THREAD CUTTER FOR AN ELECTRICALLY OPERATED SEWING MACHINE

ABSTRACT: An electrically operated sewing machine is provided with a thread cutter actuated by a solenoid so that the thread is cut automatically when the machine stops after completing a sewing operation.
This invention relates to a thread cutter for an electrically operated sewing machine.

According to the present invention, a thread cutter for an electrically operated sewing machine comprises a cutter blade adapted to be actuated by a solenoid connected in circuit with a switch which is manually operable when the machine is stopped, circuit interrupter means being provided so arranged that when the switch is closed the circuit to energize the solenoid is not completed unless the needle of the sewing machine is located out of engagement with a workpiece being sewn and a loop of thread to be cut is positioned in the path of movement of the cutter blade.

To enable the invention to be fully understood, it will now be described, by way of example, with reference to the accompanying drawings in which:

FIG. 1 is an elevational view of the sewing head of a blind-stitch electrically operated sewing machine including a thread cutter according to one embodiment of the invention;

FIG. 2 is a fragmentary view, on an enlarged scale, of the cutter blade;

FIG. 3 is a front view of the disc of the circuit interrupter;

FIG. 4 is a side view thereof;

FIG. 5 is a circuit diagram for controlling the operation of the thread cutter, and

FIG. 6 is a diagrammatic illustration of the means by which the thread controls the switch of the solenoid.

As illustrated in the drawings, 1 indicates a sewing machine head 2 and a balance or flywheel which is fast on a main driving shaft mounted in the head. The head is provided with suitable guide means 3, 4, for the thread 5.

A thread cutter device is provided generally indicated by 6 and comprises a base 7 having a flange 8 detachably secured to the machine head by screws 9. A solenoid is mounted on the base 7 including a coil 10c located in a casing 10, an armature being slidably mounted in the coil and provided with a bifurcated end 11 projecting axially outwardly of the lower end of the casing 10.

A lever 12 is pivoted to the base 7 at 13 and has a cutter blade 14 detachably attached to its free end by a screw 15. The lever is free to pivot about the pivot axis 13 and the inner end of the lever is pivotally connected at 16 to the bifurcated end 11 of the armature. A coil spring 17 is provided having its opposite ends anchored to the lever 12 and part of the coil casing so as to urge the lever into its inoperative position wherein the cutter blade is spaced from the looped portion of the thread and the armature is urged by the lever inwardly of the coil of the solenoid. The solenoid coil is connected by lead wires 18 to a switch controlled by a foot treadle which is used for controlling the normal operation of the sewing machine when the treadle is pivoted in one sense by the sole of the foot of the operator. Pivoting the treadle in an opposite sense by the heel controls the circuit to the solenoid to effect a thread severing operation.

A synchronizer device or circuit interrupter 19 is provided in the circuit between the solenoid switch and the coil of the solenoid and includes a disc 20 made of electrically insulating material having a central hole 21 for fitting over the end of the main driving shaft of the sewing machine where it projects outwardly of the balance or flywheel 2. As shown more particularly in FIG. 3, the disc is provided with an insert in the form of a metal segment 22 made, for example, of brass and having an outer surface extending over a small part of the circumference of the disc and flush therewith. A fixing plate 23 fits over a stepped portion 20a of the disc and is secured to the disc by screws extending through holes 24 in the fixing plate 23 and screwing into bores 25 in the disc. Further, holes extend radially through the fixing plate and disc for receiving screws such as 26 (FIG. 1), the inner ends of the screws being adapted to engage the drive shaft which extends through the hole 21 in the disc 20 and thereby serves to secure the disc and fixing plate to the drive shaft. It will be understood that by loosening the screws 26, the disc and fixing plate can be adjusted in a circumferential direction relative to the drive shaft and secured in adjusted position by retightening the screws.

Mounted adjacent the disc 20 is a brush-holder which is mounted on part of the machine frame and provided with two brushes 27 respectively connected by lead wires 28 to the manually operated switch previously referred to, the brushes being rubbing engagement with the peripheral surface of the disc and the outer surface of the segment 22 which forms part of said peripheral surface.

The sewing machine is operated in a conventional manner by depressing the motor switch by the sole of the foot so as to close the circuit to the motor to drive the main drive shaft in the sewing machine. At the completion of a sewing operation the pressure on the motor switch is released and the machine will come to a halt. The operator then exerts pressure by the heel on the second switch which controls the circuit to the thread cutter solenoid. It will be understood that the disc 20 of the circuit interrupter rotates with the main drive shaft and if, when the machine is stopped, the segment 22 is aligned with the brushes 27, the circuit to the solenoid is automatically completed and is isolated to effect the operation of the armature so that the bifurcated end 11 pivots the lever 12 and the cutter blade 14 is thereby drawn across a loop of the thread 5 to cut it. The workpiece being sewn is then free to be removed from the sewing table of the machine.

If, however, when the machine stops the segment 22 is not aligned with the brushes 27, the mechanism in the sewing machine will have withdrawn the needle from the workpiece being sewn and as the cutter blade cannot be operated until the drive shaft and disc are in this position damage to the cutter or other parts of the machine by the incorrect operation of the cutter is prevented.

The solenoid and its associated parts are easily fitted to any electrically operated sewing machine and will enable the sewing operations to be speeded up as the garment or the like being sewn can be removed from the machine quickly and without the delay of severing the thread by hand by breaking it or cutting it by the use of scissors.

While the invention has been described as applied to a blind-stitch sewing machine, it will be understood that it is applicable to other types of electrically operated sewing machines.

With reference to the circuit diagram illustrated in FIG. 5, the current supply from the mains is reduced to a low voltage by the transformer 29 and the output coil of the transformer is connected to the coil 10e of the solenoid through a manually operable switch 30, the circuit also including the circuit interrupter 19. When the switch is closed, current flows to the solenoid only if the circuit interrupter is in a position such that the brushes 27 are in engagement with the segment 22.

If desired, the positioning of the circuit interrupter can be made fully automatic by providing a positioning motor for operating the machine so that when the foot pressure on the motor switch is released the motor stops when the segment 22 of the circuit interrupter is aligned with the brushes 27 so that no manual adjustment of the wheel 2 is necessary and the circuit to operate the thread cutter is completed merely by heel pressure on the said second switch.

FIG. 6 illustrates in diagrammatic form the means by which the circuit to the solenoid is controlled. As shown, a microswitch 31 is mounted in a casing 32 which is connected to a shaft 32a which controls the clutch through which the sewing machine is driven by the electric motor. A rod 33 is slidably mounted in a hole in the base of the casing and has a head 34 normally urged into spaced relation to the switch 31 by a spring 34c whose opposite ends respectively abut the bottom of the casing and a collar 35 adjustably secured to the rod 33.
A pivotally mounted foot treadle (not shown) is provided and connected to the rod 33 such that when pivoted in one direction, for example, by the sole or toe of the foot of the operator, the rod 33 is moved downwardly and the head 34 engages and moves the casing 32 and shaft 32a downwardly to actuate the clutch to couple the main drive motor to the drive shaft of the sewing mechanism, switch for the motor having already been closed by hand. When the treadle is pivoted in an opposite direction, for example, by heel pressure of the operator, the shaft 32a will return to the position shown in FIG. 6 to release the clutch and the rod 33 is moved upwardly relative to the casing 32 so that the head 34 engages and closes the switch 31 in a circuit which includes the brushes 27 and the solenoid. When the heel pressure on the treadle is released, the shaft 33 is returned by the spring 34a to reopen the switch 31.

I claim:

1. In an electrically operating sewing machine having a stitch forming means including a reciprocating needle, a drive shaft for operating said means and a thread cutter mounted adjacent said needle and operable across the path of movement thereof, a solenoid for actuating said cutter, a manually operable switch in circuit with said solenoid and control means for said circuit so arranged that when the switch is closed the circuit to energize the solenoid is completed only if the needle of the sewing machine is positioned out of engagement with a workpiece being sewn and a loop of thread to be cut is positioned in the path of movement of the cutter, said control means comprising a circuit interrupter having an insulated disc rotatable in synchronism with said drive shaft, an electrical conducting element on the peripheral surface of said disc, electrical contact means connected in circuit with said solenoid and mounted so as to make rubbing engagement with said disc so that the said circuit is closed when the disc stops in a position wherein the said contact means make electrical contact with the conducting element.

2. The combination as claimed in claim 1, wherein said thread cutter is supported on a pivoted lever actuated by said solenoid.

3. The combination as claimed in claim 1, wherein a pivoted foot treadle is provided for controlling the said drive shaft, the pivotal operation of said treadle being such that when the treadle is pivoted in one direction, the drive shaft is operable to drive the said stitch forming means and when pivoted in an opposite direction, the drive shaft is rendered inoperative and the circuit to said contact means is closed so that the circuit to the solenoid will be completed when said contact means is in contact with the said conducting element on said disc.