

[54] **THREAD HOLDING AND CUTTING**

3,489,115 1/1970 Marforio..... 112/252
1,352,514 9/1920 Hill..... 112/252

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[22] Filed: **July 14, 1971**

[21] Appl. No.: **162,375**

[57] **ABSTRACT**

[52] U.S. Cl. 112/252

[51] Int. Cl. D05b 65/00

[58] Field of Search..... 112/252, 253

A device for use in sewing machines for holding and cutting thread in which open tongs move from an initial position adjacent the thread into a position straddling the thread. The tongs then close to hold the thread and retract to their initial position while still holding the thread. Immediately after tong closing, a knife is moved across the thread to cut the thread.

[56] **References Cited**

UNITED STATES PATENTS

2,301,798 11/1942 Spaine 112/252

8 Claims, 4 Drawing Figures

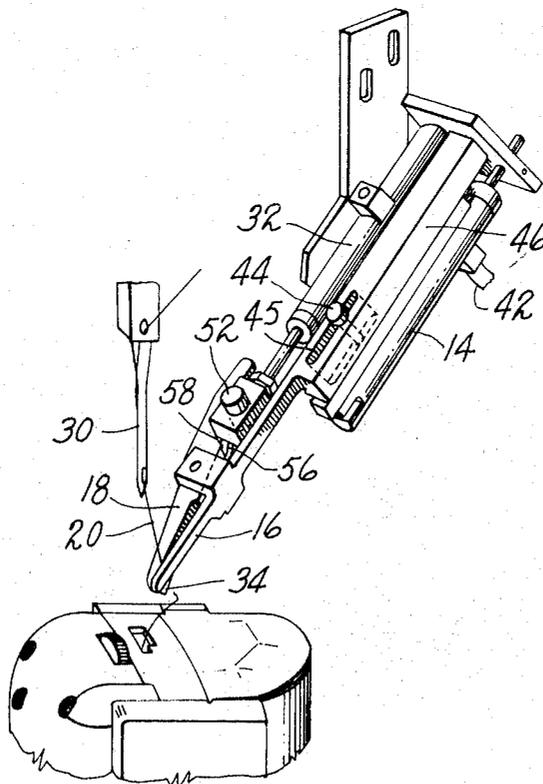


Fig. 1

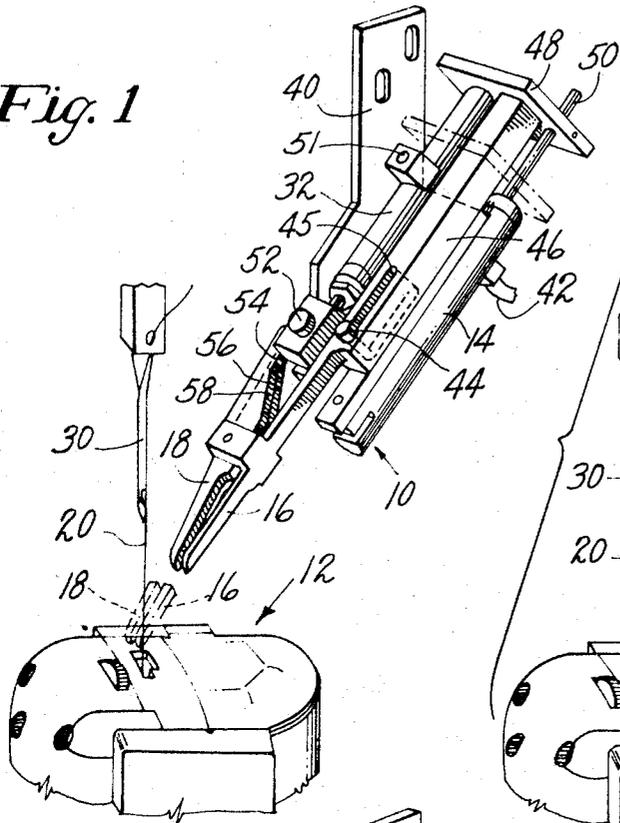


Fig. 3

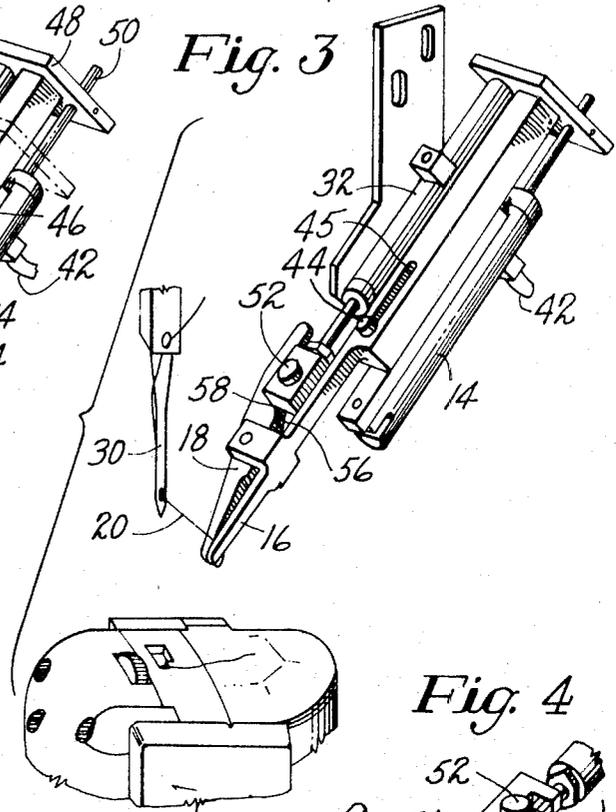


Fig. 4

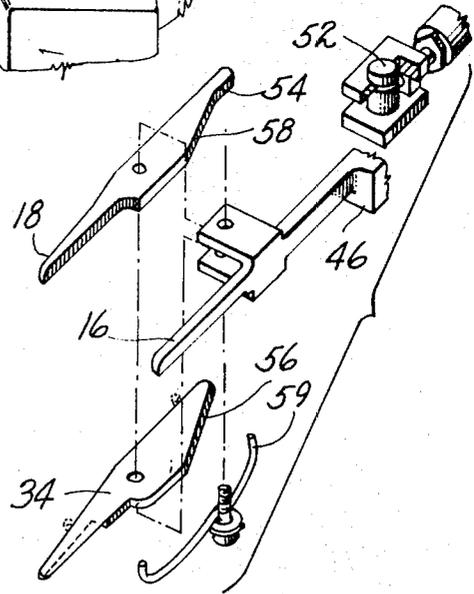
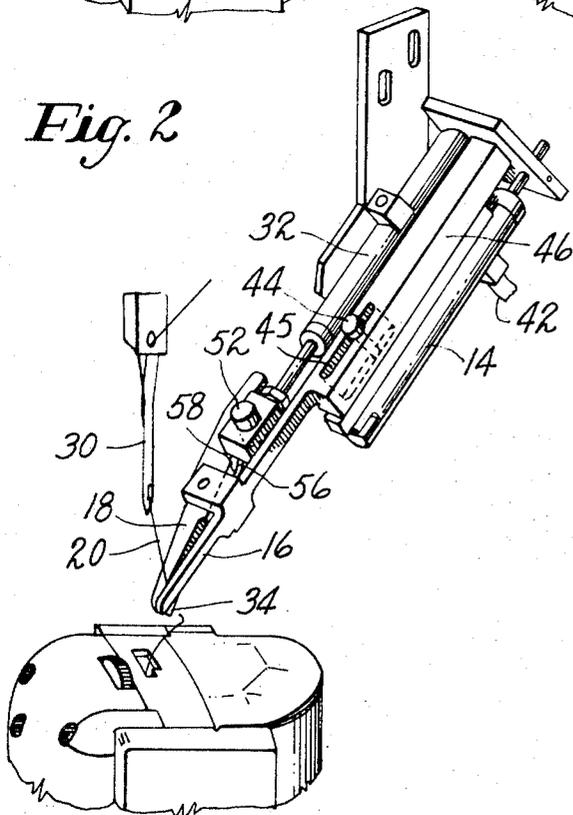


Fig. 2



THREAD HOLDING AND CUTTING

BACKGROUND OF THE INVENTION

This invention relates to a device for holding and cutting thread preferably for use in a stitching portion of a sewing machine.

In a stitching portion of a conventional sewing machine, a needle reciprocally passes a thread through material being sewn. A second thread from a bobbin on the opposite side of the material from the needle secures the needle thread to the material. Both the needle and bobbin threads are thus attached to the material in stitches made by the machine. At the end of a sewing operation both threads must be cut before the material being sewn may be removed from the machine.

It has long been common practice to provide a small stationary knife in the stitching portion of the machine against which an operator of the sewing machine can manually cut the threads. Not only are the threads small and difficult to grasp for cutting, but the cutting is additionally a tedious and repetitive operation.

In recent years efforts have been made to reduce the skill and tedium of sewing machine operation by providing automatic controls for the various operations of the sewing process. One such effort is described in U.S. Pat. No. 3,080,836 issued Mar. 12, 1963 in the name of John E. Clemens, et al. This patent describes automatic controls, including work guidance mechanisms, which relieve the operator from certain machine operations. No means are there described for automatically holding and cutting threads thereby reducing the effectiveness in an otherwise automatic machine so that operator attention is still required.

One prior effort at holding and cutting sewing machine threads is described in U.S. Pat. No. 3,489,115 issued Jan. 13, 1970 in the name of Nerino Marforio. This patent describes a device mounted adjacent the stitching portion of the machine in which an axially extendable cutter has a blade on a concave side of a hook at one end of the cutter. As the cutter is extended toward the thread, an outer, convex edge of the hook laterally displaces the thread until it springs into the bladed hook. The cutter then withdraws toward a counter-blade and the thread is displaced by the blade until it is held and cut between the blade and counter-blade of the device. While the thread is thus held, the entire device withdraws from the sewing portion of the machine. However, the variations in thread tension or defects in the thread may cause the blade to sever the thread before it is held. In addition, the thread is easily dislodged from the small holding surfaces shown. Failure to hold the thread may cause blank stitches when the machine is restarted so that operator monitoring is required to maintain the quality of the machine output.

SUMMARY OF THE INVENTION

Accordingly it is an object of the invention to overcome the above problems by providing an automatic device for positively holding the thread before cutting the thread.

To this end, the invention provides a thread holding and cutting device suitable, in one embodiment, for use on a sewing machine. When a sewing operation is terminated, the device is advanced into the sewing portion of the sewing machine where open tongs of the device straddle the thread. The tongs then close to grip and hold the thread, after which a knife is moved across the

thread to cut the thread. While the thread is still held by the tongs, the device is retracted from the sewing portion of the machine. Preferably, thread tensioning devices in the sewing machine are released before the tongs draw the held thread from the sewing portion of the machine. When the device is to operate on the needle thread of a sewing machine, it is additionally preferable to provide means to assure that the needle is in its raised position remote from the material when a sewing operation is terminated to avoid potentially damaging contact between the tongs and the needle. The thread is released from the tongs after a subsequent sewing operation is started.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other features of the invention will now be more particularly described with reference to drawings of a preferred embodiment of the invention in which:

FIG. 1 is a perspective view of the device initially positioned adjacent a stitching portion of a sewing machine for operation on the needle thread of the machine and in which an advanced position of certain parts of the device are shown in phantom;

FIG. 2 is a perspective view of the device immediately after the thread is held and cut;

FIG. 3 is a perspective view of the device in its initial position and holding the thread; and

FIG. 4 is an exploded perspective view of a tong portion of the device.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The preferred embodiment of the invention operates on the needle thread of a sewing machine. However, in one of the other embodiments of the invention, a device comprising the invention operates on the bobbin thread of a sewing machine. It should be understood that alternative embodiments of the invention are contemplated and that the preferred embodiment is only illustrative of the invention.

In the preferred embodiment of the invention illustrated in FIG. 1, a device comprising the invention, indicated generally at 10, is shown in its initial position adjacent thread in a partial view of a stitching portion, generally at 12, of a single needle sewing machine of a type long known in the art. When a sewing operation is terminated, a control (not shown) for example, a known foot switch which may also control the sewing operation, causes a linear actuator 14 to advance a pair of open tongs 16 and 18 to a position (shown in phantom lines on FIG. 1) straddling a needle thread 20 in the sewing portion of the machine. Means (not shown) of the type described in the above-mentioned Clemens patent are preferably provided to insure that the needle 30 is in its raised position when the sewing operation is terminated so that the tongs will avoid contact with the needle. The control for example, a known, sequential, preferably time delay switch, then causes a second linear actuator 32 to close the tongs to hold the thread and to move a knife 34 (best seen in FIG. 4) to cut the thread. As seen in FIGS. 2 and 3, the control, for example, another known, sequential, preferably time delay switch, causes the first actuator 14 to retract the device to its initial position adjacent the stitching portion of the machine while the tongs remain closed to hold the thread. Preferably, the control causes means for thread

ensioning (not shown) to be released simultaneously with the initiation of returning motion of the device so the thread may be freely pulled by the device. When the first stitch of a subsequent sewing operation has been made, the control, for example, still another known, preferably time delay switch, causes the tongs to open to release the thread. The device and machine are then in the condition shown in FIG. 1 and can repeat the thread holding and cutting operation when the subsequent sewing operation is terminated.

The device has a support 40 carrying the actuator 14 and attached to any convenient portion of the sewing machine to locate the device in its initial position adjacent the thread in the stitching portion of the machine. The linear actuator 14 is a spring loaded pneumatic piston and cylinder connected to an air supply from the control (not shown) at air input 42. The spring (not shown) is effective to return the device to its initial position when air is not supplied to input 42 from the control. A stop 44 projects from the linear actuator 14 through a slot 45 in a bar 46 slidingly mounted on the actuator 14. The stop maintains the device in its initial position against the action of the spring. A plate 48 connects one end of the bar 46 and the second linear actuator 32 with a piston rod 50 of the actuator 14 for moving the bar and second actuator toward an advanced position in response to a supply of air to the actuator 14.

An end of the bar 46 opposite the plate 48 is formed into a stationary tong 16. A movable tong 18 is pivotally mounted on the bar 46 for closing movement toward the stationary tong 16 to grasp the thread. As best seen in FIG. 4, the knife 34 is coaxially pivoted with the movable tong 18 on the bar 46.

FIG. 2 shows the device when air is supplied to the first actuator 14 and the tongs are advanced to a position determined by the stop 44 and slot 45 which are relatively positioned so that the tongs straddle the thread 20. The control then supplies air to the second actuator 32 at input 51. The actuator 32 advances a pin 52 into contact with a cam surface 54 on a rear portion of the movable tong 18. The pin causes the movable tong to swing toward the stationary tong 16 to close on and hold the thread between the tongs. Upon further movement, the pin 52 engages a rearwardly extending cam surface portion 56 of the knife 34. The pin thus swings the knife across the thread to cut the thread as seen in FIG. 2. Further movement of the pin is arrested by abutment with a second cam surface 58 on the rear portion of the movable tong 18 which is held against further movement by the previous engagement with the stationary tong 16. Abutment of the pin and second cam surface 58 additionally serves to maintain the tongs in their closed, thread holding position.

After the tongs grip the thread, the control terminates the supply of air to the first actuator 14 so that the tongs retract to their initial position under the spring action of the actuator. The tongs continue to hold the thread. When the control terminates the air supply to the first actuator, it may additionally release thread tensioning devices (not shown) so that the thread is not under tension and runs freely to reduce

the possibility of thread breakage during retracting movement of the device.

When a subsequent stitching operation has started and the needle thread is attached to material being sewn by at least one stitch, the control terminates the air supply to the second actuator 32 so that the pin 52 returns to its initial position shown in FIG. 1 under the power of a spring (not shown) in the second actuator. As the pin moves out of engagement with the cam surface portions 54, 56, and 58 of the movable tong and knife, a spring 59 (seen in FIG. 4) causes the knife and tong to return to their initial, open positions. The entire device is now in the position shown in FIG. 1 and is ready to repeat the thread holding and cutting operation when the subsequent sewing operation is terminated.

It should be apparent that the foregoing describes only one, preferred embodiment of the invention and that substitution of equivalent elements or mechanisms other than those described can be made without departing from the scope of the invention defined by the following claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A device for holding and cutting a thread, comprising: a pair of open tongs in an initial position adjacent the thread; means for movably mounting the tongs; means for advancing the open tongs to an advanced position straddling the thread; means for closing the tongs in their advanced position to hold the thread; a knife; and means effective after said tong closing means for moving the knife to cut the tong-held thread.

2. A device as in claim 1 wherein the knife is mounted adjacent the tongs for advancing motion therewith.

3. A device as in claim 1 additionally comprising means for retracting the tongs to their initial position while the tongs are closed to hold the thread.

4. A device as in claim 3 wherein the retracting means is operable when the thread is not under tension.

5. A device as in claim 1 wherein one of the tongs and the knife have cam surfaces and the tong closing means and the knife moving means comprise a pin engageable with the cam surfaces on the tong and knife and means for moving the pin.

6. A device as in claim 1 wherein one of the tongs is pivotally movable for closing the tongs and the knife is coaxially pivoted with the movable one of the tongs for advancing motion therewith and for cutting movement.

7. A device as in claim 1 adapted for use on a sewing machine wherein the tong advancing means is responsive to termination of a sewing operation of the machine for initiating tong advance.

8. A device as in claim 1 adapted for use on a sewing machine wherein the tong closing means is responsive to the starting of a subsequent sewing operation for opening the tongs.

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