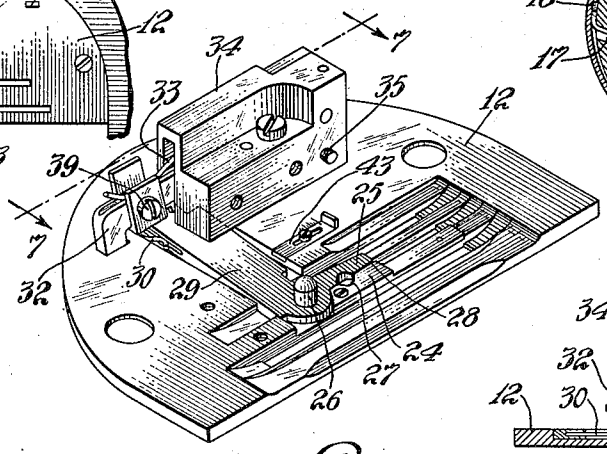


Fig. 4

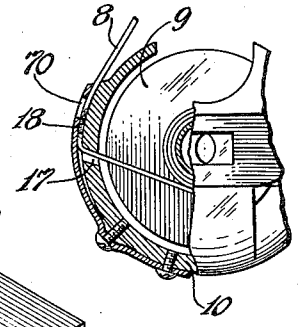


Fig. 8a

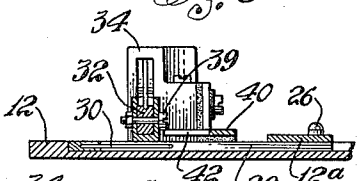


Fig. 8

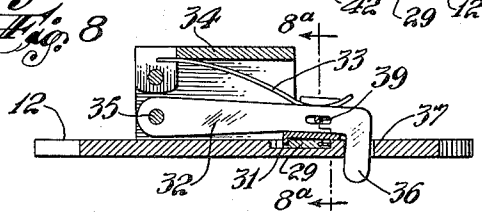
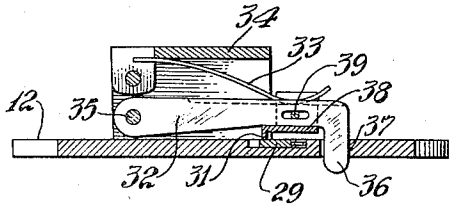


Fig. 7



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DEVICE FOR INDICATING VARIATIONS IN THREAD TENSION IN SEWING MACHINES

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Fig. 12

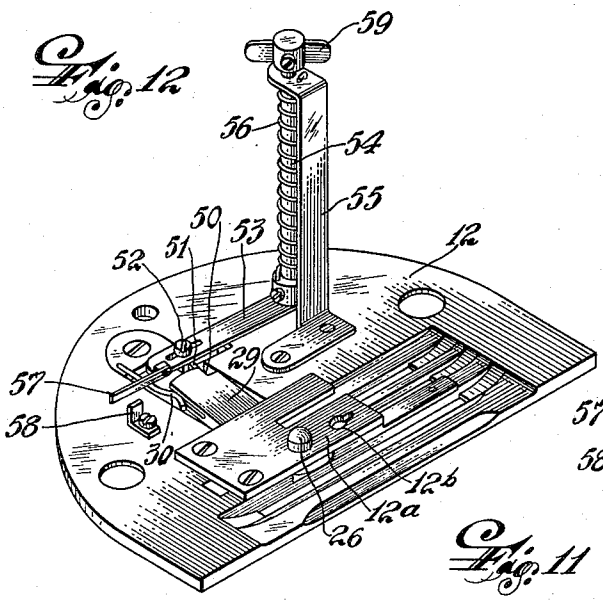


Fig. 13

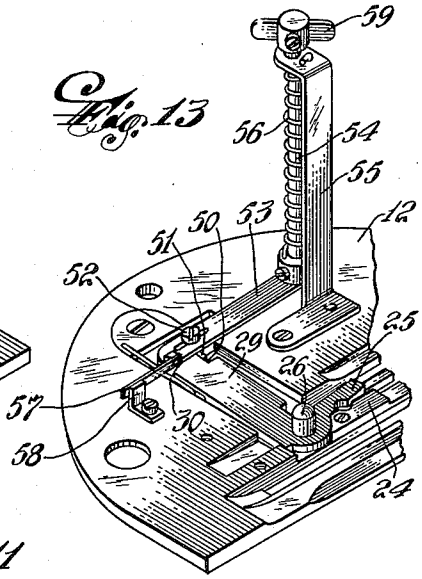


Fig. 11

Fig. 2

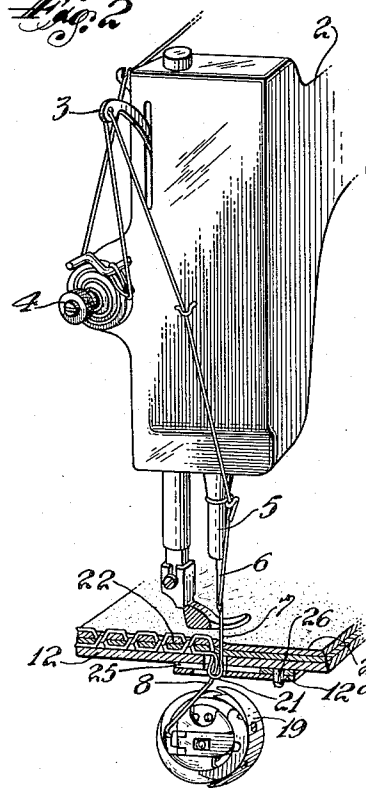
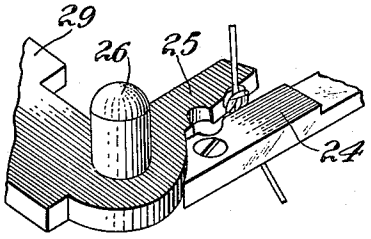


Fig. 9



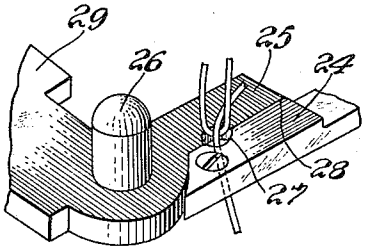
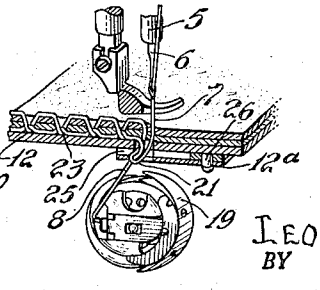


Fig. 3



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DEVICE FOR INDICATING VARIATIONS IN THREAD TENSION IN SEWING MACHINES

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Fig. 14

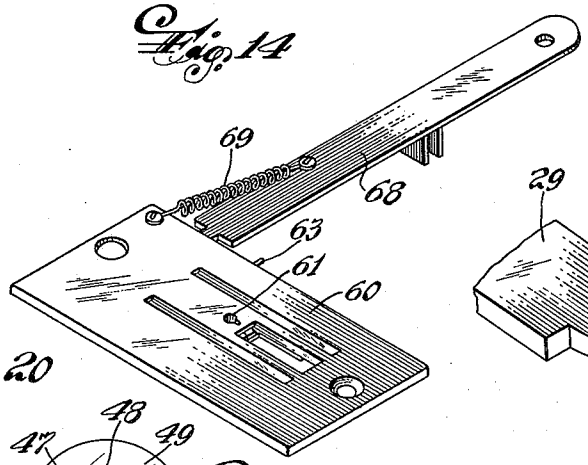


Fig. 10

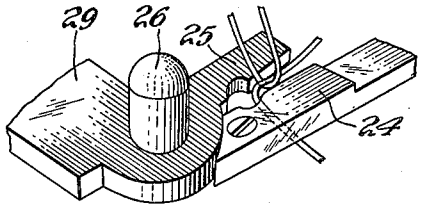


Fig. 20

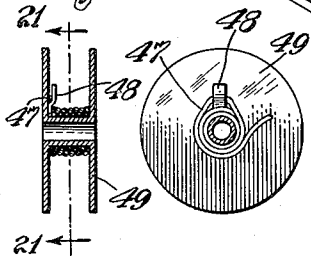


Fig. 21

Fig. 15

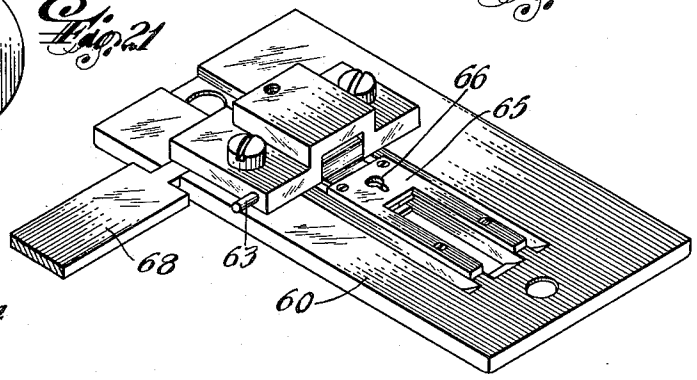


Fig. 10a

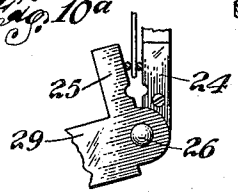


Fig. 16

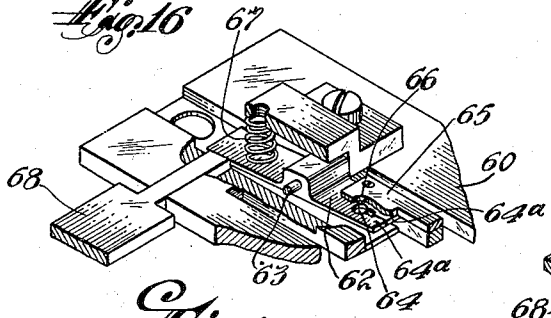


Fig. 17

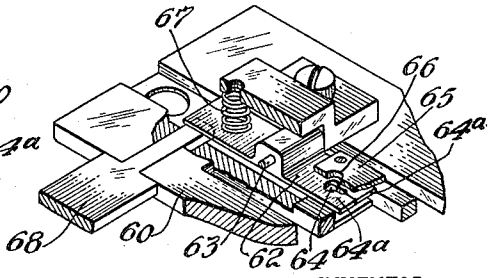


Fig. 18

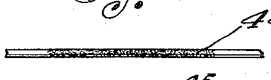


Fig. 19



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DEVICE FOR INDICATING VARIATIONS IN THREAD TENSION IN SEWING MACHINES

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Fig. 22

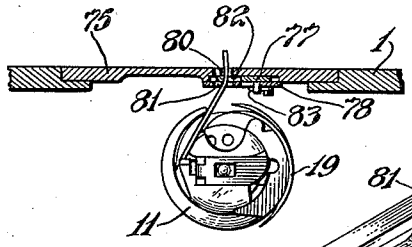


Fig. 23

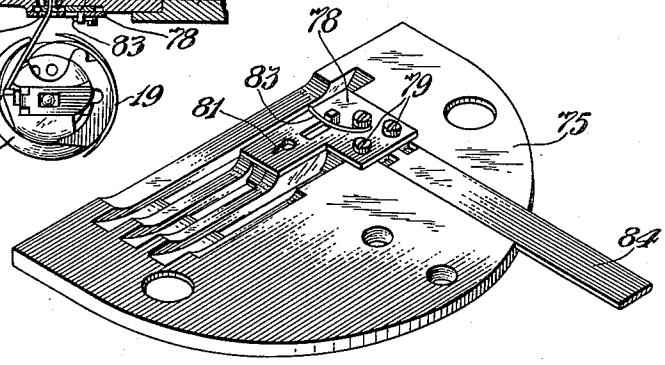


Fig. 24

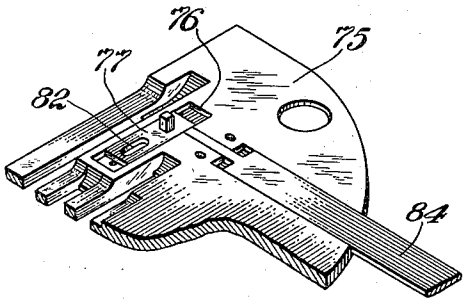


Fig. 25

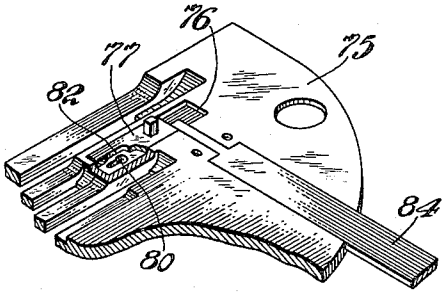
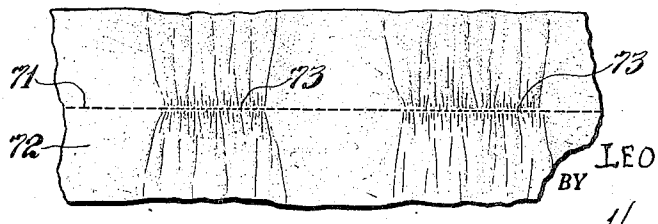


Fig. 26



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Patented Nov. 21, 1950 2,530,841

UNITED STATES PATENT OFFICE

2,530,841

DEVICE FOR INDICATING VARIATIONS IN THREAD TENSION IN SEWING MACHINES

Leo Roseman, Newark, N. J.

Application October 31, 1947, Serial No. 783,251

27 Claims. (Cl. 112—218)

1

This invention relates in general to sewing machines, and more particularly to machines of the types that include bobbins, shuttles or the like, and one object of the invention is to provide a novel and improved mechanism for automatically indicating, or for performing some other operation or producing some result upon, a change in the tension of a thread or in the relative tension of two threads, for example, the bobbin and needle threads, during operation of the machine.

Another object is to provide in machines of the character described, a novel and improved means for automatically changing the tension of a thread at a predetermined time or at a predetermined portion of the length of the thread, so that the change in tension may be utilized for any desired purpose, for example, to indicate the approaching exhaustion of the bobbin thread.

A further object is to provide a thread having at least a portion thereof treated or constructed in a novel and improved manner, in combination with parts of a sewing machine or other machine in which the thread is used, to automatically change the tension of the thread, whereby said change in tension may be utilized for actuating a signal or any other desired means.

Another object is to provide novel and improved means in such sewing machines whereby the operator may be warned of excessive tension on the needle thread.

Still another object is to provide in a sewing machine novel and improved mechanism for indicating or producing a warning of imperfect stitching on the underside of an article being sewn, thereby eliminating the necessity for the operator to periodically turn over the work and visually inspect the underside thereof.

Other objects, advantages and results of the invention will be brought out by the following description in conjunction with the accompanying drawings, in which

Figure 1 is a fragmentary schematic perspective view of a portion of a sewing machine embodying my invention, showing the bed plate, the bobbin mechanism, the throat plate, the presser foot and the needle;

Figure 1*a* is a fragmentary top plan view of the throat plate and a portion of the bed plate;

Figure 2 is a schematic perspective view of the head end of a sewing machine embodying my invention and illustrating the normal stitching operation on a piece of work;

Figure 3 is a similar view, with portions emitted, indicating the operation when a change in the relative tensions of the bobbin thread and needle thread occurs;

Figure 4 is an enlarged sectional side elevational view of the bobbin and its case that are illustrated in Figures 1-3, inclusive, the bobbin case being removed from its holder in the machine;

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Figure 5 is an enlarged perspective view of the underside of the throat plate illustrated in Figure 1 and having my invention embodied therein;

Figure 6 is a similar view, with portions omitted for clearness in illustration;

Figure 7 is a fragmentary vertical sectional view, approximately on the plane of the line 7—7 of Figure 6, showing the parts in normal operating position;

Figure 8 is a similar view, showing the position of the parts when a change in the thread tension occurs;

Figure 8*a* is a fragmentary vertical sectional view, approximately on the plane of the line 8*a*—8*a* of Figure 8;

Figure 9 is an enlarged schematic fragmentary perspective view of a portion of the mechanism embodying the invention, showing the parts during operation of the machine with normal thread tension, as shown in Figure 2;

Figure 10 is a similar view, showing the position of the parts when a change in the thread tension occurs, as illustrated in Figure 3;

Figure 10*a* is a fragmentary top plan view of the mechanism shown in Figure 10 and illustrating the threads in horizontal cross-section;

Figure 11 is a view similar to Figure 10, showing the operation of the parts by a protuberance on the thread;

Figure 12 is a view similar to Figure 5, showing a modification of the invention, with the parts in normal position;

Figure 13 is a similar view, showing the parts in the positions resulting from a change in the thread tension;

Figure 14 is a top plan view of a modified form of the mechanism embodying the invention;

Figure 15 is an enlarged bottom plan view thereof;

Figure 16 is a fragmentary bottom plan view of the mechanism shown in Figure 13, with portions broken away and showing the parts in normal position;

Figure 17 is a similar view, showing the parts in a position assumed after a change in the thread tension;

Figure 18 is a fragmentary plan view of a thread having one form of means for causing a change of tension in the thread during a sewing operation;

Figure 19 is a similar view, showing another form of the thread;

Figure 20 is an enlarged fragmentary longitudinal vertical sectional view through a partially wound bobbin that embodies other means for varying the tension on the bobbin thread;

Figure 21 is a transverse vertical sectional view, approximately on the plane of the line 21—21 of Figure 20;

Figure 22 is an enlarged transverse vertical sectional view through the bed plate of a sewing

machine having a modification of my invention applied thereto;

Figure 23 is an enlarged bottom plan view of the throat plate shown in Figure 22;

Figure 24 is a similar view of the throat plate, with portions broken away and showing the parts in normal position;

Figure 25 is a like view, showing the parts in the position assumed upon a change in the bobbin thread tension, and

Figure 26 is a fragmentary plan view of a piece of work showing an effect of an increase in the tension of the bobbin thread.

For the purpose of illustrating the principles of the invention, I have shown it in conjunction with a known type of lock stitch sewing machine which includes the usual bed plate 1 from which upwardly projects the main frame or gooseneck 2 in which is mounted a thread takeup lever 3, a needle thread tension device 4, and a reciprocable needle bar 5 which carries the usual needle 6 through the eye of which the needle thread 7 is threaded to cooperate with a bobbin thread 8 that is wound on a bobbin 9 which is mounted in a bobbin case 10 supported by the usual bobbin case holder 11 beneath the bed plate of the machine. A throat plate 12 is removably mounted on the bed plate beneath the needle, as usual, and has a needle hole 13 and a plurality of slots 14 through which projects the usual feed dog of the work-feed mechanism 15, some of which has been omitted because it forms no part of the present invention. For a purpose to be later described in detail, the needle hole 13 has a lateral slot 16 extending in the direction of feed of the work so that the needle hole is keyhole-shaped.

The bobbin case has a lateral opening 17 through which the thread is drawn outwardly from the bobbin over the outer surface of the case and beneath a tension spring 18. The usual sewing hook 19 cooperates with the bobbin thread and needle thread in known manner, being driven by the usual mechanism which has not been shown. In order that my invention may be more clearly understood, it is desirable to describe briefly the normal operation of the sewing mechanism, and with reference to Figures 1 and 2, it will be understood that the needle, as it descends through the work 20 and the needle hole 13 in the throat plate, carries the needle thread downwardly and the sewing hook 19 picks up the needle thread and loops it around the bobbin thread to interlock the two threads, as best shown in Figure 2; and as the needle rises, the needle thread loop 21 is pulled upwardly, and thereafter the takeup lever 3 exerts further tension on the needle thread so as to complete a stitch wherein the needle and bobbin threads interlock at about the center of the thickness of the work, as indicated at 22. In normal operation and with proper tension on the needle and bobbin threads exerted by the respective tension devices 4 and 18, the bobbin thread hugs the needle hole wall in the direction of feed of the work, and the needle thread loop pulls the interlocked bobbin thread toward the center of the needle hole 13 and straight upwardly therethrough. However, should the tension on the bobbin thread become excessive relatively to the tension on the needle thread, the drag exerted by the bobbin thread will pull the needle thread loop 21 in the direction of feed of the work, as best shown in Figure 3, and the interlock between the bobbin thread and the needle thread occurs on the bottom side of the work, as indicated at 23, thus causing faulty or imperfect stitching.

In accordance with my invention, means is provided to indicate the variation in the relative tensions on the bobbin thread and the needle thread or to cause some operation or the production of some result in accordance with such variation, for example, to warn of faulty stitching or of the approaching exhaustion of bobbin thread.

Referring particularly to Figures 1–10, inclusive, a mechanism responsive to variations in the relative tension of the two threads or to an increase in tension in the bobbin thread, is mounted on the underside of the throat plate 12. In the form of the invention shown, this means comprises a fixed jaw 24 on the underside of the throat plate at one side of the needle hole 13, and a movable jaw 25 which is pivotally mounted on a stud 26 on the throat plate to cooperate with the fixed jaw. These two jaws have complemental notches 27 in their juxtaposed edges, which, when said jaws are in one relation to each other, form a hole in register with the needle hole 13 through which the needle thread loop and interlocked bobbin thread may normally freely pass, as shown in Figures 2, 6 and 9. The juxtaposed edges 28 of the jaws outwardly from the pivot 26 are normally in contact with each other or so spaced that should the needle thread loop and the bobbin thread located therein or a plurality of thicknesses of thread disposed in a plane transverse of the space between the jaws, as shown in Figures 10 and 10*a*, be pulled between the jaws, the movable jaw will be swung about its pivot away from the fixed jaw. Accordingly, should the tension on the bobbin thread become excessive relatively to the tension of the needle thread, as shown in Figure 3, the needle thread loop 21 and the bobbin thread 8 will be pulled simultaneously between said edge portions 28 of the jaws, and there being then at least two thicknesses of thread between the jaws, the movable jaw will be swung away from the fixed jaw, as shown in Figure 10. It will be observed that the slot 16 in the needle hole 13 of the throat plate will permit such movement of the threads between the jaws, and a cover plate 12*a* is secured to the underside of the throat plate over the jaws and has a hole 12*b* corresponding in shape to the needle hole 13.

This movement of the movable jaw may be utilized to control any other desired operation, but, as shown, the movable jaw has an angularly extending arm 29 which is normally pressed by a spring 30 so as to yieldingly hold the movable jaw 25 in normal position. When the jaw is in this position, a detent tooth 31 carried by a detent lever 32 normally bears against one side of the arm 29, as shown in Figure 7, being spring-pressed by a suitable spring 33, one end of which is secured in a bracket 34 depending from the throat plate and in which the detent lever 32 is pivotally mounted at one end, as indicated at 35. When the jaw 25 is actuated by a variation in the thread tension, the arm 29 is swung outwardly from beneath the detent tooth 31 which then engages one edge of the arm, as shown in Figure 8, so as to hold the latter in that position. The detent lever 32 has an end portion 36 extending upwardly through an opening 37 in the throat plate for manipulation by the finger of the operator to disengage the tooth 31 from the arm and permit the jaw 25 to be swung to its normal position.

Preferably, the detent tooth 31 is adjustable, and for this purpose it is shown as carried by a channel-shaped piece 38 which has an adjustable bolt and slot connection 39 with the detent lever 32. It will be observed that the projection of the end 36 of the detent lever upwardly through the throat plate upon variation in the thread tension, will serve as a signal or warning of said tension change. If desired, other visible or audible signals may be provided. For example, an electrical contact element 40 may be mounted on the bracket 34 in electrically insulated relation to the bracket and the throat plate and have a binding post or the like 41 for connection in an electric circuit. This contact element is shown as having a contact finger 42 that underlies the head of the bolt 39 on the detent lever 32, so that when the machine is operating normally, said bolt head will be out of contact with the finger 42, as shown in Figure 5, while when the change in the thread tension occurs, the bolt head will engage the contact finger 42, as shown in Figure 8a. The bolt head may be grounded in an electric circuit. Thus, by connecting the contact element 40 and the bolt 39 in an electrical circuit with a source of electricity and a signal or other device, the signal or device will be actuated upon a change in the relative tension of the needle and bobbin threads.

It may be desirable to adjust the movable jaw 25 relative to the fixed jaw 24, and thus I may mount a slidably adjustable stop plate 43 on the underside of the throat plate to form an abutment for the arm 29 to hold the jaw 25 in predetermined spaced relation to the jaw 24. This adjustment may be particularly desirable to accommodate the use of threads of different diameters.

It will be observed that this mechanism will indicate the change in tension regardless of the cause of the change which may result either from loosening of the tension of the needle thread or increase in the tension of the bobbin thread as the result of variation of the spring pressure exerted by the tension devices 4 and 18, or as the result of varying diameters of the threads, or as the result of a deliberate change in tension, for example, by treatment of the thread to cause increase in tension thereon as it passes beneath the bobbin spring 18, or by winding the thread at a certain point in such a manner as to provide an increase in tension as the thread is unwound.

To deliberately cause a change in tension of the bobbin thread at a predetermined time or at a predetermined point in the length of the bobbin thread, the thread may have a knot tied therein, or friction-producing substances, such as soap, crayons, waxes and numerous other substances applied thereto, or by attaching a friction-producing element to the thread, or by reversing the winding of the thread on the bobbin at a certain point, or by passing a convolution of the thread through a friction-producing element on the bobbin during winding of the latter, and so on.

In Figure 18 is shown a piece of thread saturated with or having applied thereto some friction-producing substance, such as soap, as indicated at 44, while in Figure 19 a thread having an enlarged portion 45 is shown, and in Figure 11 a thread having a knot 46 therein is illustrated. With all of these forms of thread, when the portions 44, 45 or 46 pass beneath the bobbin spring 18, the tension on the bobbin thread will be substantially increased by the friction between the spring and certain portions of the threads.

In Figures 20 and 21, one convolution of the bobbin thread 47 is shown as slipped between a spring tongue 48 and one end flange 49 of the bobbin, so that as said convolutions pull from said tongue, the tension on the thread will be increased.

A modification of the invention is shown in Figures 12 and 13. In this form of the invention, the structure is identical with that hereinbefore described with the exception that a different detent mechanism is provided for the arm 29. As shown, said arm 29 has a notch 50 in one end thereof with which cooperates a detent tooth 51 that has an adjustable screw and slot connection 52 with a detent lever 53, one end of which is mounted on a shaft 54 that is journaled in a bearing bracket 55 in perpendicular relation to the throat plate 12. A torsion spring 56 has one end connected to said bracket and its other end connected to the detent lever 53 so as normally to influence the detent finger 51 toward the arm 29, as shown in Figure 12. When the movable jaw 25 and its corresponding arm 29 are in normal position, the detent tooth 51 abuts one end of the arm 29 and is held away from the notch 50, but when the jaw 25 is actuated upon a change in tension of the thread, the arm 29 is swung so that the detent tooth is snapped into the notch 50, as shown in Figure 13, so as to hold the arm in that position. An electrical contact finger 57 is mounted on the lever 53 to cooperate with another contact element 58 on the throat plate, so that said contact finger and contact element may be connected in an electrical circuit for operating a signal or any other desired mechanism. The shaft 54 may have a finger-piece 59 or any other suitable means for rotating it to swing the detent lever 53 to its normal position to release the movable jaw 25 and to hold the contact finger 57 out of engagement with the contact member 58.

Another modification of the invention is shown in Figures 14–17, inclusive, wherein the throat plate 60 has a needle hole 61 like the hole 13 and has means responsive to variations in thread tension mounted on its underside. As shown, this means comprises a lever 62 that is pivotally mounted intermediate its ends on a pin 63 to swing about a horizontal axis or in a plane perpendicular to the plane of the throat plate. One end portion of the lever has a hole 64 in approximate register with the needle hole 61 in the throat plate, said end portion having a slit outwardly from said hole of a width to permit free passage of only one thread at a time and forming spring arms 64a, and overlying said end portion of the lever is a cover plate 65 having a similar hole 66. The other end of the lever 62 is normally actuated by a compression spring 67 so as to swing the first-mentioned end downwardly or away from the throat plate when the latter is mounted in a sewing machine.

In operation, the needle loop and bobbin thread normally move through the holes 61, 64 and 66, but upon an increase in tension of the bobbin thread relatively to the needle thread, the loop is drawn into the narrow ends of the holes 61, 64 and 66 in such a manner as to swing the lever 62 into the position shown in Figure 17.

For controlling the operation of some other device, for example, to produce a signal, a detent bar 68 may be slidably mounted in the throat plate so as to normally abut the edge of the spring-pressed end of the lever 62 when the latter is in its normal position, as shown in Fig-

ure 16, said bar being normally influenced by a spring or other suitable means 69 in such a manner as to slide beneath said spring-pressed end of the lever when the lever is actuated upon a change in thread tension, as shown in Figure 17. The rod 68 may be connected to an electric switch or any other suitable mechanism so as to actuate the latter upon sliding of the rod when the thread tension changes.

It will be observed that due to swinging of the lever 62 as the result of the pulling of the needle loop into the narrow portion of the hole 64, the position of the lever relative to said threads will change so that the threads will clear themselves in the larger portion of the hole when the lever has been swung to its limit, as shown in Figure 17.

From the foregoing, it will be understood that the device responsive to tension will operate with the usual thread to indicate an increase in the tension of the bobbin thread relative to the tension of the needle thread so as to, for example, warn of imperfect stitching. Also, by treatment or special construction of the thread at predetermined points, as by saturating the thread with a friction-producing substance to increase the frictional characteristics, or by tying a knot in the thread, the tension on the bobbin thread may be artificially increased when said portion of the thread passes beneath the bobbin spring 18 at a predetermined time, so as to, for example, indicate the approaching exhaustion of the thread.

Furthermore, when the bobbin thread is specially treated or constructed so as to actuate a signal at a predetermined time during operation of the machine, for example, to indicate the approaching exhaustion of the bobbin thread, the failure of the signal to operate at said predetermined time or prior to the exhaustion of the bobbin thread would, under otherwise normal conditions, warn the operator that the needle thread tension is excessive.

It is also possible to utilize the device for detecting the presence of knots or similar abnormalities in the bobbin thread, even should the knot pass the bobbin spring without causing actuation of the tension-responsive mechanism and without any change in the tension on the bobbin thread. In Figure 11 is shown a bobbin thread having a knot 46 therein. During normal operation, the bobbin thread is normally pulled in the direction of work feed between the edges 28 of the jaws or into the slotted portion of the hole 64 during each stitch formation, and therefore, a knot alone in the bobbin thread would actuate the jaw 25 or the lever 62 upon passage of the knot between the jaws or through the slotted portion of the hole 64, respectively. Moreover, it should be understood that keyhole slots, although preferable, are not necessary to operation of my mechanism, the keyhole shape being used mainly to provide clearance for the thread to pass between the jaws 24 and 25 or through the lever 62, and consequently the shape of the holes may be varied as desired.

As above indicated, soap is preferred for increasing the friction-producing properties of the thread because it creates sufficient tension to activate the jaws but not enough to cause unsatisfactory stitching; but almost any other substance can be used if the tensions of the various springs, such as the bobbin tension spring 18, springs 30 and 67, and the space between the jaws 24 and 25, are properly adjusted.

When a substance such as soap is applied to the thread, it is desirable to form a hole 70 in the bobbin tension spring 18 for scraping and releasing the soap from the thread and preventing accumulation of excess soap under the tension spring. Such an opening also will act as a snubber for knots in the thread to ensure that the tension on the thread is increased in the desired manner where knots or similar protuberances are used instead of soap or the like.

Instead of or in addition to indicating the variation in thread tension, the treatment of the thread with soap or the like may also be utilized for rippling or puckering the work being sewed, as shown in Figure 22 of the drawing, where the reference character 71 designates normal stitches in the work-piece 72, while the reference character 73 designates shortened stitches that are caused by the excess tension on the bobbin thread and produce puckers or ripples 74 in the work.

The invention may also be embodied in mechanism that is actuated solely by the bobbin thread and does not depend upon the needle thread loop for operation. As shown in Figures 23–25, inclusive, the throat plate 75 has a recess 76 on its underside in which an element 77 responsive to variations in the bobbin thread tension is longitudinally slidably mounted and is covered by a cover plate 78 separably secured to the throat plate by screws 79. The throat plate has a needle hole 80 that may be like the hole 13 and the cover plate 78 has a similarly shaped hole 81. An elongated slot 82 is formed in one end portion of the slide 77 and this slide is normally yieldingly actuated by a spring 83 so that the end of the slot 82 in the direction of work feed is normally freely engaged but not actuated by the bobbin thread when the tension on the latter is normal, while when the bobbin thread tension becomes excessive, the thread will be drawn laterally of the needle hole and against said end of the slot 82 so as to actuate the slide 77 in the direction of the work feed and against the tension of the spring 83, as shown in Figure 25.

For controlling the operation of some other device, for example to produce a signal, a detent bar 84 similar to the bar 68 shown in Figures 14–17, inclusive, may be slidably mounted in the throat plate so as to normally abut the edge of the slide 77 when the latter is in its normal position, as shown in Figure 24, said bar being normally influenced by a spring or other suitable means 85 so as to slide behind the end of the slide 77 when the latter is actuated upon a change in thread tension, as shown in Figure 25. The bar may be used to actuate an electric switch or any other suitable mechanism upon sliding of the bar when the thread tension changes.

It is immaterial whether or not the needle thread loop is pulled by the bobbin thread tension against the end of the slot 82, because the slide 77 is actuated solely by the pull on the bobbin thread rather than by the multiple thicknesses of the threads as in the other forms of the invention.

It will be observed that in all forms of the invention the mechanism is shown as attached to the throat plate so that it can be easily and quickly applied to and removed from the machine by simple application and removal of the throat plate; but obviously, the mechanism may be mounted on the machine in other ways than by attachment to the throat plate. Moreover, while I have shown the invention as used in conjunction with a certain type of sewing machine, it

can be adapted to other types by modification which would be apparent to one skilled in the art as necessary to accommodate the invention to a particular machine. For example, the jaws may be placed on just one side of the elongated needle hole of a known type of zig zag machine and actuated by stitches on only one side of the bite, i. e., at one end of the tranverse movement of the needle.

It will also be apparent to those skilled in the art that my invention may be used on either automatic constant speed machines or upon machines in which the speed is frequently varied, and the invention has especial value in connection with the latter type or variable speed machines.

For the purpose of illustrating the principles of the invention, I have shown several specific embodiments thereof, but it should be understood that the details of construction of the mechanism may be widely modified and changed within the spirit and scope of the invention.

Having thus described the invention, what I claim is:

1. The combination with a sewing machine in which during the sewing operation a needle thread is passed through the work and formed into a loop around a bottom thread beneath the work and the portions of said threads at said loop normally follow a predetermined path and are drawn out of said path upon an excess in the tension on the bottom thread relative to the tension of the top thread, of means actuated by said portions of said threads when they are drawn out of said normal path by excessive tension on said bottom thread for performing an operation upon occurrence of said change in tension.

2. The combination with a sewing machine in which during the sewing operation a needle thread is passed through the work and formed into a loop around a bottom thread beneath the work and the portions of said threads at said loop normally follow a predetermined path and are drawn out of said path upon a variation in the tension on one thread relative to the tension of the other thread, of means engaged and actuated by said portions of said threads at said loop when they are drawn out of said normal path for performing an operation upon occurrence of said change in tension.

3. The combination as defined in claim 2, wherein said means comprises an element including a movable part and having a clearance through which said portions of said threads normally freely pass, said movable part being located so as to be actuated when said portions of said threads are drawn out of said normal path.

4. The combination as defined in claim 3 with the addition of means for normally yieldingly influencing said part into a normal position, and wherein said part is actuated out of said normal position into another position when said portions of said threads are drawn out of said normal path, and detent means is provided for releasably holding said part in the second mentioned position.

5. The combination as defined in claim 2, wherein the friction-producing properties of said bottom thread are greater at a predetermined portion of its length than the other portions thereof, and with the addition of means to frictionally engage said predetermined portion of said thread to increase the tension on the thread during the sewing operation.

6. The combination as defined in claim 2, wherein said sewing machine has a throat plate and said means is located on the underside of said throat plate.

7. The combination as defined in claim 2, wherein said means comprises two jaws one of which is movable relative to the other, said jaws having complemental notches to form between them normally an opening through which said portions of said threads normally may freely pass, said movable jaw being actuated by movement of said thread portions laterally out of said opening and between said jaws when said thread portions are drawn out of said normal path.

8. The combination as defined in claim 7, with the addition of means for adjusting and holding said movable jaw in predetermined relation to said fixed jaw.

9. The combination as defined in claim 7, with the addition of means normally actuating said movable jaw toward the fixed jaw, and an adjustable stop for limiting movement of said movable jaw toward the fixed jaw.

10. The combination as defined in claim 7, with the addition of means normally actuating said movable jaw toward the fixed jaw, a detent lever having a detent tooth to engage and hold said movable jaw when it is actuated away from said fixed jaw, and means adjustably mounting said detent tooth on said detent lever to compensate for different degrees of movement of said fixed jaw.

11. The combination with a sewing machine in which a top thread and a bottom thread are interconnected normally under predetermined relative tensions to form stitches, of means engaged and actuated by said bottom thread upon a change in said relative tensions.

12. The combination with a sewing machine in which a top thread and a bottom thread are drawn from respective sources of supply and interconnected in work to form stitches with said threads under predetermined relative tensions during normal sewing operations, of means located between the source of supply of the bottom thread and the point of interconnection and engaged and actuated by a portion of at least one of said threads upon a change in said relative tension for performing an operation upon occurrence of said change.

13. The combination with a sewing machine in which a top thread and a bobbin thread are drawn from respective sources of supply and interconnected in work to form stitches with said threads under predetermined relative tensions during normal sewing operations, of means located between the source of supply of the bobbin thread and the point of interconnection and engaged and actuated by a portion of at least one of said threads upon an increase in the tension of the bobbin thread for performing an operation upon occurrence of said increase.

14. The combination as defined in claim 12, wherein said sewing machine has a throat plate and said means is located on the underside of said throat plate.

15. The combination with a sewing machine in which during the sewing operation a needle thread and a bottom thread are drawn from respective sources of supply and are interconnected in work to form stitches, of a movable part located between the source of supply of said bottom thread and the point of interconnection of said threads, said part having clearance to permit free passage thereby of not more than a certain number of thicknesses of thread simul-

taneously without actuation of said part and being actuated upon passage thereby of more than said certain number of thicknesses of thread at a time.

16. The combination as defined in claim 15, wherein said threads normally operate under predetermined tensions, and said movable part is actuated upon an increase in the tension of the bottom thread relative to the tension of the top thread.

17. As an article of manufacture, a throat plate for a sewing machine having a needle hole, means on the underside of said throat plate including a movable part located adjacent said needle hole, said part having clearance to permit free passage thereby of a single thickness of thread without actuation of said part and being actuated upon passage thereby of more than one thickness of thread.

18. As an article of manufacture, a throat plate for a sewing machine having a needle hole, means on the underside of said throat plate including a movable part located adjacent said needle hole and normally inactive, said part being actuated upon abnormal movement of a thread laterally of said hole in one direction.

19. As an article of manufacture, a throat plate for a sewing machine having a needle hole, means on the underside of said throat plate including a movable part located adjacent said needle hole, said part having clearance to permit free passage thereby of not more than a certain number of thicknesses of thread simultaneously without actuation of said part and being actuated upon passage thereby of more than said certain number of thicknesses of thread at the same time.

20. As an article of manufacture, a throat plate for a sewing machine having a needle hole, means on the underside of said throat plate including a movable part located adjacent said needle hole, said part having clearance to permit free passage thereby of two thicknesses of thread simultaneously without actuation of said part and being actuated upon passage thereby of more than said two thicknesses of thread at the same time.

21. An article of manufacture as defined in claim 18, wherein said movable part is provided with a thread hole that has a large portion and a small portion communicating therewith so that a plurality of thicknesses of thread may pass simultaneously through said large portion without actuating said part but attempted passage of said thicknesses through said small portion will actuate said part.

22. The combination with a lockstitch sewing machine having stitch-forming devices including a needle, a loop taker, a wound locking thread supply about which the loop taker passes each loop of needle thread and which is unwound and interlocked at a certain point with said needle thread during operation of said machine with said needle thread and said locking thread under predetermined relative tensions, of means located between said locking thread supply and said point of interlocking and responsive to change in the relation of said tensions for performing an operation upon the occurrence of said change.

23. The combination with a lockstitch sewing machine having stitch-forming devices including a needle, a loop taker, a wound bobbin thread supply about which the loop taker passes each loop of needle thread and which is unwound and interlocked at a certain point with said needle thread during operation of said machine with said needle thread and said bobbin thread under predetermined tensions, of means responsive to an increase in the tension of said bobbin thread for performing an operation upon the occurrence of said increase.

24. The combination with a lockstitch sewing machine having stitch-forming devices including a needle, a loop taker, a wound bobbin thread supply about which the loop taker passes each loop of needle thread and which is unwound and interlocked at a certain point with said needle thread during operation of said machine with said needle thread and said bobbin thread under predetermined relative tensions, of means located between said bobbin thread supply and said point of interlocking and including a movable part directly engaged and actuated by at least one of said threads upon a change in the relation of said tensions for performing a certain operation.

25. The combination with a lockstitch sewing machine having stitch-forming devices including a needle, a loop taker, a wound locking thread supply about which the loop taker passes each loop of needle thread and which is unwound and interlocked at a certain point with said needle thread during operation of said machine with said needle thread and said locking thread under predetermined relative tensions, of means including a movable part directly engaged and actuated by said locking thread upon a change in the relation of said tensions for performing a certain operation, and means controlled by said movable part for indicating said change.

26. The combination with a lockstitch sewing machine having stitch-forming devices including a needle, a loop taker, a wound locking thread supply about which the loop taker passes each loop of needle thread and which is unwound and interlocked at a certain point with said needle thread during operation of said machine and the portions of said threads at said loop normally follow a predetermined path and are drawn out of said path upon a variation in the tension on one thread relative to the tension of the other thread, of means engaged and actuated by said portions of said threads when they are drawn out of said normal path for performing an operation upon occurrence of said change in tension.

27. The combination with a sewing machine in which during the sewing operation a needle thread is passed through the work and interconnected with a bottom thread with said bottom thread under predetermined tension, of means beneath the work engaged and actuated by a portion of at least one of said threads upon a change in said tension upon the bottom thread.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,455,387	Cobb	May 15, 1923
1,569,074	Collins et al.	Jan. 12, 1926
2,200,720	Morin et al.	May 14, 1940
2,254,606	Gomez	Sept. 2, 1941
2,364,515	Bryson	Dec. 5, 1944
2,387,369	Vossen	Oct. 23, 1945
2,387,958	Vossen	Oct. 30, 1945
2,407,342	Nachman	Sept. 10, 1946