Oct. 14, 1969 F. GEGAUF 3,472,190

SEWING MACHINE HAVING NEEDLE THREAD TENSIONING DEVICE

Filed Dec. 5, 1966

Fig. 1

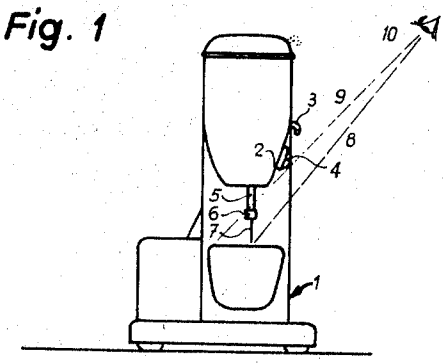


Fig. 2

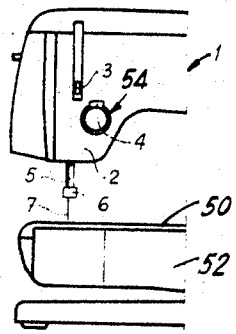


Fig. 4

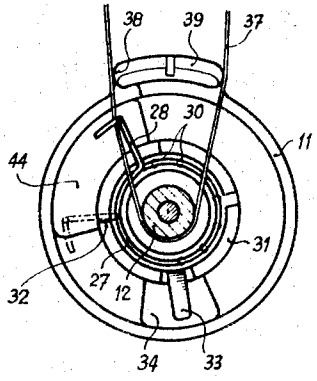


Fig. 3

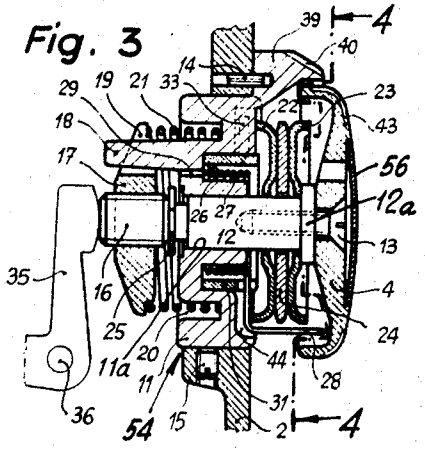
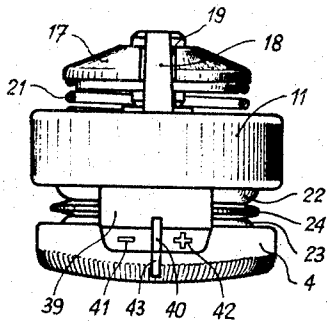


Fig. 5



INVENTOR
FRITZ GEGAUF

BY McGlew & Toren
ATTORNEYS

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SEWING MACHINE HAVING NEEDLE THREAD TENSIONING DEVICE

Fritz Gegauf, Steckborn, Switzerland, assignor to Fritz Gegauf Aktiengesellschaft, Bernina-Nahamaschinenfabrik, Steckborn, Switzerland

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U.S. Cl. 112—254 5 Claims

ABSTRACT OF THE DISCLOSURE

A sewing machine includes an arm head portion overlying a sewing base and which carries a tensioning device arranged on the arm head portion above the reciprocating needle in a position to permit easy passing of the thread through the tensioning device and adjustment of the tensioning in a simple manner. The location of the tensioning device is in the line of view of an operator and at a location so that there is no interference with the operator's view of the sewing field on the supporting base of the machine.

The internal construction of the tensioning device is shown in sectional and plan views and its orientation on the sewing machine is indicated. The tensioning device comprises a relatively small-sized unit which includes tensioning disks which are biased together under the force of a spring, the setting of which may be varied by a control knob which is visible and operable from the front of the device on the sewing machine. The sewing thread is passed from a thread giver downwardly around a mounting shaft for the tensioning disks so that it will be looped between the tensioning disks during the operation of the machine. The mechanism for the regulation of pressure on the tensioning disks between which the needle thread is passed and the spring regulator for engaging the thread and taking up any slack therein are built one into the other. A knob for effecting proper tensioning control provides an adjustment of a tensioning nut which is mounted on a threaded end portion of the disk shaft. The nut is restrained against rotation with the disk shaft by a projecting cam which is formed as an extension of a collar or housing member which surrounds the disk shaft so that the nut will advance along the disk shaft when it is rotated by the knob. The nut bears against a coiled tension regulating spring which causes the collar to bear against the disk plates with a selected amount of pressure in accordance with the setting of the control knob. The collar is provided with a recess in one end face to accommodate the tension regulating spring.

A further feature which is illustrated and described is the arrangement of a coiled thread regulating spring which is carried in an axially extending recess in an appropriate end face of the collar which is carried on the disk shaft. The spring member includes an end loop portion which extends around the periphery of the tensioning disks so that when a thread is engaged between the disks, the thread will normally pick up this loop end of the spring and the spring will provide some tensioning effect on the thread to take up any slack therein.

SUMMARY OF THE INVENTION

The known thread tensioning devices which are employed with sewing machines and which employ tensioning disks are arranged on the side of the arm head facing the operator at a location below the lowest position of the thread giver. Such devices have great structural height and therefore they interfere with the clear view of the operator of the material being sewn. This structural height is due to the fact that the tensioning devices are constructed in a manner such that the thread regulator is arranged behind the thread tensioning disk and the tensioning device for the production of pressure on the needle thread is arranged before these disks. In order to accommodate the thread tensioning device on the machine, the sewing machine housing usually possesses an eye for the uptake of the holder part of the tensioning device so that the structural height is additionally increased. In order to avoid the distadvantages of tensioning devices which obstruct the view of the needle, it has been proposed to separate the thread tensioning device and the thread regulator and to arrange only the regulator below the thread giver. The tensioning device for the needle would then be arranged either at the front of the machine or the greatest possible distance above the regulator or at the back of the sewing machine arm or even on the rear end thereof. All of these expedients lead to poorer sewing results due to the fact that the thread must be guided over excessively long and varied guiding paths and especially because of the long thread path which is required from the tensioning device to the needle. Such a long guide path is highly disadvantageous especially with respect to synthetic threads because of their plastic deformation.

In accordance with the present invention there is provided a construction in which the thread tensioning device and the regulator are arranged so that they can be attached below the lowermost position of the thread giver without disturbing the field of vision. For this purpose the device according to the invention is characterized in a thread tensioning device in which the mechanism for producing the pressure on the needle thread and the regulator for the thread are built one into the other. The construction is such that the thread tensioning disks and the regulator disk project from the sewing machine head at a location at which the field of sewing will remain unobstructed from the operator's view.

An object of the invention is to provide a sewing machine having an arm head which overlies a lower sewing base and which carries the sewing needle with a thread regulating and tensioning device mounted on the head directly below the thread giver so that the thread may be easily passed between the tensioning disks of the device and which includes means for regulating the tension on the thread and for effecting the automatic release of the tension through the operating mechanism of the sewing machine.

A further object of the invention is to provide a thread tensioning device of simple and compact construction with a coiled spring for regulating the engaging force on a pair of tensioning members for the thread arranged in a recess of one end face of a collar or housing member and a spring having a torsion arm portion engageable with the thread for taking up any thread slack which is disposed in a recess in the opposite end face of the housing.

A further object of the invention is to provide a thread tensioning device for a sewing machine which is simple in design, rugged in construction and economical to manufacture.

BRIEF DESCRIPTION OF THE DRAWING VIEWS

In the drawings:

FIG. 1 is an end elevational view of a sewing machine having a tensioning device constructed in accordance with the invention;

FIG. 2 is a partial side elevational view of the sewing machine of FIG. 1;

FIG. 3 is an enlarged axial sectional view of the thread tensioning mechanism;

FIG. 4 is a section taken on the line 4—4 of FIG. 3; and

FIG. 5 is a top plan view of the tensioning device alone.

DETAILED DESCRIPTION

Referring to the drawings in particular, the invention embodied therein comprises a sewing machine generally designated **1** which includes an arm head portion **2** which overlies a sewing table **50** of a base portion **52**.

In accordance with the invention, a thread tensioning and regulating device generally designated **54** is mounted on the arm head **2** below the lowermost position of a thread giver **3**. A regulating disk or knob **4** for the tensioning device is located as indicated so that it will be readily visible to the eye **10** of an operator without interfering with the operator's complete view of the table **50** and the material being sewn thereon. The broken lines **8** and **9** in FIG. 1 indicate the normal range of view of an operator and shows how this view would not be obstructed by the location or construction of the regulating or tensioning device **54**. A needle bar **5** with a needle holder **6** and a needle **7** is arranged in a known manner within the arm head portion **2** to extend downwardly in a position to overlie this sewing table **50**.

The arm head **2** has a housing which is provided with an opening to accommodate the thread tensioning device. The tensioning device includes a housing or collar member **11** which is secured in the opening against rotation by a pin **14** which permits axial displacement by an amount which may be regulated by the frictional drag of a set screw **15**. The collar **11** is provided with a central bore in which is slidably located a tensioning bolt or disk shaft **12**. A regulating disk or knob control **4** is secured to the bolt by means of an adjustable screw **13**. After adjustment of the screw **13**, it is covered from view by means of a flexible plate member **56**.

The thread tensioning bolt **12** is provided with an extension portion or threaded end **16** on which is arranged a tensioning nut **17** which is located on the interior of the housing of the arm head **2**. The nut **17** is provided with an opening or slot through which extends a projection or cam portion **18** of the collar **11** so that the nut is prevented from rotating in respect to the tensioning bolt **12**. The interior end face of the collar **11** immediately surrounding the cam projecting portion **18** is provided with an annular recess **20** which accommodates one end of a coil spring **21** which bears at its opposite end against the nut **17**.

The regulating disk **4** covers tensioning disks **22** and **23** which are carried on the tensioning bolt **12** on each side of an intermediate disk **24**. The disk **23** abuts against a collar portion or abutment **12***a* of the bolt **12**. The tensioning bolt **12** carries between its threaded end **16** and the main portion a widened stop ring **25** which will abut against the collar **11** to limit axial movement of the tensioning bolt member **12** within the collar. The front or exterior end of the collar **11** is provided with an annular recess or depression **26** which accommodates a regulator spring **27** which has a diameter which is located within the diameter of the tensioning spring **21**. One end of the regulator spring is bent radially outwardly and then around the periphery of the tensioning disks **22** and **23**. The collar **11** is provided with a recess **44** to accommodate the bent off end **28** of the regulator spring **27**. The opposite end **29** of the spring is inserted into a bore **30** which is defined in the collar **11**. A regulator ring **31** is arranged around the spring **27** in the same recess of the collar **11** and it carries a ratchet **32** on which the end **28** of the spring **27** engages. The ring **31** becomes wedged in the depression **26** by inherent tension. Ring **31** has a setting lug **33** accessible from the outside of the tensioning device **54**. This lug can be moved in a recess **34** of the housing to set ratchet **32** in accordance with the needle insertion. The tension of the regulator spring **27** is varied by resetting of the spring end **29** into a selected one of the circumferentially spaced bores **30**. This need be done only once.

The release of the thread tension occurs in a manner which is well known through the action of a releasing bow **35** which is mounted on a bolt **36** within the upper arm member **2**. The bow **35** is actuated in a known manner by a ventilating lever (not shown) of the sewing machine.

The needle thread which is designated by the numeral **37** is looped over the tensioning bolt **12** and it engages around the bent arm portion **28** of the tensioning spring **27** when the thread giver **3** is moved to its highest position so that the thread is tensioned and places itself against a stop **38** of the collar member **11**. Stop **38** is formed by the lateral edges of a covering **39**. In the embodiment illustrated, this covering **39** is formed integrally with collar member **11**. The top of the covering **39** is provided with a marking **40** as well as with symbols **41** and **42** for the setting of stronger and weaker thread tension. Opposite the line marking **40** on the regulating disk **4** there is a similar marking **43**.

The thread tensioning device **54** operates as follows:

After the correct thread tension has been adjusted the screw **13** is loosened and the regulating disk is rotated until the lines **40** and **43** are opposite each other. The screw **13** is then tightened and the cover **56** is replaced on the regulating disk **4**. By rotating the regulating disk **4** in one or the other direction, the tension of the needle thread **37** is either increased or decreased as desired. The rotation of the disk causes the movement of the tensioning nut along the threaded portion **16** so that the thread tension spring is either permitted to expand or retract to change the tension acting on the collar member and hence from the collar member through the disks **22** and **23** and **24**. In this manner, the tension on the needle thread **27** is either increased or reduced accordingly.

When the thread giver **3** is moved into its highest position, the needle thread **37** will cause the bent-off portion **28** of the regulator spring **27** to move upwardly, that is, clockwise, as viewed in FIG. 4, into a tensioned position. In this tensioned position, the thread will bear against the stop **38**. During the descent of the thread giver **3**, the bent-off arm portion **28** of the regulator spring **27** will bear against the thread and take away any slack. As the needle enters the material to be sewn, the end **28** of the regulator spring will then place itself on the ratchet **32** until the loop formation is completed and the needle thread is pulled up again.

It should be appreciated that the tensioning device **54** may be made with a collar portion **11** comprising a plurality of separate parts. The guide cam **18** for the tensioning nut may be replaced by a pin, for example, if desired. The covering of the tensioning disk with the tension indication may be secured on the arm head **2** in a separate manner. Also the regulator spring **27** may lie either radially within the thread tensioning spring or radially outside thereof. With the construction set forth above, the tensioning device **54** requires only a minimum of lateral and elevational space so that there is no interference with the visionary field of the operator.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the inventive principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claim is:

1. A needle thread tensioning device comprising a collar member having a central bore and including a tension disk end-face with an axially extending annular regulator spring recess defined therein and an opposite end face having a larger diameter axially extending tension spring recess defined therein located radially outwardly from said regulator spring recess, a shaft slidable and rotatable in the central bore of said collar member, at least two tension members carried by said shaft and having at least

portions which are displaceable together to engage the thread, a collar on said shaft engaging said tension members, a thread regulating coil spring located within the regulator spring recess and bearing at its inner end against the interior of the regulating spring recess and having an outer end adjacent said tension members and biased in a direction to engage the needle thread and take-up any slack therein, a tension coil spring located in the tension spring recess of said collar member and bearing against the inner end of the tension spring recess to urge said collar member against said tension members to apply tension on said members and to the needle thread, and a nut member on said shaft and bearing against the outer end of said tension coil spring.

2. A needle thread tenisoning device, according to claim 1, including means for shifting said nut member along said shaft for varying the force on said tension coil spring and against said collar member and said tension members.

3. A needle thread tensioning device, according to claim 1, wherein said tension members comprise a pair of disks mounted on said shaft, said shaft having a threaded portion, said nut member being threaded onto the threaded portion of said disk shaft and being capable of being advanced therealong upon rotation of said shaft, means for holding said nut member against rotation with said shaft when said shift is rotated, and a regulating knob carried on said shaft and exposed at the exterior thereof and being rotatable to adjust the position of said nut member to regulate the tensioning on said tension coil spring.

4. A needle thread tensioning device, according to claim 3, wherein said nut member includes a slot, said collar member having a portion extending through the slot of said nut member and constituting said means for holding said nut member against rotation with said shaft when said shaft is rotated.

5. A needle thread tensioning device, according to claim 4, wherein said collar member is made of a plastic material.

References Cited

UNITED STATES PATENTS

2,131,005	9/1938	Chason	242—150
2,518,703	8/1950	Marsac	242—150
2,701,694	2/1955	Hamlett	112—254 XR
2,843,336	7/1958	Herbst	242—150
2,955,775	10/1960	Johnson	112—254 XR

FOREIGN PATENTS

1,219,825	12/1959	France.
723,852	8/1942	Germany.

MERVIN STEIN, Primary Examiner

GEORGE H. KRIZMANICH, Assistant Examiner

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