

Nov. 24, 1959

S. M. COHEN

2,914,010

AUTOMATIC THREAD CUTTER AND NEEDLE POSITIONER

Filed Jan. 17, 1957

3 Sheets-Sheet 1

Fig. 1.

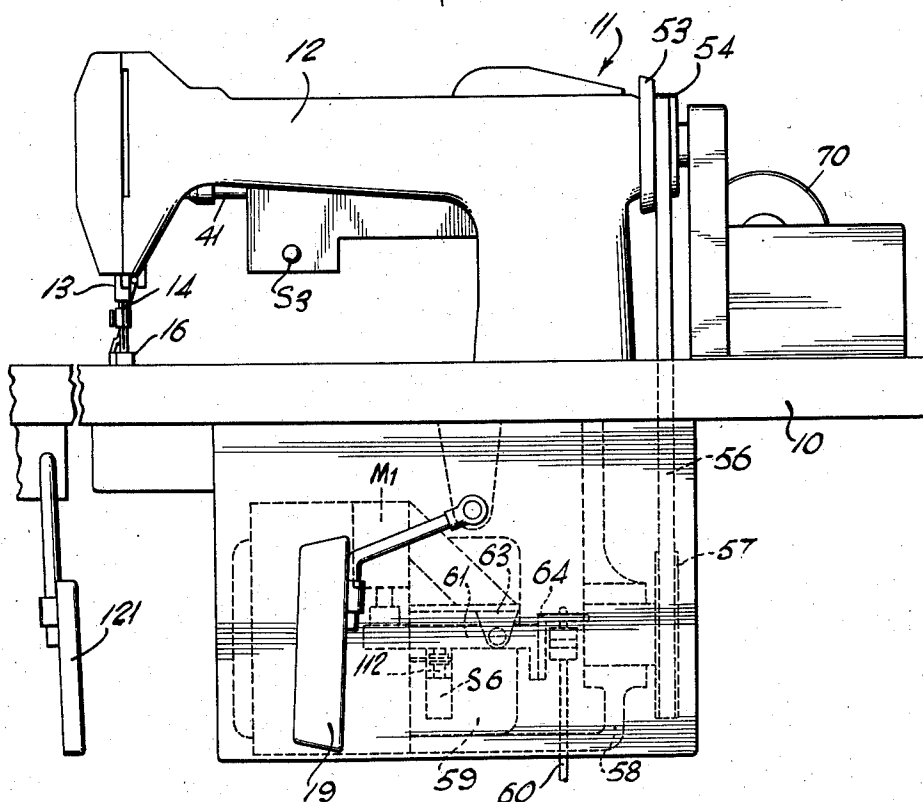
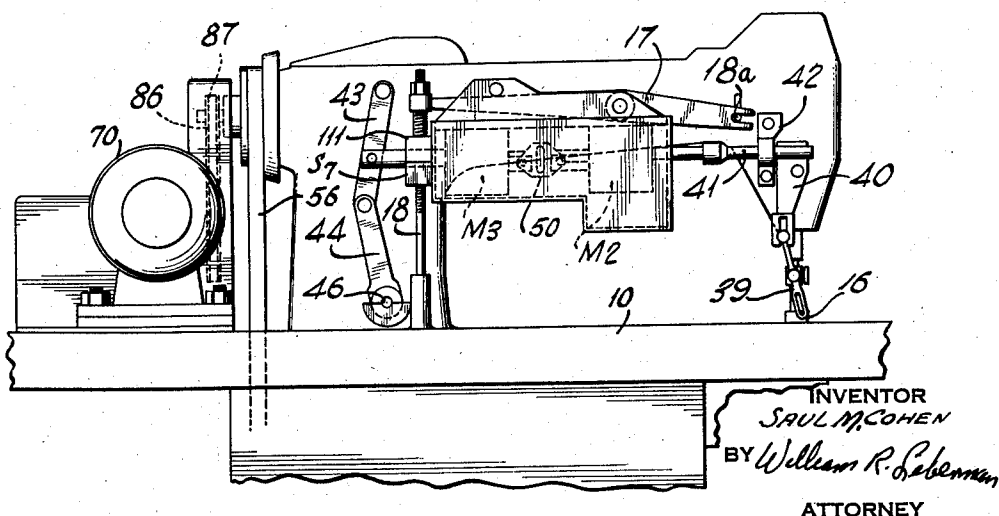


Fig. 2.



Nov. 24, 1959

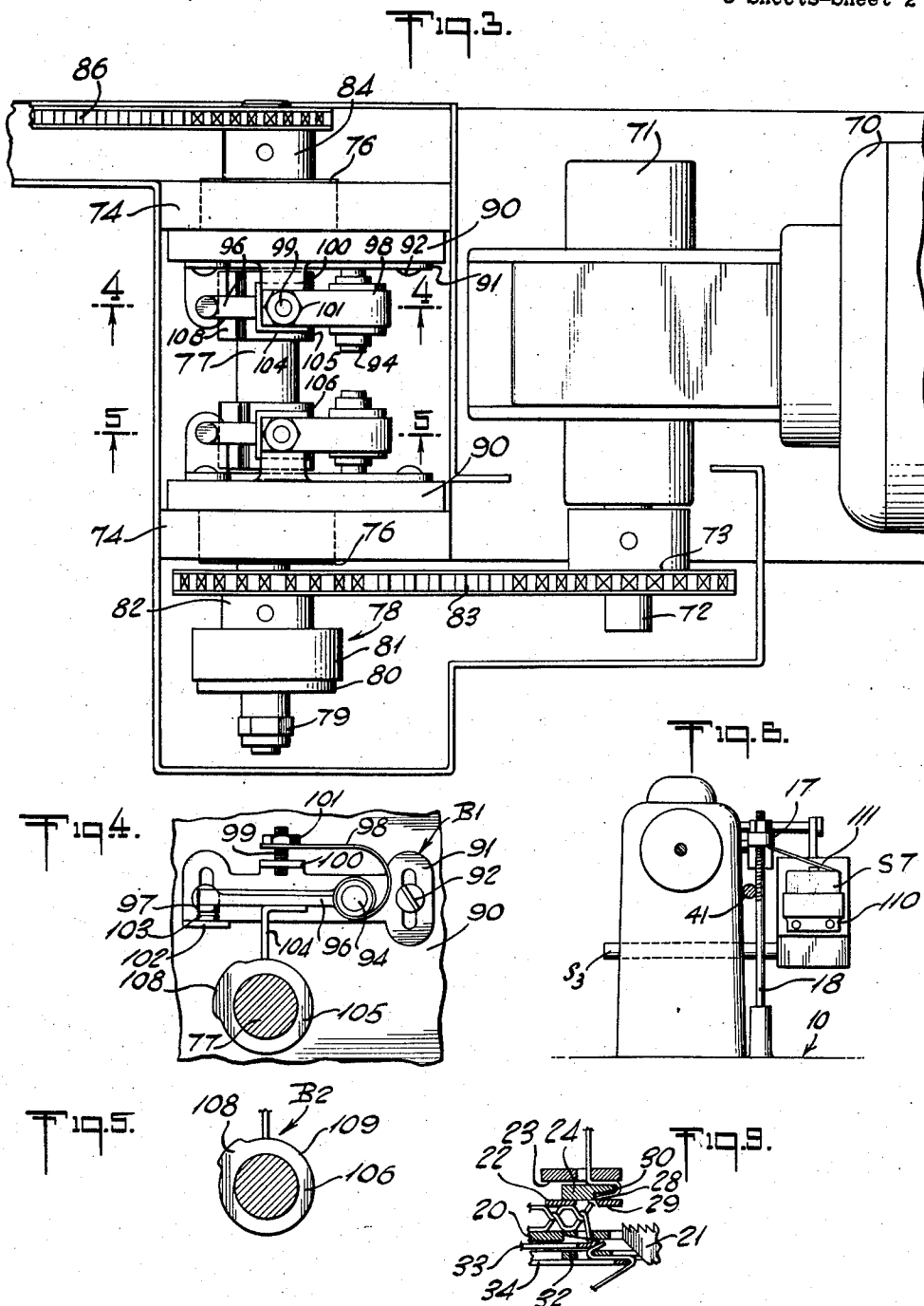
S. M. COHEN

2,914,010

AUTOMATIC THREAD CUTTER AND NEEDLE POSITIONER

Filed Jan. 17, 1957

3 Sheets-Sheet 2



INVENTOR
SAUL M. COHEN
BY *William K. Ruben*
ATTORNEY

Nov. 24, 1959

S. M. COHEN

2,914,010

AUTOMATIC THREAD CUTTER AND NEEDLE POSITIONER

Filed Jan. 17, 1957

3 Sheets-Sheet 3

Fig. 7.

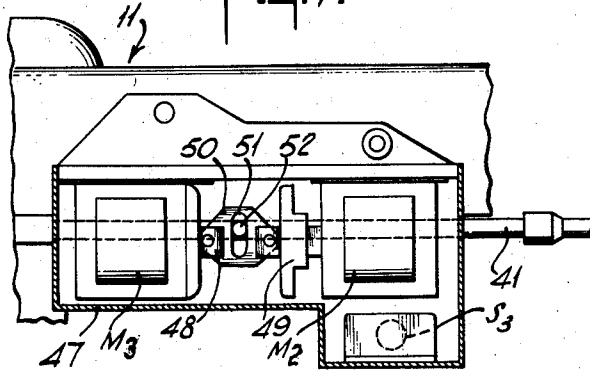


Fig. 8.

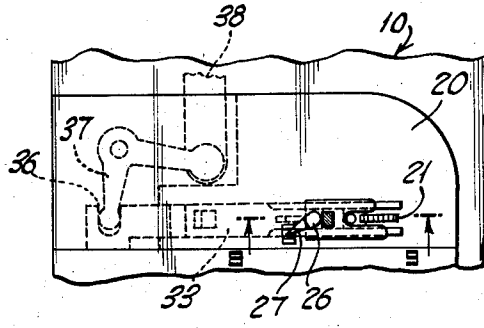
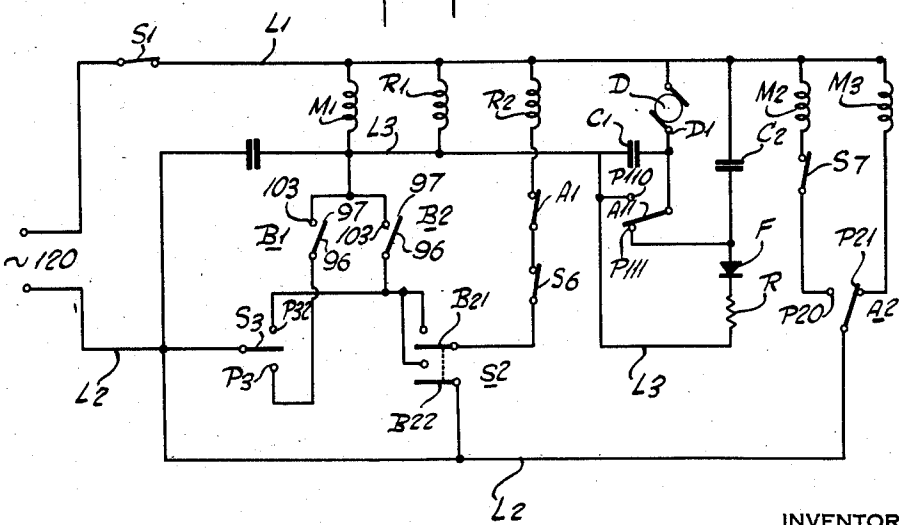


Fig. 10.



INVENTOR
SAUL M. COHEN
BY *William K. Lieberman*
ATTORNEY

1

2,914,010

AUTOMATIC THREAD CUTTER AND NEEDLE POSITIONER

Saul M. Cohen, Paramus, N.J., assignor to Clinton Industries, Inc., New York, N.Y., a corporation of New York

Application January 17, 1957, Serial No. 634,770

5 Claims. (Cl. 112—252)

The present invention relates generally to improvements in sewing machines, and it relates more particularly to an improved device for use with a sewing machine for effecting the selective automatic cutting of the sewing thread.

In domestic and commercial sewing operations employing conventional sewing machines the frequent cutting of the sewing thread is necessary. This cutting of the thread is effected either following each sewing sequence or the workpieces are connected in succession by the continuous thread and subsequently cut. In either event the cutting of the thread is highly time consuming and inefficient and results in a large waste of sewing thread. There have been many proposals for expediting the cutting of the thread but these have been of a crude nature and contributed very little to the overall efficiency of the sewing operation.

It is therefore a principal object of the present invention to provide an improved sewing machine.

Another object of the present invention is to provide an improved mechanism for automatically effecting the cutting of a thread in a sewing machine.

Still another object of the present invention is to provide an improved apparatus for automatically positioning a sewing machine needle and effecting the cutting of the sewing thread.

A further object of the present invention is to provide an improved mechanism for automatically positioning a sewing machine needle in any desired position.

The above and other objects of the present invention will become apparent from a reading of the following description, taken in conjunction with the accompanying drawings, wherein

Figure 1 is a front elevational view of a sewing machine embodying the thread cutting mechanism of the present invention shown partially broken away for convenience of illustration;

Figure 2 is a rear elevational view thereof;

Figure 3 is a top plan view of the needle positioning mechanism;

Figure 4 is a sectional view, taken along line 4—4 in Figure 3;

Figure 5 is a sectional view, taken along line 5—5 in Figure 3;

Figure 6 is an end elevational view illustrating a safety switch mechanism;

Figure 7 is a partial rear detail view illustrating the thread cutting motivating mechanism;

Figure 8 is a horizontal detailed sectional view showing the thread cutting mechanism;

Figure 9 is a sectional view, taken along line 9—9 in Figure 8;

Figure 10 is a schematic circuit diagram of the improved thread cutting mechanism.

The present invention, in a sense, contemplates the provision of the improved combination comprising a reciprocable needle bar, a thread engaging needle carried by said needle bar, means motivating said needle

2

bar to reciprocate said needle along a predetermined path, a thread cutting element movable across the path of said needle, means for automatically positioning said needle above the level of said thread cutting element and means responsive to the position of said needle above said thread cutting element to actuate said thread cutting element.

Referring now to the drawings, the numeral 10 generally designates a base upon which is mounted a sewing machine head 11 of substantially conventional construction including a cantilevered arm 12 carrying a reciprocating needle bar 13 which removably holds a sewing needle 14. Also provided is a presser foot 16 movable between a depressed and raised position by means of a lever 17 pivotally connected to the rear face of the arm 12 and having a grooved forward end engaging a pin 18a which is connected to the presser foot 16 in the usual manner. The rear end of the lever 17 is adjustably coupled by a vertically movable connecting bar 18 to a knee treadle 19 in a conventional manner. Disposed below the presser foot 16 is a cloth plate 20 which has longitudinal slots formed therein with which register the cloth advancing dogs 21.

The underface of the presser foot 16 is recessed and carries a sole plate 22 to define a housing 23 having aligned openings formed therein to permit the passage of the sewing needle. A knife 24 is located in the housing 23 and is rotatably carried by a crank 26 provided with a rearwardly projecting arm 27 terminating in a balled end. The knife 24 has a lower cutting edge 28 which cooperates with the stationary edge 29 formed on the sole plate 22. Also carried by the knife 24 is a forwardly projecting raised loop forming flange 30.

Disposed below the cloth plate 20 and spaced therefrom is a guide plate 32. A reciprocating knife 33 is slidably located between the confronting faces of the cloth plate 20 and the under plate 32 and is provided with an upwardly sprung forward cutting edge which abuts the underface of the plate 20. The thread pulling member 34 is slidably located in abutment with and below the plate 32 and terminates rearwardly in a recessed portion 36. The cutting plate 33 and the looping member 34 are connected by a lost motion arrangement and the recessed portion 36 is engaged by the balled end of an arm of a pivoted bell crank 37, the other end of which is connected to one end of an actuating rod 38.

The crank arm 27 is engaged by a longitudinally extending slot formed in a lever 39 pivoted at its midpoint to the presser foot bar so as to be oscillatable about a horizontal axis, the opposite end of the lever slidably engaging a vertical slot formed in the lower end of a bracket member 40. A rod 41 is horizontally slidable in a support bracket 42 mounted on the sewing machine head and carries the depending bracket 40. The opposite end of the rod 41 is pin connected to a vertically extending arm 43 which has its upper end pivoted to the sewing machine head 11. The lower end of the arm 43 is pin connected to the upper end of a second arm 44 which is pivoted to the sewing machine head 11 as at 46 and has a depending portion engaging the rear end of the rod 38. Thus, upon the forward and rearward movement of the rod 41 the cutting knife 24 is actuated to effect the looping and cutting of the upper thread and the lower cutting and looping members 33 and 34 are likewise reciprocated by way of the arms 43 and 44 and connecting rod 38 and bell crank 37 to effect the looping and cutting of the bobbin thread. A complete and detailed description of the thread cutting mechanism above described as well as its operation is set forth in U.S. Patent No. 2,376,417, issued May 22, 1945, to J. Chudner.

A pair of opposed horizontal longitudinally aligned

solenoids M2 and M3 are housed in a casing 47 which is mounted on the sewing machine head 11. The solenoids M2 and M3 are provided with slidable armatures 48 and 49 respectively which are connected by a link member 50 provided with a vertical groove 51 engaging a pin 52 mounted on the rod 41. In normal operating position the rod 41 and the corresponding solenoid armatures 48 and 49 are in their rearmost position. In order to effect the cutting operation, the solenoid M3 is first energized to advance the rod 41 forwardly and then the solenoid M2 is energized and the solenoid M3 deenergized to effect the retraction of the rod 41. The circuit for achieving the aforesaid energization will be hereinafter set forth and the mechanism of the thread cutting operation has been described in the previously cited Chudner patent.

The sewing machine head 11 is provided with a conventional hand wheel 53 carrying a drive pulley 54 which is connected by way of a V-belt 56 to a power pulley 57. The power pulley 57 is rotatably carried by a bracket 58 and may be selectively coupled by way of a clutch mechanism to a main drive motor 59 or a brake plate. The clutch mechanism is for effecting the driving or braking of the pulley 57 and the sewing machine and is controlled by means of a rod 60 connected to the foot treadle of the sewing machine. The above braking and drive control mechanism is conventional. It should be noted that by control of the rod 60 and the various parts connected thereto the clutch may be located at the position intermediate the braking and driving position so that the hand wheel 53 may be rotated independent of the drive motor and the brake plate.

In order to automatically effect the aforesaid intermediate positioning of the clutch there is provided a lever 61 pivotally connected to a support bracket 63, the forward end of the lever 61 carrying an angle member 64 which is adapted to bear upon the upper end of the control rod 60 when the arm 61 is rotated clockwise and is free of the movement of the control rod 60 when the lever 61 is in its counterclockwisest position. The opposite end of the lever 61 is connected to the armature of a solenoid M1 the actuation of which will be hereinafter described.

In order to effect the thread cutting operation it is necessary that the needle 14 and the needle bar 13 be located in a raised position. The mechanism for automatically positioning the needle in raised position and effecting the actuation of the thread cutting device, and if desired, for selectively positioning the needle in its depressed position or raised position including an auxiliary drive motor 70 suitably mounted on the base 10 adjacent the drive end of the sewing machine head 11 and connected to the input end of a right angle gear reduction unit 71. The gear reduction unit 71 is provided with an output shaft 72 which carries a sprocket wheel 73.

A pair of horizontally spaced parallel vertical blocks 74 have aligned openings formed therein which engage respective ball bearing members 76. A shaft 77 passes through and is rotatably engaged by the ball bearing members 76 and carries at its rear end an overrunning clutch coupling device 78 which is secured and positively positioned on the shaft 77 by means of a nut 79 which engages the threaded end of the shaft 77. The driven member 80 of the overrunning clutch 78 is rigidly affixed to the shaft 77 whereas the drive member 81 is rotatably carried thereby and it is in drive relationship with the driven member 80 and the shaft 77 only when the drive member 81 rotates at a greater speed than the driven member 80. There is no intercoupling between the clutch members 80 and 81 when the driven member 80 is rotated at a greater speed than the drive member 81.

The drive member 81 carries a sprocket wheel 82 which is connected by way of a sprocket chain 83 to the sprocket wheel 73. Mounted on the forward end of the shaft 77 is a sprocket wheel 84 which is connected by way of a sprocket chain 86 to a sprocket wheel 87 affixed to the

sewing machine hand wheel 53 so that the shaft 77 rotates with the hand wheel 53 and with the needle bar drive mechanism. Thus, when the sprocket wheel 73 is stationary or is driven by way of the auxiliary drive motor 70 so that the clutch drive member 81 rotates at a speed less than the driven member 80 there is no drive coupling between the auxiliary drive motor 70 and the shaft 77.

A pair of base plates 90 are carried on the inner face of each of the blocks 74. Mounted on the confronting faces of the base plates 90 are breaker point mechanisms B1 and B2 respectively each of which includes a bracket member 91 adjustably affixed to the base plate 90 by means of screws 92 engaging slots formed in the enlarged ends of the brackets 91 and engaging tapped openings in the base plate 90. The bracket 91 carries a pin 94 which rotatably supports a rocking breaker arm 96, one end of which is provided with a circular opening engaging an insulator bushing carried on the pin 94. The free end of the breaker arm 96 is provided on its lower face with a contact point 97. The pin portion of the rocker arm 96 carries a flexed spring member 98, the free end of which is provided with an opening slidably engaging a stud 99 carried by an upwardly directed ear 100 disposed on the bracket 91. The tension on the spring 98 is adjustable by means of a nut 101 engaging the stud 99. The lower forward end of the bracket 91 is provided with an upstanding lug 102 which carries a stationary contact point 103 in registry with the breaker point 97. It should be noted that the breaker arm 96 and the breaker point 97 are electrically separated from the contact point 103 and its supporting mechanism in the manner well known.

Each of the breaker arms 96 is provided in the conventional manner with a depending cam follower 104 which engages the surface of a respective cylindrical cam 105 and 106 carried by and rotatable with the shaft 77. Each of the cams 105 and 106 is provided with a raised surface 108, the breaker points 97 and 103 being separated when the cam follower 104 engages the raised surface 108 of the respective cams 105 and 106 and are in closed position when the cam follower 104 registers with the depressed portions 109 of the cams 105 and 106. It should be noted that the respective cams 105 and 106 are carried on the shaft 77 so that their raised portions 108 are separated approximately 180°. The angular position of the cam 105 is such that when the needle bar 13 and the needle 14 are in depressed or lowermost position the raised portion 108 of the cam 105 engages the cam follower 104 and when the needle bar 13 and needle 14 are in their raised position the corresponding cam follower 104 registers with the raised surface 108 of the cam 106. Thus, when the needle is in depressed position the breaker switch B1 is closed and breaker switch B2 open and when the needle is in its raised position the breaker switch B2 is closed and the breaker switch B1 is open.

A switch S7 is carried on a bracket 110 adjacent to the presser foot actuating control rod 18. An actuating arm 111 is carried by the switch 110 and engages the underface of the free end of the presser foot lever 17. When the presser foot 16 is in its raised position the rear end of the lever 17 depresses the arm 111 to effect the opening of the normally closed switch S7. However, when the presser foot is in its depressed position the rear end of the lever 17 is raised to effect the closing of the switch S7. A switch S6 is provided with an actuating plunger 112 which engages the underface of the inner end of the clutch plate control lever 61. The switch S6 is normally closed and is opened upon actuation of the solenoid M1. The purpose of the switch S6 is to prevent multiple cycling of the cutting operation as will be hereinafter set forth.

Referring now more particularly to Figure 10 of the drawing which schematically illustrates the wiring and

5

electrical components of the improved device, the designation L1 indicates a conductor line which is connected by way of a main switch S1 to one terminal of a source of alternating current 120, the other terminal of which is connected to a line L2. A hand operated single pole double throw switch S3, which is readily accessible and carried on the sewing machine head 11, has its arm connected to the line L2 and one pole P3 thereof connected to the arm 96 of the breaker mechanism B1 and the other pole P32 connected to the arm 96 of the breaker mechanism B2. A normally open single throw double pole switch S2 is closed by an auxiliary knee peddle 121 depending from the sewing machine base 10 and laterally spaced from the knee treadle 19. One of the arms B22 of the switch S2 is connected to the line L2 and the other arm B21 thereof is connected by way of the switch S6 to the arm A1 actuated by the relay R1, the cooperating contact of which is connected to one terminal of the solenoid of the relay R2. The other terminal of the relay R2 is connected to the line L1. Both of the poles of the switch S2 are connected to the arm 96 of the breaker mechanism B2. The contact elements 103 of the breaker mechanism B1 and B2 are connected to a line L3. The clutch actuating solenoid M1 and the solenoid of the relay R1 are connected between the lines L1 and L3. The line L3 is also connected by way of a filter condenser C1 to one pole D1 of an alternating current induction motor D, the other pole of which is connected to the line L1.

A contact P110 associated with its arm A11 which is actuated by the relay R1 and connected to the motor pole D1, is connected to the line L3. An opposite pole P111 associated with the relay arm A11 is connected to one side of a rectifier F and through a braking condenser C2 to line L1. The other side of the rectifier F is connected through a resistor R to the line L3. The relay R2 actuates an arm A2 which is connected to the line L2 and alternately engages contact P20 which is connected through the presser foot control safety switch S7 to one terminal of the solenoid M2, the other terminal of which is connected to the line L1 and contact P21 which is connected to one end of the terminal M3, the other terminal of which is connected to the line L1. It should be noted that when the solenoid of the relay R1 is energized the relay arm A1 is in open position and the arm A11 engages the contact P110 and when the solenoid of the relay R2 is energized the arm A2 engages the contact P20.

Considering now the operation of the improved sewing machine, upon termination of the sewing cycle, the operator releases the foot treadle permitting the raising of the drive control rod 60 so that the clutch swings from the motor engaged position to the braking position thereby stopping the sewing machine. He thereupon actuates the knee treadle 121 to close the switch S2 bringing the arms B22 and B21 into engagement with the respective switch poles. In the event that the needle bar 13 and needle 14 are not in their raised position the raised portion 108 of the cam 106 will be out of registry with the cam follower 104 so that the breaker mechanism B2 is in closed position to complete the circuit connecting the solenoid M1 and the solenoid of relay R1 across the lines L1 and L2 to energize the solenoids. The energization of the solenoid M1 depresses the rod 60 slightly to release the main drive brake to permit the rotation of the pulley 54 and movement of the needle bar and needles 13 and 14 respectively. Furthermore, the energized relay R1 swings the arm A1 to open position so that the circuit to the relay R2 is open, and pulls the arm A11 into engagement with the contact P110 to connect the motor D between the power lines L1 and L2 by way of the breaker mechanism B2 and the switch S2.

The energized motor D drives the sewing machine by way of the reduction gear 71, shaft 77 and the associated overrunning clutch 78 and the various sprocket wheels

6

and sprocket chains. When the needle bar 13 and needle 14 reach their upper position the raised portion 108 of the cam 106 registers with the corresponding cam follower 104 to open the breaker mechanism B2 to thereby deenergize the solenoid M1 and brake the sewing machine. The deenergized relay R1 permits the arm A11 to return into engagement with the contact P111 and the arm A1 to return to closed position to thereby energize the solenoid of the relay R2. As the arm A11 engages the contact P11 the condenser C2 which has been previously charged by way of the rectifier F and resistor R is connected across the motor D to rapidly dynamically brake the motor D. The energization of the solenoid of the relay R2 brings the arm A2 out of engagement with the contact P21 and into engagement with the contact P20 to energize the solenoid M2 which in turn carries the cutter actuating bar 41 to its rear position. The knee treadle is thereafter released to permit the switch S2 to open thereby deenergizing the relay R2 and permitting the arm A2 to return to engagement with the contact P21 and out of engagement with the contact P20 thereby deenergizing the solenoid M2 and energizing the solenoid M3 and returning the rod 41 to its forward position to complete the cutting operation. The reciprocating motion of the rod 41 mechanically effects the cutting operation as has been hereinbefore set forth.

In the event that it is desired to automatically bring the needle bar 13 and needle 14 to its depressed position the toggle switch S3 is manipulated to bring the arm thereof into contact with the pole P3 which energizes the solenoid M1 to relieve the drive brake and energizes the solenoid of the relay R1 to raise the arm A11 into engagement with the contact P110 completing the circuit to the auxiliary drive motor D which drives the sewing machine through the shaft 77 until the raised portion 108 of the cam 105 engages the corresponding cam follower 104 to open the breaker mechanism B1 and deenergize the solenoid M1 and the solenoid of the relay R1 permitting the arm A11 to return into engagement with the pole P111 effecting the dynamic braking of the auxiliary drive motor D.

Inasmuch as the switch S2 has been maintained in open position the cutting operation is not affected. By manipulating the toggle switch S3 in an opposite direction to effect engagement of the pole P32 the needle may be automatically located in its upper position without the actuation of the cutting mechanism in the manner similar to that for automatically locating the needle in its depressed position as above described.

It will be noted that when the presser foot 16 is in its raised position the switch S7 is opened as aforesaid thereby preventing the energization of the solenoid M2 and the effecting of the cutting operation. It should also be noted that when the solenoid M1 is energized the switch S6 is opened by the swinging of the lever 61. Thus, in the event of multiple cycling which may occur when the operator actuates the main drive foot treadle as well as the knee peddle 121 the switch S6 because of the inertia of the system will be maintained open during the opening of the breaker mechanism B2 to thereby prevent the energization of the solenoid of the relay R2 and the successive repetitive recycling of the thread cutting operation.

While there has been described and illustrated a preferred embodiment of the present invention, it is apparent that numerous alterations and omissions may be made without departing from the spirit thereof.

I claim:

1. The improved combination comprising a sewing machine including a reciprocable needle bar, a thread engaging needle carried by said needle bar, means motivating said needle bar to reciprocate said needle along a predetermined path, a thread cutting element movable across the path of said needle, means for stopping said needle bar and said needle, automatically operable means for

7

thereafter selectively positioning said needle above the level of said thread cutting element, means responsive to the positioning of said needle above said thread cutting element to actuate said thread cutting element, and means to deactivate the last referred-to means thereby to prevent the thread cutting, as desired, when the needle is positioned above the thread cutting element.

2. The improved combination in accordance with claim 1, including a second thread cutting element disposed below said first thread cutting element, and a cloth supporting plate located between said thread cutting elements.

3. The improved combination comprising a sewing machine including a reciprocable needle bar, a thread engaging needle carried by said needle bar, a thread cutting element movable across the path of said needle, a main drive motor, means including a clutch coupling said main drive motor to said needle bar, said clutch being movable into engagement with said drive means, into braking position, and into a position intermediate said drive means engaging position and said braking position, a first solenoid including an armature adapted to shift said clutch into said intermediate position upon energization of said first solenoid, an auxiliary motor connected to said needle bar through an overrunning clutch, a first normally open selectively operable switch, a second normally open switch responsive to the position of said needle bar to be closed when said needle bar is in a raised position, said first solenoid and said first and second switches being connected in series across a source of current, a first relay having a solenoid connected in series with said first and second switches across a source of current, a pair of first relay contacts associated with said first relay, a pair of normally closed relay contacts movable to open position upon energization of said first relay solenoid, a third switch operable concurrently with said first switch, a second relay having a solenoid connected in series with said first contact points and said first and third switches to a source of current, a contact carrying arm actuated by said first relay and a second normally engaging and a third normally disengaged contact registering therewith, said auxiliary drive motor having one pole connected to one terminal

8

of a source of current and the other pole being connected to said first relay arm and said third contact being connected through said first and second switches to the other terminal of said source of current, a second contact carrying relay arm associated with said second relay, a fourth contact registering with and normally out of engagement with said second relay arm and a second solenoid having an armature connected to said thread cutting element and having one terminal connected to one pole of a source of current and the other terminal connected to said third contact, said second relay arm being connected to the other terminal of said source of current.

4. The improved combination in accordance with claim 3, including a capacitor connected in series with a rectifier and said first and second switches to a source of current, one terminal of said capacitor being connected to one pole of said auxiliary drive motor and the other terminal of said capacitor being connected to said relay second contact.

5. The improved combination in accordance with claim 3, including a fourth normally open switch responsive to the position of said needle bar to be closed when said needle bar is in depressed position, and a fifth normally open selectively operable switch, said fourth and fifth switches being connected in series across said first and second switches.

References Cited in the file of this patent

UNITED STATES PATENTS

1,592,115	Lindgren	July 13, 1926
2,037,721	Haas	Apr. 21, 1936
2,201,969	Haas	May 21, 1940
2,226,401	Haas	Dec. 24, 1940
2,376,417	Chudner	May 22, 1945
2,517,567	Hill et al.	Aug. 8, 1950
2,707,927	Artzt et al.	May 10, 1955
2,759,444	Schwab et al.	Aug. 21, 1956

FOREIGN PATENTS

744,660	Great Britain	Jan. 21, 1953
---------	---------------	---------------