United States Patent [19]

Uozake et al.

[11] **3,889,615**

[45] **June 17, 1975**

[54] **SAFETY DEVICE FOR A SEWING MACHINE**

[75] Inventors: **Seizo Uozake**, Toyota; **Hitoshi Sakashita**, Nukata, both of Japan

[73] Assignee: **Aisin Seiki Kabushiki Kaisha**, Japan

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[30] **Foreign Application Priority Data**

May 30, 1973 Japan 48-61383

[52] **U.S. Cl.** ..... **112/252**; 112/219 A

[51] **Int. Cl.** **D05b 65/00**

[58] **Field of Search** .... 112/122, 130, 219 R, 219 A, 112/219 F, 252

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Primary Examiner—Werner H. Schroeder
Attorney, Agent, or Firm—Oblon, Fisher, Spivak, McClelland & Maier

[57] **ABSTRACT**

A sewing machine is provided with a safety device which does not permit a high speed stitching operation to be performed during the performance of a cutting operation. The cutting mechanism is actuated by means of a knee-operated switch for the performance of the cutting operation and simultaneously therewith, a solenoid-actuated detent is also activated so as to prevent a mechanical connection from being attained between the primary power source of the machine and the machine drive shaft. In this manner, power from the primary power source is not conducted to the drive shaft during the cutting operation and consequently the stitching operation is not able to be performed.

6 Claims, 15 Drawing Figures

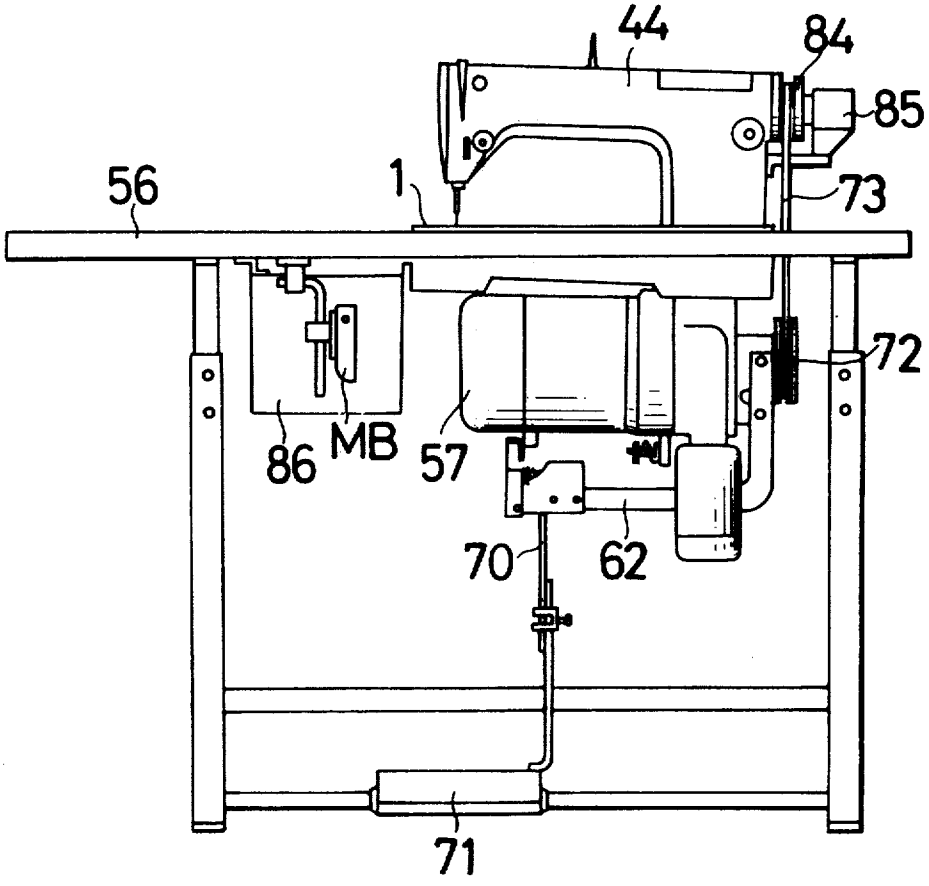
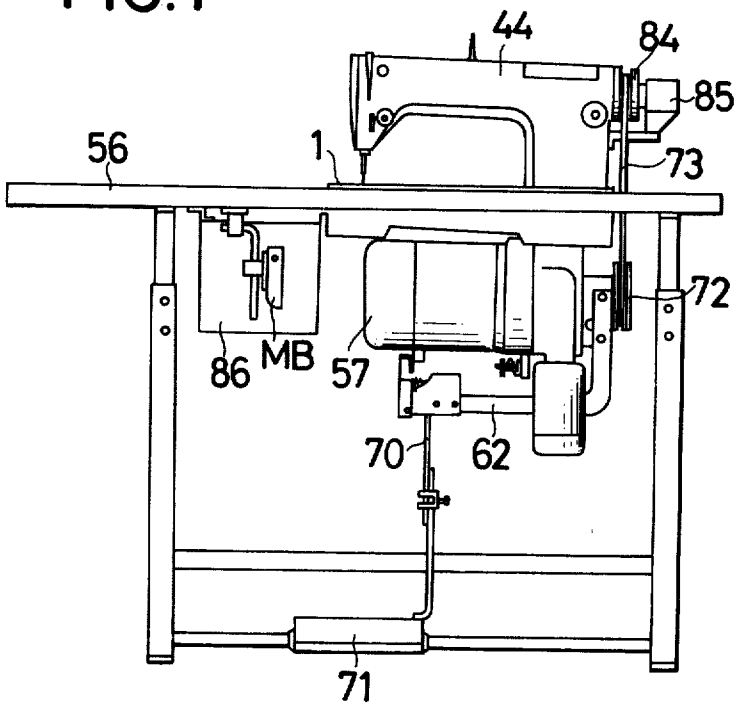


FIG.1



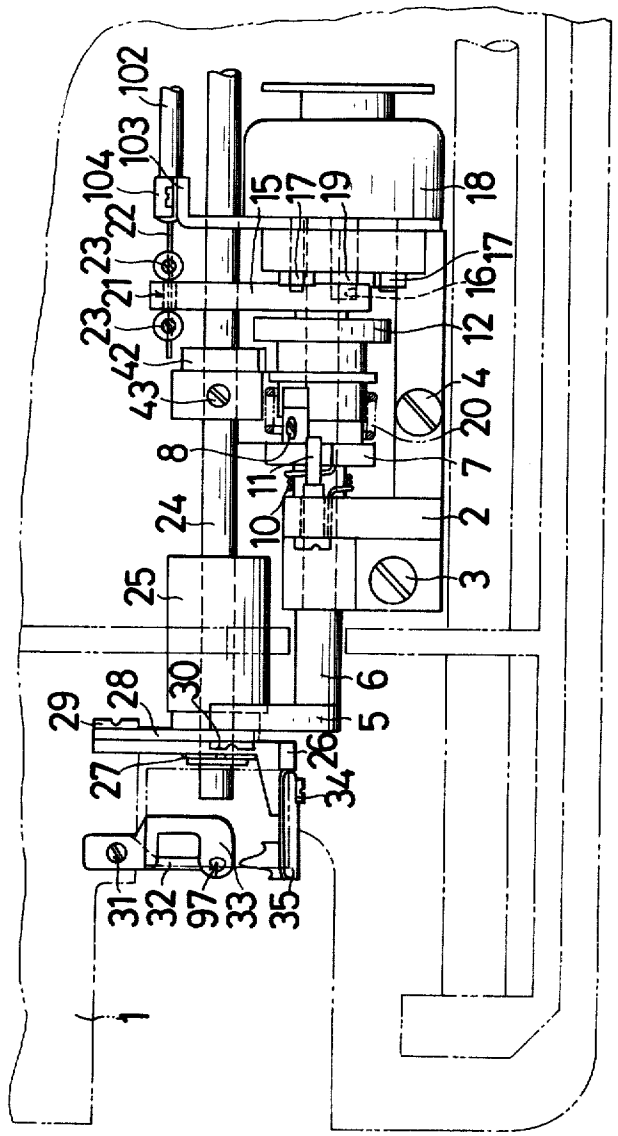

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FIG.2

FIG. 3

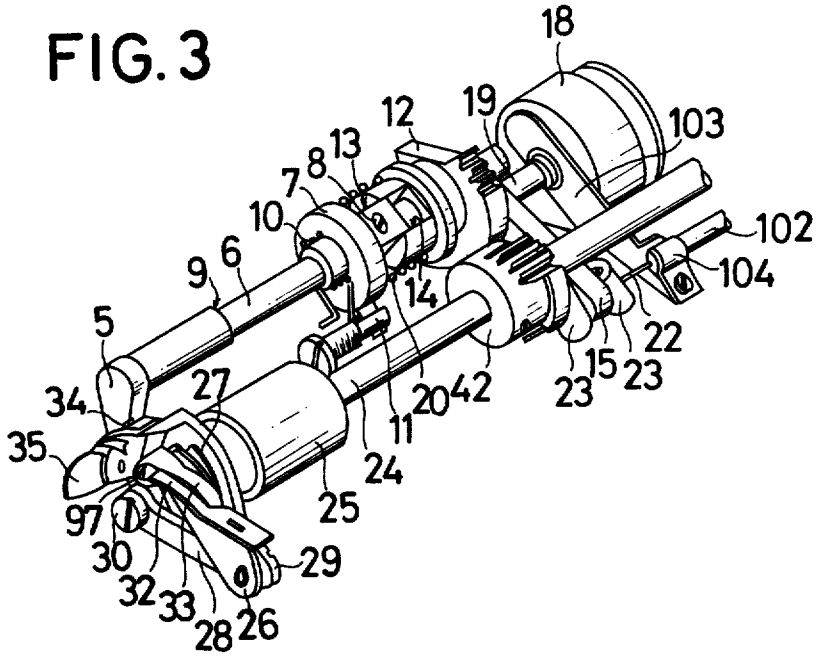
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FIG. 4

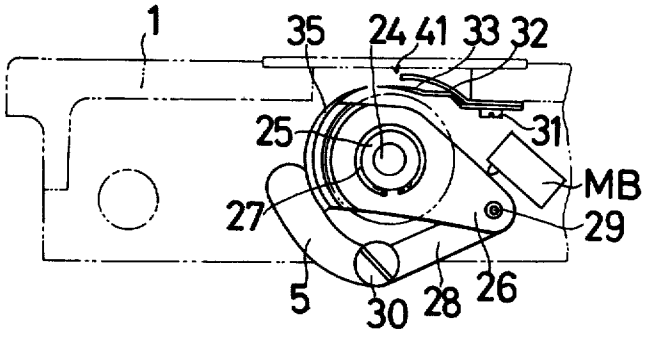
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FIG. 5

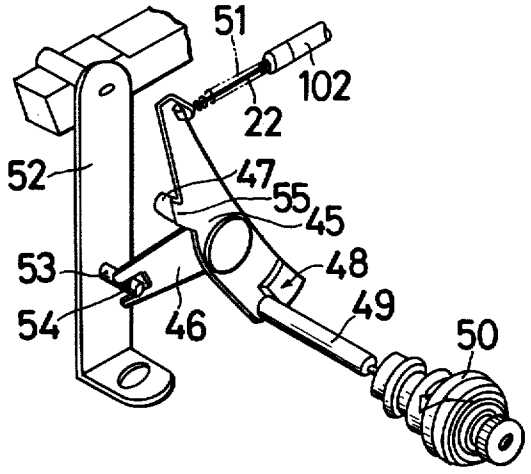
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FIG.6

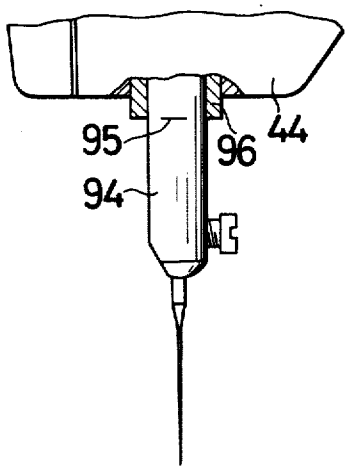

FIG.7

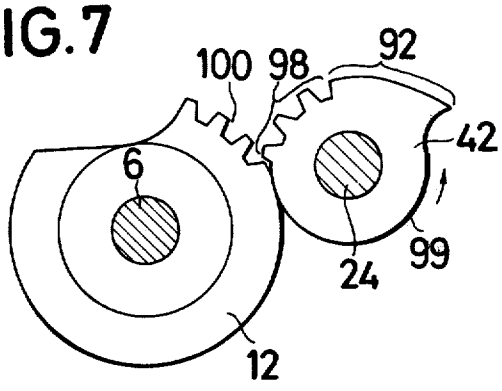

FIG. 8

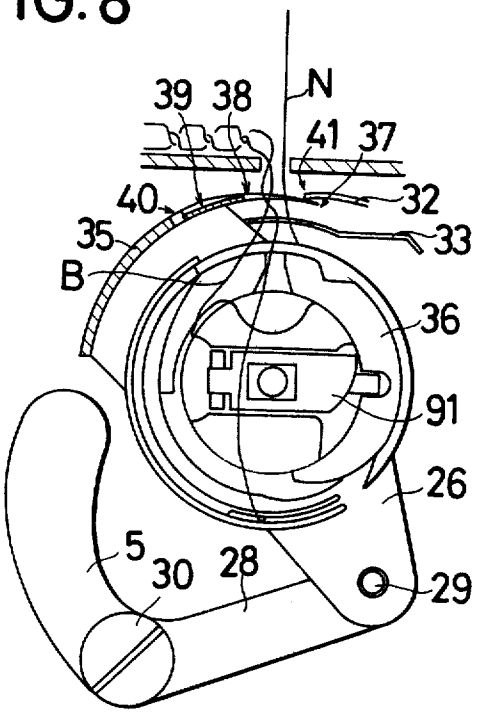

FIG. 9

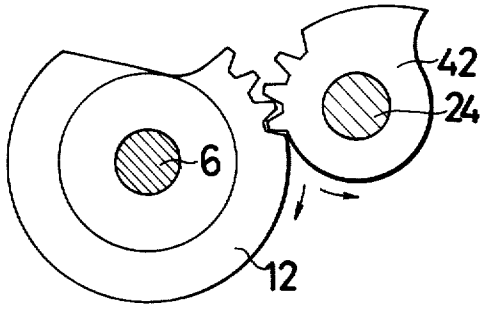

FIG. 10

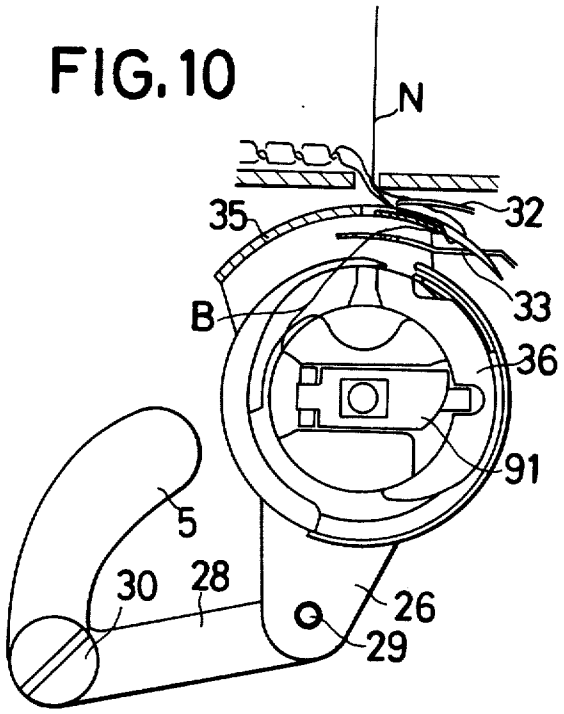

FIG. 11

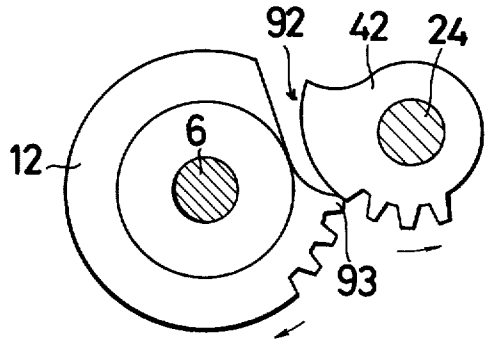

FIG. 12

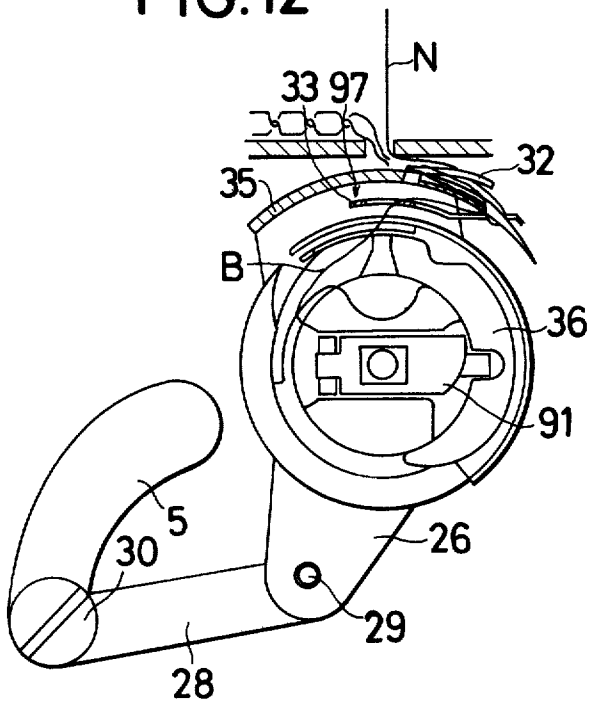

FIG. 13

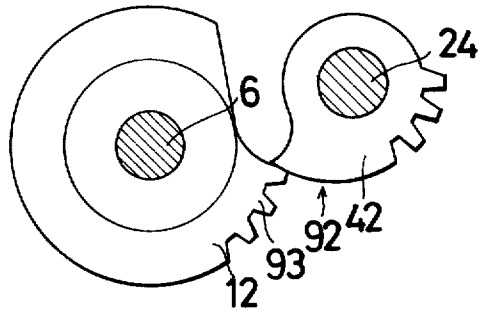

FIG.14

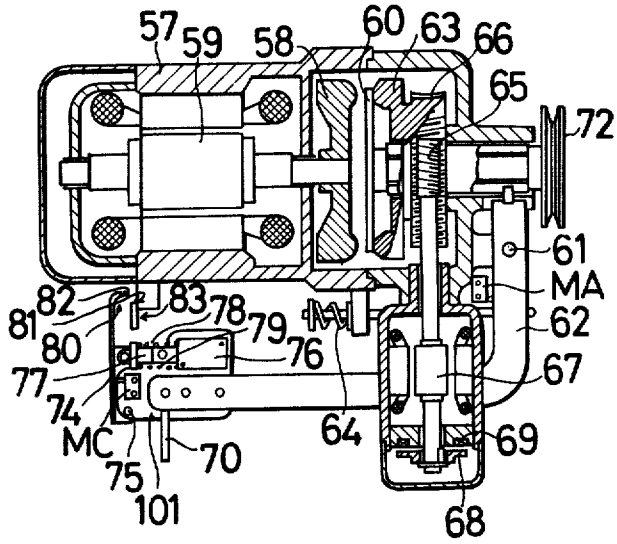
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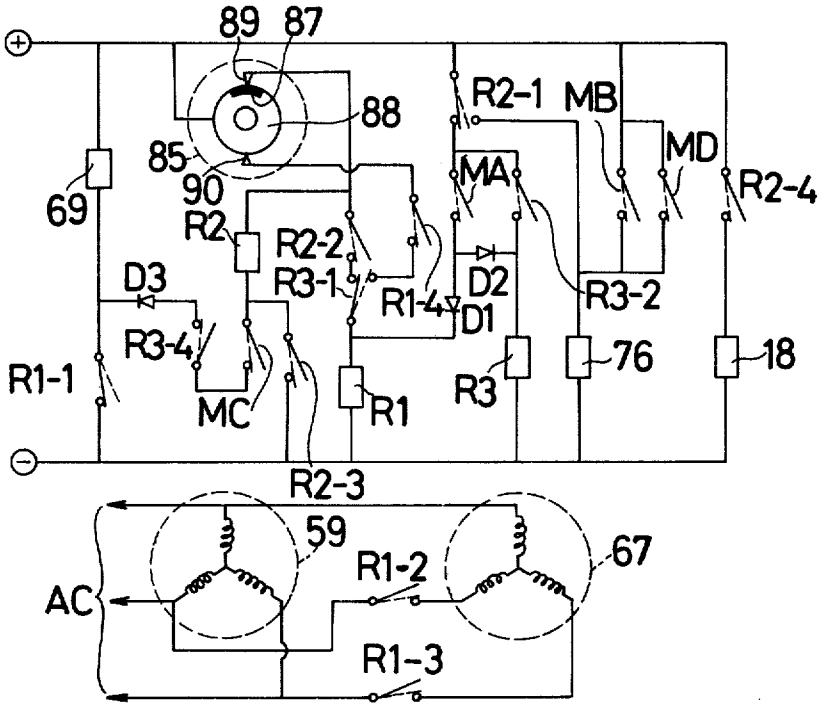
FIG. 15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R2
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R3-1
R1-4
D3
R3-4
R1-1
MC
R1
R2-3
R2-1
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MA
MD
R2-4
D2
D1
R3-2
R3
76
18
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67
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R1-2
R1-3

SAFETY DEVICE FOR A SEWING MACHINE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to sewing machines within which automatic thread cutting devices are provided, and more particularly to a safety device or mechanism incorporated within the thread cutting device of the sewing machine for reliably and securely actuating the thread cutting device.

2. Description of the Prior Art

Conventional sewing machines are known wherein mechanisms are employed and actuated, between stitching operations, whereby upper and lower threads may be automatically caught and severed, by means of the thread holder and cutter device, at a position between the cloth material and the shuttle race. Within a few of such prior art thread cutting devices, safety devices are also provided for reliably actuating the same.

However, such safety devices are usually only actuated at the same time or prior to the performance of the thread cutting operation. Therefore, if the foot pedal or the like is erroneously depressed so as to actuate a stitching operation during a thread cutting operation, the thread cutting device under operation, as well as other component parts of the machine, might be damaged due to the undesired forces suddenly applied thereto as a result of the erroneously actuated stitching components.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide an improved sewing machine which incorporates a safety device which obviates the above-mentioned drawbacks characteristic of conventional sewing machines.

Another object of the present invention is to provide an improved sewing machine which incorporates a safety device which prevents the high speed actuation of the stitching operation of the machine while a thread cutting operation is being performed.

BRIEF DESCRIPTION OF THE DRAWINGS

Various other objects, features, and attendant advantages of the present invention will be more fully appreciated as the same becomes better understood from the following detailed description when considered in connection with the accompanying drawings, in which like reference characters designate like or corresponding parts throughout the several views, and wherein:

FIG. 1 is a front elevation view of a sewing machine incorporating the safety device of the present invention;

FIG. 2 is a bottom view of a thread cutting device incorporated within the sewing machine of FIG. 1;

FIG. 3 is a perspective view of the device of FIG. 2;

FIG. 4 is an end view of the device of FIG. 2;

FIG. 5 is a perspective view of a thread tension release mechanism incorporated within the machine of the present invention;

FIG. 6 is an end view, partly in section, of a needle and a needle bar secured to the machine arm;

FIG. 7 is a schematic view of the ratchet wheels of the thread cutting device of the machine of the present invention;

FIG. 8 is a view similar to that of FIG. 4, partly in section and showing however the thread holding operation being initiated;

FIG. 9 is a view similar to that of FIG. 7 showing however the ratchet wheels being engaged;

FIG. 10 is a view similar to that of FIG. 8 showing however the thread holding operation;

FIG. 11 is a view similar to that of FIG. 9 showing however advanced engagement of the ratchet wheels being performed;

FIG. 12 is a view similar to that of FIG. 10, showing however the thread cutting operation being terminated;

FIG. 13 is a view similar to that of FIG. 11, showing however the position of the ratchet wheels corresponding to the operation illustrated within FIG. 12;

FIG. 14 is a cross-sectional view of the safety device constructed according to the present invention and showing its cooperative parts; and

FIG. 15 is a schematic diagram of the electrical circuitry embodied within the safety device of FIG. 14.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings, and more particularly to FIGS. 1–9 thereof, the sewing machine of the present invention includes a horizontally disposed arm 44 and a bed 1 upon which the machine is fixedly supported. A frame member 2 is secured to the rear portion of bed 1 by means of screw bolts 3 and 4 and a stepped shaft 6 which is pivotally mounted upon frame member 2 is provided at one end thereof with a stepped portion 9 and a lever member 5. A disc-type setting member 7 is also mounted upon shaft 6 and at the end opposite to that upon which member 5 is mounted, member 7 being fixed thereon by means of a set screw 8 which is adapted to be inserted within a rectangularly configured portion 13 of setting member 7.

The axial displacement of shaft 6 may be prevented by interposing a portion of frame member 2 between the stepped portion 9 of shaft 6 and the setting member 7, as is best shown in FIG. 2, and a coil spring 10 is interposed between the frame member 2 and the setting member 7 and about shaft 6 whereby an arm portion 7*a* of setting member 7 is, under the influence of the biasing force of spring 10, urged into contact with a stopper pin 11 which is threadedly engaged within the frame member 2. In this manner, the setting member 7, and accordingly, the shaft 6, is prevented from rotating in a counterclockwise direction from the inoperative positions illustrated within FIG. 3.

A first ratchet wheel member 12 is pivotably mounted upon shaft 6 and includes an outer peripheral portion which is partially toothed as illustrated at 100 as shown in FIG. 7 and also includes a partially formed cam surface, and an axially extending recess defining portion 14 within which the rectangular portion 13 of the setting member 7 is longitudinally receivable whereby the first ratchet wheel member 12 is freely slidable upon shaft 6 in the axial direction thereof but is also secured against rotation with respect thereto. In this manner, then, the first ratchet wheel member 12, the setting member 7, and the shaft 6 may be rotated in unison. In conjunction with such structure, it is further seen that another coil spring 20 is similarly interposed between the setting member 7 and the first ratchet wheel member 12 for normally biasing the latter toward the right as seen in FIGS. 2 and 3.

A lever **15** is also slidably mounted upon shaft **6** adjacent to the first ratchet wheel member **12**, and at one outer end thereof is provided with a recess **16** within which a plunger **19** is inserted, the latter of which is operatively connected to a first solenoid means **18** through means of an intermittent lever **103**. As the first solenoid means **18**, as well as a second solenoid means **76**, a somewhat detailed description of which appears hereinafter, may be applicable within any conventional solenoid valve mechanism, a detailed description of the construction thereof is hereby omitted, although it is noted that the first solenoid means **18** is secured to frame member **2** by means of a plurality of bolts **17**.

Upon energization of the first solenoid means **18**, the plunger **19** is moved toward the left as seen in FIGS. **2** and **3** so as to similarly move lever **15** toward the left the movement of which in turn causes the movement or displacement of the first ratchet wheel member **12** toward the left so as to overcome the biasing force of coil spring **20**.

A cable member **22** is passed through a through-hole **21** provided within the other end lever **15** and is fixed relative thereto by means of a pair of stoppers **23**. The cable member **22** is additionally slidably movable within an outer cable member **102** one end of which is fixed to the intermittent lever **103** by means of a clip **104**.

Another shaft **24** disposed parallel to shaft **6** is rotatably supported upon bed **1** through means of a bushing **25** which is press-fitted within bed **1**, and a holder **26** is rotatably mounted upon one end of shaft **24**. A stop ring **27** is provided so as to prevent holder **26** from undergoing any axial displacement relative to shaft **24**, and the other end of shaft **24** is operatively connected to a hand wheel **84** (See FIG. **1**) through means of a link, not shown, provided within the arm **44**. Holder **26** is relatively rotatably connected to lever portion **5** of shaft **6** through means of a link member **28** one end of which is secured to holder **26** by means of a stepped, threaded bolt **29**, while the other end thereof is similarly secured to lever portion **5** by means of another stepped threaded bolt **30**.

A stationary blade member **32** and a tension thread guide **33** are fixedly secured to bed **1** by means of a screw bolt **31** and a presser foot **35** is similarly fixed to holder **26** by means of a screw bolt **34** so as to face stationary blade member **32** whereby a first blade portion **41** of member **32** and a second blade portion **40** (See FIG. **8**) of presser foot **35** may be pivoted together so as to overlap an area with respect to each other and thereby coact together in the manner of a scissors so as to perform a thread cutting operation. The arcuate portion of tension thread guide **33** is interposed between a shuttle race **36** and presser foot **35** and is positioned coaxially therewith, and an aperture **97** is provided within the tip portion of tension thread guide **33** for providing a passageway for thread to be passed therethrough. The presser foot **35** is seen to serially comprise a horn **37**, a thread guard **38**, a groove or slot **39**, and the blade **40**.

Still referring to FIGS. **2** and **3**, a second ratchet wheel member **42** fixedly secured upon shaft **24** by means of a threaded bolt **43** comprises a toothed portion **98** (Sec FIG. **7**) and an outwardly extending cam surface **92** the diameter of which is gradually increased and subsequently decreased to an amount less than that of the toothed portion **98**. Ratchet wheel **42** is thus oscillatingly rotated together with shaft **24** during a normal stitching operation, however upon the performance of a thread cutting operation whereby the first solenoid means **18** is energized, the first ratchet wheel member **12** will be move along shaft **6** to a position so as to be engageable with the second ratchet wheel **42**. A switch MD provided upon bed **1** is maintained within its OFF condition unless the holder **26** is rotated by means of the lever portion **5** of shaft **6**, that is, the switch MD is actuated only when a thread cutting operation is required.

As may be especially seen within FIG. **5**, a tension release member **45** and a rotatable member **46** are relatively rotatably connected to each other by means of a pin **47** secured to the arm **44** of the machine. The tension release member **45** has a cam surface **48** at one end thereof and upon rotation of tension release member **45**, a pin rod **49** which is connected to a well-known thread tension regulator **50** a detailed construction of which is hereby omitted, is forced to ride over the cam surface **48** of tension release member **45** so as to push the pin rod **49** toward the regulator **50** whereby the tension within the upper thread may be released by means of the operation of regulator **50**.

The other end of outer cable member **102** is fixed to arm **44** by appropriate securing means, not shown, and since the inner cable member **22** is at one end thereof connected to tension release member **45** while the other end thereof is fixed to lever **15** as seen in FIG. **3**, upon energization of the first solenoid means **18** and therefore upon the performance of a thread cutting operation, the tension release member **45** is rotated about pin **47** so as to release the tension within the upper thread as a result of the operation of regulator **50**. Upon de-energization of the first solenoid means **18**, the tension release member **45** will be returned to the position illustrated within FIG. **5** by means of the biasing force of a spring **51** interposed between the upper end of tension release member **45** and the outer cable member **102**.

In connection with the tension release operation, a conventional presser foot lifting operation will now be briefly explained. A lifting plate **52** is operatively connected to a conventional presser foot lifting member, partially shown but not numbered, at one end thereof while a pin **53** is provided upon the lifting plate **52** near the other end thereof and is adapted to be loosely disposed within a bifurcated or forked portion **54** of the rotatable member **46**. Upon raising the plate **52** by means of the presser foot lifting member the rotatable member **46** is consequently rotated in the clockwise direction as seen in FIG. **5** whereby the same will come into contact with a detent **55** provided upon tension release member **45** which thereby serves to operate the regulator **50** so as to release the upper tensioned thread. It is noted that this operation is performed independently of the energization and de-energization of the first solenoid means **18**.

Referring more particularly to FIG. **6**, a timing mark **95** is stamped upon a needle bar **94** at a predetermined position thereof, such position being determined such that when the mark **95** is aligned with the under side or bottom surface of the needle bar metal support **96**, as seen in FIG. **6**, the timing is set such that the needle bar is approximately 55° ahead of the upper dead center position.

Turning now to FIGS. 1 and 14, a clutch motor housing 57 is suitably secured beneath the sewing machine table 56 and within housing 57 there is provided a motor assembly 59, a first flywheel 58 connected to one end of the motor assembly drive shaft, not numbered, a clutch disc 60, and a second flywheel 63, all of which are serially arranged from left to right as seen in FIG. 14, it therefore being noted that the outer surfaces of the clutch disc 60 are opposed to the first and second flywheels 58 and 63. An arm lever 62 is pivotally mounted upon the housing 57 by means of a pivot pin 61 and the clutch disc 60 is operatively connected to arm lever 62 whereby disc 60 may undergo sliding movement in response to rotation of lever 62. A return spring 64 is interposed between a support member, not numbered, of the housing 57 and a stop member, also not numbered, of the arm lever 62 so as to normally bias the latter to its inoperative position whereby the clutch disc 60 within the housing 57 will normally be in contact with the second flywheel 63 but not in contact with flywheel 58 whereby a driving torque from the motor 59 is normally not transmitted to a pulley 72 which is associated with the main drive shaft of the machine, not shown, through means of pulley 84 and belt 73.

The second flywheel 63 is integrally formed with a worm wheel 66 the latter of which is intermeshed with a worm portion 65 of a drive shaft, not numbered, of an auxiliary motor 67. The lower end of the drive shaft, not numbered, is operatively associated with a brake coil 69 and a brake disc 68, the working surfaces of members 68 and 69 being disposed in opposed relation with respect to each other.

The arm lever 62 is operatively connected to a foot pedal 71 through means of a connecting rod 70 and upon depression of pedal 71 the arm lever 62 is rotated in the counterclockwise direction so as to disengage the clutch disc 60 from the second flywheel 63 and alternatively, to engage disc 60 with the first flywheel 58. In this manner, the drive torque from the motor 59 is able to be transmitted to the hand pulley wheel 85 through means of the first flywheel 58, clutch disc 60, pulley 72, and pulley belt 73 for driving the sewing machine in the well-known fashion, the hand wheel 84 of course being operatively connected to the main drive shaft, not shown, provided within the arm 44.

At the other end of arm lever 62 there is provided a supporting plate 101 upon which hook 74, the second solenoid means 76, and a switch MC are mounted. The hook 74 is pivotally mounted upon the plate 101 by means of a pivot pin 75 and is also connected to the second solenoid means 76 by means of a link member 77. A coil spring 79 is interposed between the link 77 and the second solenoid means 76 so as to normally bias the hook 74 toward the left as seen in FIG. 14, and detent 78 is secured to housing 57 so as to be opposed to a bent portion 80 of the hook 74. The detent 78 comprises a hooked portion 81 and a planar portion 83, and upon energization of the second solenoid means 76, the hook 74 is rotated in the clockwise direction pivoting around the pin 75 and overcoming the biasing force of spring 79 so that the bent portion 80 of the hook 74 may be engaged with the hook portion 81 of the detent 78 thereby preventing the arm lever 62 from achieving any counterclockwise rotation. The switch MC is to be actuated only after the arm lever 62 has been rotated by means of the pedal 71.

Upon rotation of lever 62 due to the depression of pedal 71, hook 74 is moved downwardly, as seen in FIG. 14, together with lever 62 and under these conditions, if the solenoid 76 is energized, a hook 82, formed at the extremity of the bent portion 80, comes into contact with the planar portion 83 of detent 78 so as to prevent lever 62 from undergoing any further rotation. As noted hereinbefore, the hand wheel 84 is connected to pulley 72 of housing 57 through means of a V-shaped belt 73 so as to selectively transmit the drive torque from either the motor 59 or auxiliary motor 67.

A conventional sensor means 85 is secured to the pulley 84 for generating and transmitting a signal to a control circuit 86 so as to timely actuate the thread cutting operation. As best seen in FIG. 15, the sensor 85 comprises a disc 88 which includes an isolator 87 and is rotatable with the hand wheel 84, and a pair of diametrically opposed contacts 89 and 90 are positioned in contact with the outer periphery of disc 88 and are secured against rotation therewith. The position of contact 89 is to be approximately located at the top dead center point of a thread take-up lever, not shown, and operatively connected with the main drive shaft of the machine, while the position of contact 90 is to be approximately located at the bottom dead center point of the thread take-up lever.

Relays R1, R2, and R3 respectively actuate switches R1-1-R1-4, R2-1-R2-4, and R3-1-R3-4 so as to perform the desired ON-OFF switching operations, the relay R1 being operable when the rotational speed of the disc 88 becomes less than approximately 300 R.P.M. and similarly being inoperable when the speed is greater than 300 R.P.M. The switch MA is positioned to the ON position upon rotation of the arm lever 62 as seen in FIG. 14 and the switch MB is positioned to the ON position as a result of a manual pushing action, such as for example may be performed by a knee of the operation when the thread cutting operation is desired. The switch MC is likewise positioned to the ON mode when the safety device is actuated so as to prevent the arm lever 62 from rotating, and the switch MD may be moved to the ON position when the thread cutting operation is initiated. D_1, D_2, and D_3 are conventional diodes which permit electric current to flow in only one direction.

When a thread cutting operation is required as a result of the completion of the particular stitching operations, the first solenoid means 18 is energized so as to move the plunger 19 and shift the ratchet wheel 12 to the position at which wheel 12 is disposed opposite ratchet wheel 42 so as to be engageable therewith as is shown in FIG. 7. When the shaft 24, which is actuated by means of the motor 59, is rotated to a position which is approximately 55° ahead of the corresponding top head center position of the needle, then the ratchet wheel 42 will be engaged with the ratchet wheel 12 thereby transmitting the drive torque from the shaft 24 to the shaft 6 thus initiating the thread cutting operation as a result of the rotation of holder 26.

More particularly, when the engagement between the ratchet wheels 12 and 42 attains the condition illustrated within FIG. 9 from that of FIG. 7, then the horn portion 37 of the presser foot 35 catches the upper thread N forcing the same into a loop which is formed within the shuttle race 36 while the thread guard 38 of the presser foot 35 similarly catches and draws the lower thread B from the bobbin case 91. Continuing

further, when the engagement between the ratchet wheels **12** and **42** attains the condition illustrated within FIG. **11** from that of FIG. **9** that is, upon engagement between the teeth **98** and **100** being achieved or ended, and simultaneously therewith, the upper thread N is pulled in an upward direction by means of a conventional lever take-up operation, then the upper thread N is caught by means of the presser foot **35** which secures the same within the needle hole so as not to be capableof coming out therefrom while the lower thread B is conducted through the groove or slot **39** within the thread guard **38** of the presser foot **35** together with the upper thread N near the surface of the cloth to be sewn. Accordingly, cutting of the lower thread B is prevented at this stage and consequently, an appropriate length thereof is drawn from the bobbin case **91** in order to prepare for further or subsequent stitching operations after performance of the cutting operation.

As a result of the engagement between the teeth **98** of wheel **12** and the teeth **100** of wheel **42**, as is shown in FIG. **9**, the blade **40** of the presser foot **35** and the blade **41** of the stationary blade member **32** are caused to rapidly close with respect to each other so that the timing of the thread cutting operation may correspond as closely as possible to the top dead center position of the thread take-up lever, and after the last tooth **93** of the teeth **98** has been disengaged from the teeth **100** of the wheel **42**, as is shown in FIG. **11**, the tooth **93** of wheel **12** will be in contact with the cam surface **92** of wheel **42** as best seen in FIG. **13**, whereby the presser foot **35** will be caused to move slowly so that both the upper and lower threads N and B are assuredly severed.

After the threads have been severed, that is, the engagement between the first and second ratchet wheels **12** and **42** has been released, then the setting member **7**, together with the ratchet wheel **12** which has now been disengaged from the ratchet wheel **42**, is rotated in the counterclockwise direction, as seen in FIG. **3**, due to the biasing force of the coil spring **10** until the arm portion **7A** of member **7** makes contact with the stopper pin **11**, the presser foot **35** thereby being returned to the original position as shown in FIG. **4**. It should be noted here that the needle aperture **97** of the tension thread guard **33** is provided for reliably securing the upper thread N during the aforenoted operations by inserting the thread N therethrough at the time of performance of the thread take-up operation.

Referring now to the operation of the safety device, when the pedal **71** is disposed within its neutral position, as shown in FIG. **14**, the main drive motor **59** and flywheel **58** are rotated together, however the driving torque thereform is not transmitted to the clutch disc **60** as the same is not engaged therewith. At this time, since the switch MA has not been actuated, the auxiliary motor **67** is therefore not rotated, and furthermore, as the brake coil **69** is energized, the rotation of the flywheel **63** is braked and consequently, the sewing machine cannot be actuated and operated.

Subsequently, when the pedal **71** is depressed for actuating the sewing machine, the arm lever **62** is rotated in the counterclockwise direction thereby overcoming the biasing force of spring **64** as a result of the downward movement of the connecting rod **70** and the clutch disc **60** is separated from the flywheel **63** and is now in contact with the flywheel **58** so as to thereby transmit the rotational drive torque from the motor **59** to the pulley **72** and hand wheel **84** whereby the sewing machine is actuated and placed into operation at a high rate of speed. Due to the rotation of arm lever **62**, the switch MA is actuated so as to de-energize the brake coil **69** thereby permitting the actuation of the auxiliary motor **67** so as to rotate the flywheeel **63** through means of the worm means **65** and **66**. The flywheel **63** is, however, at this stage not engaged with the clutch disc **60** and therefore, the flywheel **63** is idly rotating at a relatively low rate of speed.

In conjunction with the actuation of switch MA, the relays R_1 and R_3 are actuated so as to thereby alter the positions of switches **R1-1**-**R1-4** and **R3-1**-**R3-4** from the conditions illustrated within FIG. **15**. The brake coil **69** is deenergized as a result of the switch **R1-1** being switched over, while the auxiliary motor **67** is actuated as a result of the switches **R1-2** and **R1-3** being switched over so as to thereby rotate the flywheel **63** at the aforenoted low rate of speed through the worm means **65** and **66**. Under these conditions, the pedal **71** may again be released to the neutral position for the performance of a thread cutting operation, whereby the clutch disc **60** is now in contact with the flywheel **63** and thus the rotational speed of the main shaft is decreased due to the low speed rotation of flywheel **63**.

At this time, the switch MA is switched over due to the releasing movement of the arm lever **62**, however, the actuation of the relay **R1** is now dependent upon the operation of the sensor means **85**, that is, if the disc **88** of the sensor means **85** is rotated at a speed in excess of **300** R.P.M., then the relay **R1** continues to be actuated so as to de-energize the brake coil **69** and to continue the actuation of the auxiliary motor **67**, while if the disc **88** is rotated at a speed which is less than 300 R.P.M., then the operation of relay **R1** is terminated so as to thereby in turn terminate the rotation of the main shaft at a position corresponding to the bottom dead center position of the needle. The relay R3 is, at this stage, still actuated as a result of the operation of switch **R3-2**.

The switch MB may be actuated by the knee of the operator for the performance of a thread cutting operation under these conditions, and subsequently, the solenoid **76** may be actuated so as to rotate or pivot the hook **74** in the clockwise direction about the pin **75** so as to thereby engage the bent portion **80** thereof with the hook portion **81** of the detent **78**. Accordingly, even if the pedal **71** is erroneously depressed at this stage, the arm lever **62** is not able to be rotated, and consequently, during the thread cutting operation, the lever **62** will in fact not be able to be actuated. After this switch MB is actuated for energizing the solenoid **76**, then the switch MC may now be moved to the ON state so as to actuate the relay **R2** whereby the switch **R2-1** may be changed over from the condition illustrated within FIG. **15**.

This movement causes the actuation of relay **R3** to be terminated, and due to the switching of switch **R2-1**, the brake coil **69** is also de-energized whereby the auxiliary motor **67** which is rotated thereby, is thus able to rotate the main shaft of the sewing machine at a low rate of speed. Simultaneously therewith, the first solenoid **18** is also energized due to the switching over of switch **R2-4**, and therefore, even if the sewing machine is actuated at a low rate of speed, the thread cutting operation can nevertheless be obtained. In addition, as the switch MC is actuated when the hook **74** is in

contact with the planar portion **83** of the detent **78** upon energization of the solenoid **76**, it is therefore apparent that even if the switch MA should be erroneously actuated when the pedal **71** is depressed so as to actuate the sewing machine at a high rate of speed during energization of solenoid **76**, the thread stitching operation will not be able to be performed due to the actuation of switch MC which does not permit rotation of lever arm **62** in conjunction with solenoid **76**.

Obviously, many modifications and variations of the present invention are possible in light of the above teachings. It is to be understood therefore that within the scope of the appended claims the present invention may be practiced otherwise than as specifically described herein.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A safety device for use in conjunction with the thread cutting mechanism of a sewing machine, comprising:

a main power source for actuating a main drive shaft of said machine for the performance of a stitching operation;

connecting means operable for connecting said main power source with said main drive shaft;

sensing means sensitive to the rotational condition of said main drive shaft and capable of generating a signal in response thereto;

a thread cutting device operable for holding and cutting the thread of said machine in response to said generated signal of said sensing means; and

detent means operatively connected to said connecting means for preventing the connection of said power source to said drive shaft during a thread cutting operation.

2. A saftey device as set forth in claim **1**, wherein said thread cutting device further comprises:

a first shaft adapted to be connected to said power source;

first ratchet means disposed upon said first shaft and rotatable therewith;

first stationary blade means fixedly secured to the framework of said machine;

a second shaft disposed parallel to said first shaft;

second ratchet means disposed upon said second shaft and being axially movable relative thereto so as to selectively engage said first ratchet means;

second pivotally movable blade means connected to said second shaft; and first solenoid operated means for moving said second ratchet means along said second shaft so as to engage said first ratchet means,

whereby said second shaft will be rotated so as to in turn rotate said second blade means relative to said first blade means for the performance of said cutting operation.

3. The safety device as set forth in claim **1**, wherein said detent means further comprises:

a first hooked member fixedly secured to a housing of said main power source;

a second hooked member pivotably secured to said connecting means so as to be selectively engaged with said first hooked member; and second solenoid-operated means secured to said connecting means for pivoting said second hooked member toward or away from said first hooked member,

whereupon engagement of said first and second hooked members, said connecting means is prevented from connecting said power source to said drive shaft.

4. The safety device as set forth in claim **1**, wherein:

said connecting means is pivotably supported upon a housing of said power source and is operatively connected to a foot pedal; and

a power switch is adapted to be actuated for providing power to said power source upon the pivotal movement of said connecting means in response to the depression of said foot pedal.

5. The saftey device as set forth in claim **2**, wherein said first solenoid means is actuated by a knee-operated switch.

6. The safety device as set forth in claim **3**, wherein said second solenoid means is actuated by a knee-operated switch.

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