Jan. 19, 1960 W. W. ARTZT ET AL 2,921,547

NEEDLE POSITIONING DEVICES FOR SEWING MACHINES

Filed July 16, 1956 3 Sheets-Sheet 1

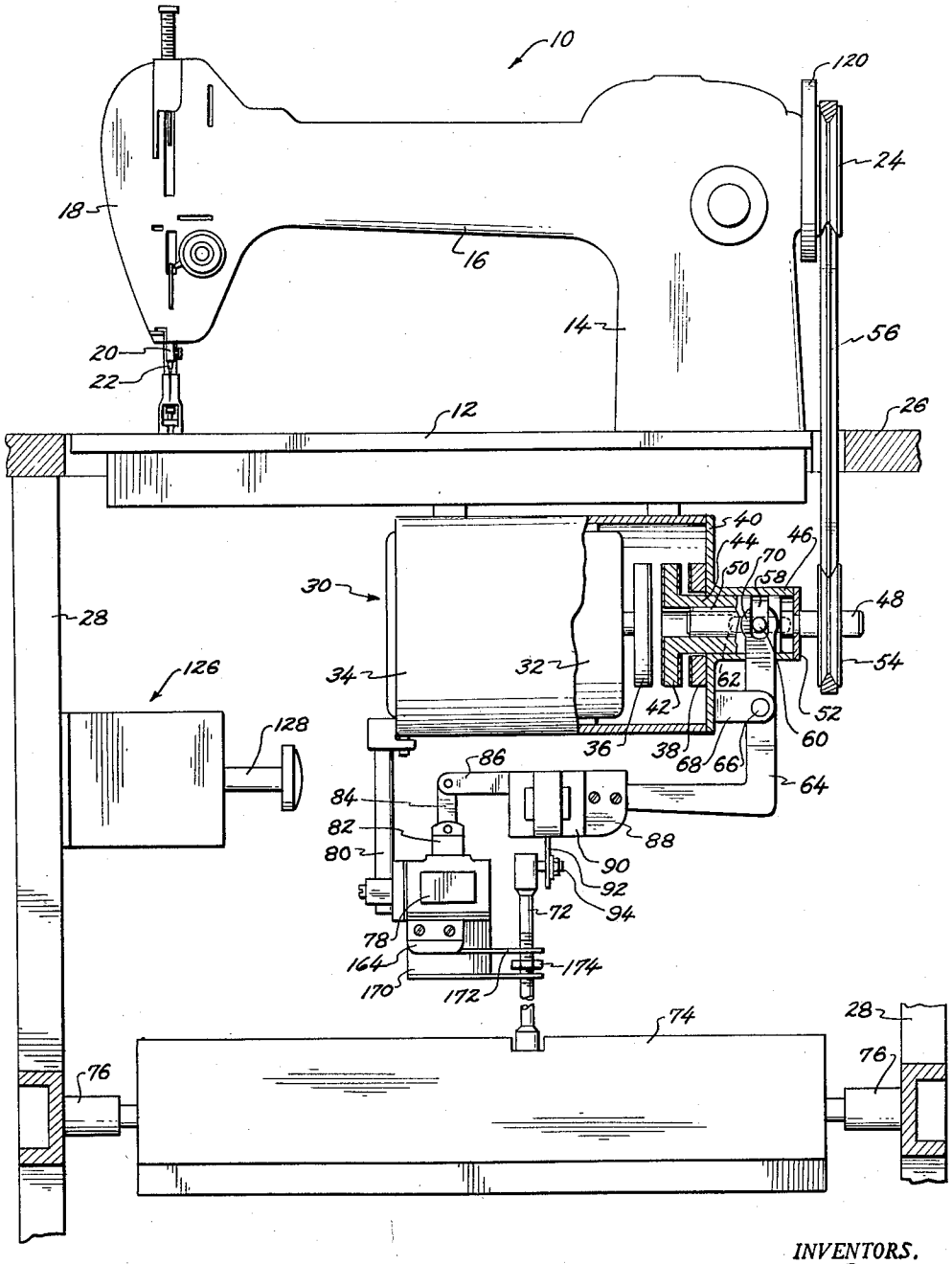


Fig. 1

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NEEDLE POSITIONING DEVICES FOR SEWING MACHINES

Filed July 16, 1956 3 Sheets-Sheet 2

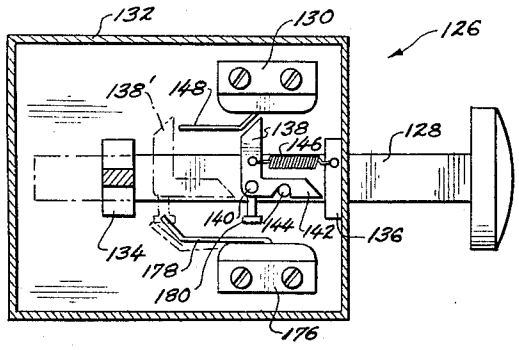


Fig. 4

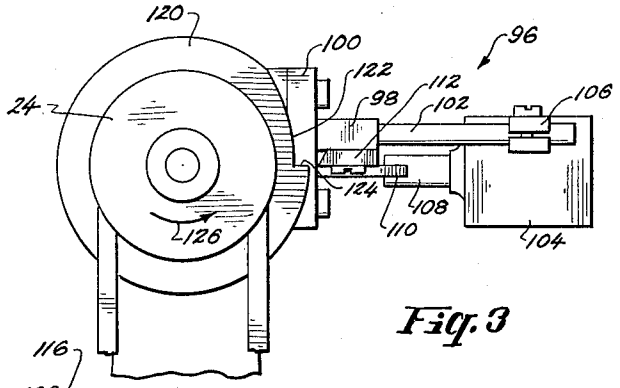


Fig. 3

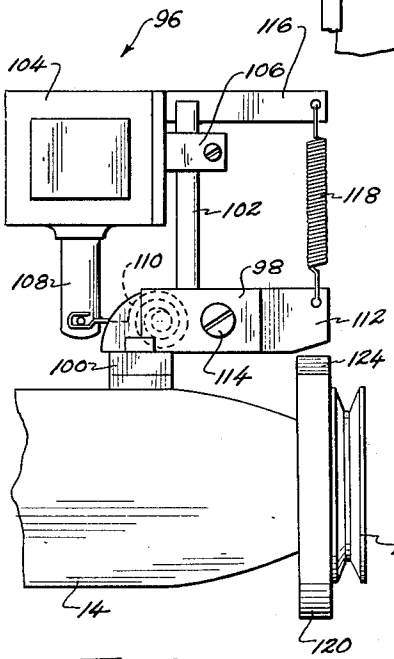


Fig. 2

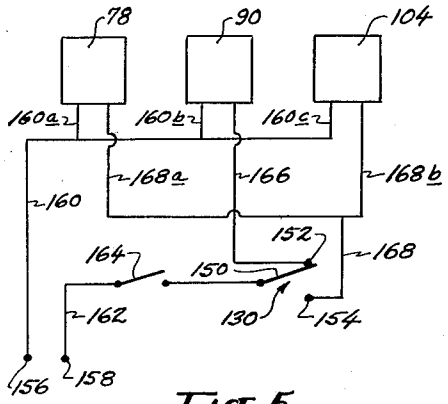


Fig. 5

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Jan. 19, 1960 W. W. ARTZT ET AL 2,921,547

NEEDLE POSITIONING DEVICES FOR SEWING MACHINES

Filed July 16, 1956 3 Sheets-Sheet 3

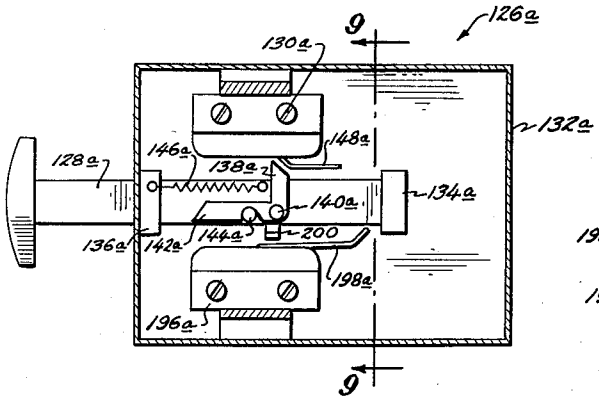


Fig. 8

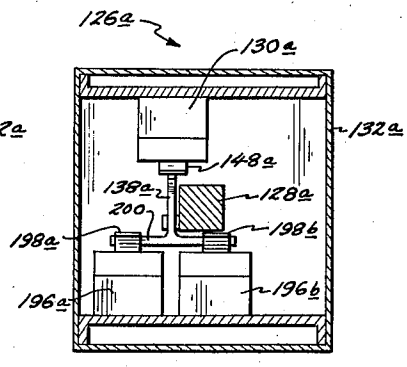


Fig. 9

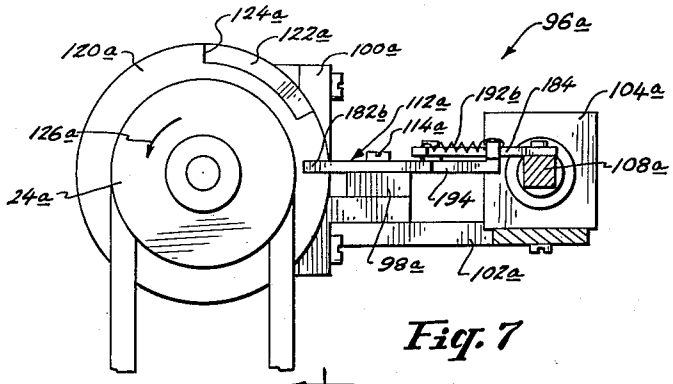


Fig. 7

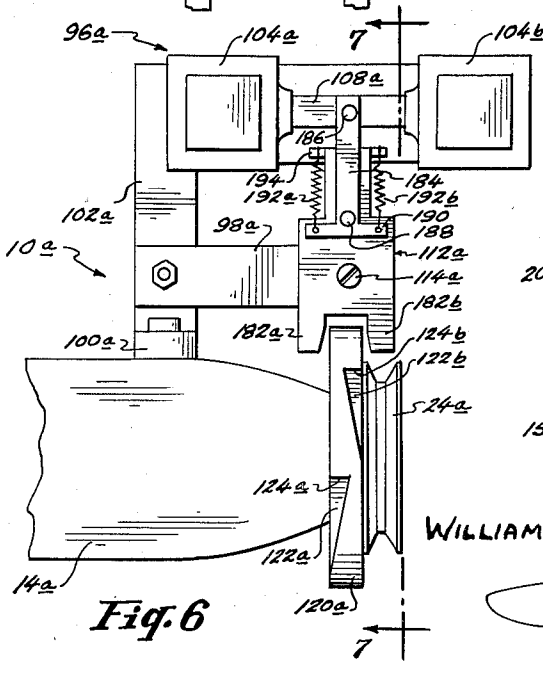


Fig. 6

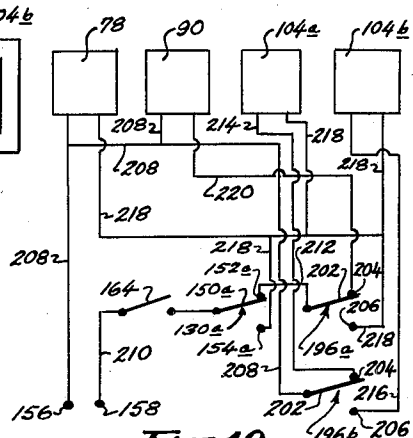


Fig. 10

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2,921,547

NEEDLE POSITIONING DEVICES FOR SEWING MACHINES

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Application July 16, 1956, Serial No. 598,140

5 Claims. (Cl. 112—219)

The present invention relates generally to sewing machines and is particularly directed to devices associated with a sewing machine for positioning the needle thereof at the conclusion of a sewing operation.

In the United States Letters Patent No. 2,707,927, issued May 10, 1955, to W. W. Artzt and S. Rieger, a device has been disclosed for association with a sewing machine to simultaneously cut or trim the upper and lower threads at the conclusion of a sewing operation. However, when such a device is associated with a conventional sewing machine, it is necessary to manually rotate the usual hand wheel of the machine, at the conclusion of a sewing operation, for the purpose of moving the reciprocable needle to its uppermost position where it will not interfere with the subsequent operation of the thread cutting device. Such manual rotation of the hand wheel on the sewing machine prior to operation of the thread cutting device is time consuming and uneconomical in that it requires the operator to move one hand from a position adjacent the needle, where it was employed in guiding the fabric during the sewing operation, to a remote position on the hand wheel and then to manipulate the hand wheel while observing the change in position of the needle so that rotation of the hand wheel can be halted when the needle is in its uppermost position.

It is also to be noted that, when sewing along a line having a sharp bend or corner therein, it is necessary to halt the sewing machine at the location of such sharp bend or corner and then to release the presser foot so that the material being sewed can be turned to permit sewing of the remaining portion of the line at a sharp angle to the previously sewed portion. In that situation, the needle should be disposed in its lowermost position prior to release of the presser foot in order to ensure that, upon resumption of the sewing operation, there will be no gap in the line of stitches. Here again, manual rotation of the hand wheel in order to dispose the needle in its lowermost position prior to release of the presser foot represents a time consuming and uneconomical movement on the part of the operator who is required to remove a hand from the position guiding the fabric to a position on the hand wheel and then to return the hand to the fabric prior to the resumption of the sewing operation.

Accordingly, it is an object of the present invention to provide a device controllable by the operator without requiring the use of the operator's hand or hands, for example, controllable by the operator's knee, and operative, at the conclusion of a sewing operation, to cause further slow movement of the machine until the needle thereof is in a desired position.

Another object is to provide a device of the described character operative under the control of the operator to initially dispose the needle of the sewing machine in its uppermost position and then to effect operation of an auxiliary device associated with the sewing machine, for

example, of a thread cutting device of the kind disclosed in United States Letters Patent No. 2,707,927, identified more fully above.

A further object is to provide a device of the described character controllable by the operator and selectively operable to bring the needle of the associated sewing machine to rest in either its uppermost or lowermost position.

Still another object is to provide a needle positioning device of the described character associated with a sewing machine and controlled so that the needle positioning device cannot operate during normal operation of the sewing machine thereby to prevent damage to the machine by reason of inadvertent actuation of the controls for the needle positioning device.

Specifically, needle positioning devices embodying the present invention are applicable to commercial sewing machines of the kind driven by a continuously operated electric motor and having a transmission between the motor and the sewing machine that includes a disengageable clutch and a brake that is applied upon disengagement of the clutch, with the clutch and brake being controlled by manipulation of a foot operated treadle. In such commercial machines, the sewing machine is operated when the operator applies pressure to the treadle for engaging the clutch and releasing the brake. When the machine is to be halted, the operator releases the foot applied pressure on the treadle thereby to disengage the clutch and apply the brake. In existing machines of the above type, the applied brake may bring the sewing machine to a halt with the needle thereof in its uppermost or lowermost position or in a position intermediate thereof.

In accordance with an aspect of the present invention, the sewing machine having a needle positioning device associated therewith is slowly operated, after the application of the brake, by energization of electro-magnetic means effective to release the brake and to partially or loosely engage the clutch, while other electromagnetic means are simultaneously energized and thereby made operative to urge a latch against the periphery of the hand wheel of the sewing machine for engagement in a suitably disposed notch or keeper formed in the periphery of the hand wheel so that, upon engagement of the latch in the keeper, the hand wheel will be in a rotational position corresponding to the desired position of the needle.

In accordance with another aspect of the present invention, energization of the electro-magnetic means for effecting slow operation of the sewing machine and for applying the latch against the notched periphery of the hand wheel, and energization of electro-magnetic means for operating a device associated with the sewing machine, such as, a thread cutting or trimming device of the kind disclosed in United States Letters Patent No. 2,707,927, are controlled by suitable switches capable of being operated only in sequence, for example, in response to pressure applied by the operator's knee against a suitably positioned movable plunger, so that the needle of the sewing machine will be positively moved to the desired position prior to operation of the associated device, for example, to ensure the movement of the needle to its uppermost position prior to operation of the thread cutting or trimming device.

Further, in accordance with the present invention, the latch adapted to cooperate with the hand wheel of the sewing machine to stop rotation of the latter when the needle is in the desired position may be movable laterally in opposite directions with respect to the latter so as to effect engagement with the hand wheel from one or the other of the opposite sides thereof, while the hand

wheel is provided with a notch in each of its opposite sides at angularly spaced apart locations corresponding to the uppermost and lowermost positions, respectively, of the needle so that, when the latch engages the hand wheel from one side, the needle will be halted in its uppermost position and, when the latch engages the hand wheel at the other side of the latter, the needle will be halted in its lowermost position. When the latch and hand wheel cooperate in the foregoing manner for selectively disposing the needle in either its uppermost or lowermost position, selectively energized electro-magnetic means are provided for effecting engagement of the latch with the opposite sides, respectively, of the hand wheel, and such electro-magnetic means are individually controllable by sequentially operated switches so that only the electro-magnetic means for engaging the latch with one side or with the other side of the hand wheel can be energized at any one time.

The above, and other objects, features and advantages of the present invention, will be apparent in the following detailed description of illustrative embodiments thereof which is to be read in connection with the accompanying drawings forming a part hereof, and wherein:

Fig. 1 is a front elevational view, partly broken away and in section, of a sewing machine having a needle positioning device associated therewith in connection with a first embodiment of the present invention;

Fig. 2 is a fragmentary top plan view of a portion of the sewing machine illustrated in Fig. 1;

Fig. 3 is a fragmentary and elevational view of the sewing machine of Fig. 1;

Fig. 4 is an elevational view of a switch assembly included in the needle positioning device on the sewing machine in Fig. 1, but with the housing of the switch assembly being broken away and shown in section in order to expose the interior mechanism thereof;

Fig. 5 is a schematic wiring diagram for the needle positioning device associated with the sewing machine in the embodiment of Fig. 1;

Fig. 6 is a top plan view similar to Fig. 2, but illustrating another embodiment of the present invention;

Fig. 7 is an end elevational view similar to Fig. 3, but partly in section and taken along the line 7—7 of Fig. 6;

Fig. 8 is an elevational view of a switch assembly employed in connection with the embodiment of Figs. 6 and 7, and with the housing of the switch assembly being broken away and shown in section in order to expose the interior mechanism thereof;

Fig. 9 is a transverse sectional view taken along the line 9—9 of Fig. 8; and

Fig. 10 is a schematic wiring diagram for the needle positioning device of Figs. 6 to 9, inclusive.

Referring to the drawings in detail, and initially to Fig. 1 thereof, a sewing machine having a needle positioning device associated therewith in accordance with the present invention is there illustrated and generally identified by the reference numeral **10**. Sewing machine **10** may be of any conventional type used in sewing garments and includes the usual flat base or bed **12** having a stock **14** mounted thereon to support a cantilever arm **16** having a head **18** at the free end thereof. The head **18** carries a vertical reciprocating needle bar **20** in which is attached a needle **22** having an eye for receiving the top or over thread. The sewing machine **10** further includes the usual drive means (not shown) within the stock **14** and arm **16** for reciprocating the needle bar **20** in response to rotation of a grooved hand wheel **24**.

The flat base or bed **12** of the sewing machine may be received in a suitable opening or recess of a table top **26** which is supported at a desired elevation on legs **28**. In order to effect rotation of the hand wheel **24**, and thereby cause reciprocation of the needle **22**, the sewing machine **10** may include a drive unit which is generally identified by the reference numeral **30** and is preferably mounted below the table top **26**. The drive unit **30** includes an electric motor **32** mounted within a fixed housing **34** and having a clutch plate **36** secured to its rotating shaft. An annular brake plate **38** is secured to the end wall **40** of the housing **34** adjacent the clutch plate **36** and is concentric with the latter, while a pressure plate **42** having friction material on its opposite faces is disposed between the clutch and brake plates **36** and **38** and is mounted upon a hollow shaft **44** which is rotatable and axially slidable within a bearing **46** extending from the end wall **40** so that the pressure plate **42** can be moved axially from its illustrated neutral position into frictional engagement either with the clutch plate **36**, so that the motor **32** will then drive the shaft **44**, or into frictional engagement with the fixed brake plate **38**, so that rotation of the shaft **44** will then be halted. A shaft **48** extends axially into the hollow shaft **44** and is keyed to the latter, as at **50**, so that the shaft **48** will rotate with the hollow shaft **44**, while axial movement of the shaft **48** is resisted, for example, by engagement of an end plate **52** of the bearing **46** in a reduced diameter portion or neck of the shaft **48**. In order to transmit rotation of the shaft **48** to the hand wheel **24**, a pulley **54** is secured on the shaft **48** and a belt **56** runs around the pulley **54** and the grooved hand wheel **24**.

In order to effect the axial displacement of pressure plate **42** into selective engagement with either the clutch plate **36** or the brake plate **38**, the hollow shaft **44** carrying the pressure plate may have an annular, external groove **58** therein engageable by a pin **60** which projects radially into the bearing **46** through an axially extending slot **62** formed in the side of the bearing and shown in broken lines on Fig. 1. Shifting of the pin **60** along the slot **62** may be effected by a bent lever **64** which is pivoted intermediate its ends, as at **66**, on a bracket **68** carried by the housing **34**, and which has a forked end **70** embracing the end of the pin **60** extending out of the bearing **46**. Thus, when the lever **64** is rocked in the counter clockwise direction, as viewed in Fig. 1, the pressure plate **42** will be moved into frictional engagement with the clutch plate **36**, thereby to drive the sewing machine **10** from the motor **32**. On the other hand, when the lever **64** is rocked in the clockwise direction, as viewed in Fig. 1, the pressure plate **42** is moved into frictional contact with the fixed brake plate **38**, thereby to halt operation of the associated sewing machine.

Normally, the end of the bent lever **64** remote from the forked end **70** is directly connected to the upper end of a rod **72** which, at its lower end, is pivotally connected to a treadle **74** which is rockably journalled, as at **76**, between the supporting legs **28** of the sewing machine. Thus, normally, when the operator of the sewing machine directs a foot applied pressure against the treadle **74** to rock the latter in the direction pulling the rod **72** downwardly, the rotation of the motor **32** is transmitted to the sewing machine and, conversely, when the treadle **74** is rocked in the direction elevating the rod **72**, the result thereof is to disconnect the sewing machine from the motor **32** and to apply a brake for quickly halting rotation of the sewing machine.

In accordance with the present invention, electromagnetically operated means are provided for releasing the brake which has halted operation of the sewing machine and for lightly applying the pressure plate **42** against the clutch plate **36** driven by the motor so that, after the sewing machine has been halted, the hand wheel **24** thereof can be made to slowly rotate until the needle **22** has assumed a desired position. In order to achieve the above described slow rotation of the hand wheel **24**, a normally deenergized solenoid **78** is fixedly mounted upon a bracket **80** depending from the housing **34** and has its armature **82** pivotally connected to a link **84** which is, in turn, pivotally connected to an extension **86** projecting from a bracket **88** secured to the bent lever **64**. Also

mounted upon the bracket 88 is a normally energized solenoid 90 having its armature 92 pivotally connected, as at 94, to the upper end of connecting rod 72 so that the armature 92 and rod 72 cooperate to provide a connection of variable length between the rockable treadle 74 and the bent lever 64. The solenoid 78 is of the kind that retracts its armature 82 when energized, while the solenoid 90 is of the kind that extends its armature 92 when energized. Thus, if the treadle 74 is rocked in the direction for elevating the rod 72 while the solenoid 90 is in its normally energized condition so that the upward movement of the rod 72 is transmitted, by way of the solenoid 90, to the lever 64 and rocks the latter in the direction for disengaging the pressure plate 42 from the clutch plate 36 and for moving the pressure plate into engagement with the brake plate 38, thereby to halt operation of the sewing machine, and, thereafter, the solenoid 90 is deenergized and the solenoid 78 is energized, retraction of the armature 82 of solenoid 78 will pull downwardly on the extension 86, thereby to rock the lever 64 in the direction freeing the pressure plate 42 from the brake plate 38 and lightly applying the pressure plate against the clutch plate 36, while the deenergized solenoid 90 will permit its armature 92 to be retracted for accommodating such movement of the lever 64 while the foot applied pressure still acts against the treadle 74. The stroke of the armature 82 of solenoid 78 is predetermined so that, when the solenoid 78 is energized, the resultant rocking of the lever 64 will be sufficient only to lightly apply the pressure plate 42 against the clutch plate 36 for effecting only slow rotation of the hand wheel 24 of the sewing machine. In order to adjust the effective stroke of the armature 82, the solenoid 78 is preferably vertically adjustable along the bracket 80.

Referring now to Figs. 2 and 3, an arrangement is there shown for positioning, or causing the needle 22 to come to rest on its uppermost position following slow rotation of the hand wheel 24 in the manner described above, and such positioning arrangement is there generally identified by the reference numeral 96. The positioning arrangement 96 includes a support member 98 extending from a pad 100 secured on the back of the stock 14 adjacent the level of the hand wheel 24. A support rod 102 extends rearwardly from the support member 98 and has a solenoid 104 adjustably mounted thereon, as at 106. The armature 108 of the solenoid 104 is connected to an end of a torsion spring 110 which, at its other end, is connected to a latch lever 112 pivoted intermediate its ends, as at 114, upon the support member 98 for swinging in a horizontal plane. An arm 116 extends from the housing of the solenoid 104 and a tension spring 118 is connected between the arm 116 and the end of the latch lever 112 remote from the end of the latter connected by the spring 110 to the armature 108. A positioning disc 120 is secured to the hand wheel 24 for rotation with the latter and is adapted to be engaged, at its periphery, by the latch lever 112. The periphery of the disc 120 is notched, as at 122 (Fig. 3), to define a radial shoulder 124 facing in the direction of normal rotation of the hand wheel and disc, as indicated by the arrow 126 on Fig. 3, and positioned so that, when the latch lever 112 engages the shoulder 124 to stop rotation of the positioning disc 120 and the hand wheel 24, the needle 22 will then be in a desired position, specifically, in its uppermost position.

The solenoid 104 is normally deenergized and is of the type that retracts its armature 108 when energized. Thus, normally, the spring 118 rocks the latch lever 112 to the illustrated inoperative position of Fig. 2 where the latch lever is spaced from the periphery of the positioning disc 120. However, when the solenoid 104 is energized and retracts its armature 108, the movement of the armature is yieldably transmitted to the latch lever 112 by the spring 110 and urges the latch lever radially against the periphery of the positioning disc. As the positioning disc 120 slowly rotates with the hand wheel 24, the latch lever rides against the periphery of the positioning disc into the recess 122 and will finally be engaged by the radial shoulder 124 of the latter thereby to stop rotation of the hand wheel and to halt the needle 22 in its uppermost position. The spring 110 employed for connecting the armature 108 of the solenoid 104 to the latch lever 112 makes it possible for the solenoid to effect full movement of its armature upon energization of the solenoid even though, at that moment, the notch or recess 122 of the locating disc may not be disposed for reception of the latch lever 112, and the final movement of the latch lever into the notch 122 is then effected by the force accumulated within the spring 110. Thus, the armature 108 of the solenoid can move instantaneously, upon energization of the latter, thereby to prevent overheating of the solenoid.

In accordance with the present invention, a switch assembly which is generally identified by the reference numeral 126 (Figs. 1 and 4) is provided for controlling the operation of the solenoids 78, 90 and 104, and is operable by actuation of a plunger 128 which is preferably displaced by the pressure of the operator's knee thereagainst so that the operator's hands will remain free for guiding of the material or fabric, as in the normal sewing operation.

As seen in Fig. 4, the switch assembly 126 includes a microswitch 130 suitably mounted within a housing 132 having bearings 134 and 136 therein for longitudinally guiding the plunger 128 along a path having the switch 130 at one side thereof. A pawl 138 is pivotally mounted, as at 140, on the plunger 128 and has an extension 142 engageable against a stop pin 144 projecting from the plunger when the pawl is rocked in the clockwise direction, as viewed in Fig. 4, by a tension spring 146 connected between the pawl 138 and the bearing 136. The spring 146 also urges the pawl 138 and the plunger 128 in the longitudinal direction tending to project the plunger out of the housing 132 and normally disposes the free end of the pawl 138 in the position shown in full lines on Fig. 4, where the pawl 138 is disposed in advance of an actuating finger 148 projecting from the switch 130 into the path of movement of the pawl 138 with the plunger 128.

As shown diagrammatically in Fig. 5, the switch 130 includes a movable contact 150 displaceable by actuation of the finger 148 between two fixed contacts 152 and 154. Normally, that is, when the plunger 128 and pawl 138 are in the positions shown in full lines on Fig. 4 so that the pawl 138 is out of contact with the finger 148, the movable contact 150 of switch 130 engages the fixed contact 152. However, when the plunger 128 is depressed, for example, by a knee applied pressure thereagainst, the pawl 138 moves from the full-line position of Fig. 4 toward the broken-line position identified at 138' and, during the course of such movement, the pawl acts against the finger 148 to move the contact 150 of the switch 130 into engagement with the other fixed contact 154. It is apparent that during the movement of the plunger 128 from right to left, as viewed in Fig. 4, the engagement of the extension 142 of the pawl 138 with the stop pin 144 will prevent rocking of the pawl relative to the plunger so that the finger 148 must be displaced by the pawl 138 as the latter passes the actuating finger. However, during the return movement of the plunger, that is, from left to right, as viewed in Fig. 4, engagement of the pawl 138 with the free end of the finger 148 causes rocking of the pawl relative to the plunger 128 in the counter-clockwise direction, as viewed in Fig. 4, so that the pawl can move past the finger 148 without actuating the latter.

Referring to Fig. 5 of the drawings, it will be seen that the switch 130 is interposed in the electrical circuit for energizing the solenoids 78, 90 and 104 so that, on the one hand, when the movable contact 150 is in its normal position engaging the fixed contact 152, the solenoid 90 will be energized and the solenoids 78 and

104 will be deenergized, and so that, on the other hand, when the contact 150 is moved into engagement with the fixed contact 154, the solenoid 90 will be deenergized, and the solenoids 78 and 104 will then be energized.

Specifically, the electrical circuit for achieving the above control of the energization of the solenoids 78, 90 and 104 may include line terminals 156 and 158, or any other suitable source of electric current, a conductor 160 extending from the line terminal 156 and having branch conductors 160*a*, 160*b* and 160*c* extending therefrom to one side of the coils of the solenoids 78, 90 and 104, respectively. An electric conductor 162 extends from the other line terminal 158 to the movable contact 150 of switch 130 and has a safety switch 164, hereinafter referred to in detail, interposed in the conductor 162 in series with the switch 130 so that the needle positioning device embodying the present invention can be operated only when the switch 164 is in its closed condition. An electric conductor 166 extends from the fixed contact 152 to the other end of the coil of solenoid 90, while an electric conductor 168 extends from the fixed contact 154 and has branches 168*a* and 168*b* connected to the other sides or ends of the coils of solenoids 78 and 104, respectively.

Referring to Fig. 1, it will be seen that the safety switch 164 is mounted upon a bracket 170 depending from the solenoid 78 and has an actuating finger 172 extending into the path of movement of a nut 174 adjustably threaded upon the rod 72. The switch 164 is of the kind that is normally in an open condition and is adapted to be closed by upward movement of the actuating finger 172. Thus, when the treadle 74 is rocked in the direction lowering the rod 72 thereby to engage the pressure plate 42 with the clutch plate 36 for causing normal operation of the sewing machine 10, the nut 174 is moved downwardly away from the finger 172 and the switch 164 then remains in its normal open condition so that, even if the plunger 128 of switch assembly 126 is inadvertently depressed, the needle positioning device embodying the present invention cannot operate. However, when the treadle 74 is rocked in the direction elevating the rod 72 in order to halt the operation of sewing machine 10, the upward movement of rod 72 brings the nut 174 against the actuating finger 172 and the resulting upward movement of the latter causes closing of the switch 164 so that, upon subsequent depressing of the plunger 128 to cause movement of the contact 150 of switch 130 into engagement with the fixed contact 154, the circuit for energizing the solenoids 78 and 104 will be completed, thereby to cause slow rotation of the hand wheel 24 while the latch lever 112 is urged against the periphery of positioning disc 120 and falls into the notch 122 and is engaged by the shoulder 124 when the needle 22 has reached its uppermost position. It is to be understood that, during the positioning of the needle 22, the plunger 128 is not fully depressed, but is moved only to an extent sufficient to dispose the pawl 138 in contact with the finger 148 of switch 130 so that the finger 148 will be displaced during the period when the desired positioning of the needle is being accomplished.

When the above described needle positioning device is employed in connection with an auxiliary device on the sewing machine 10, for example, in connection with the thread cutting or trimming device as disclosed in United States Letters Patent No. 2,707,927, an additional microswitch 176 (Fig. 4) corresponding to the switch 42 of the above identified patent, is disposed within the housing 132 of switch assembly 126 at the side of the plunger 128 remote from the switch 130 and is provided with an actuating finger 178 which is engageable by a projection 180 movable with the plunger 128. The switch 176 is normally in its open condition and is closed only upon displacement of its finger 178 by the projection 180. Further, as seen in Fig. 4, the finger 178 is disposed so that it is engaged and displaced by the projection 180 only after the plunger 128 has been depressed to the full extent possible, that is, only after the pawl 138 has moved to the position 138' where it is free of the actuating finger 148 of the switch 130.

When the switch 176 is closed, in response to full depression of the plunger 128, the thread cutting or trimming device, or other auxiliary device, controlled thereby is made to operate. However, since the switch 176 is closed only after the pawl 138 has displaced the finger 148 of switch 130 to cause energization of the solenoids 78 and 104, it is apparent that operation of the thread cutting or trimming device can occur only after the hand wheel 24 of the sewing machine has been slowly rotated and halted in the position corresponding to the uppermost position of the needle 22. Thus, the thread trimming or cutting device can operate without interference from the needle of the sewing machine.

Further, since the pawl 138 moves out of engagement with the finger 148 of switch 130 prior to the engagement of the projection 180 with the finger 178 of switch 176, it is apparent that, during operation of the associated thread cutting or trimming device, the solenoids 78 and 104 will be deenergized while the solenoid 90 is again energized so that, if the operator maintains the foot applied pressure against the treadle 74 in the direction for moving pressure plate 42 against the brake plate 38, upon reenergization of the solenoid 90, the brake will be immediately reapplied thereby to prevent inadvertent rotation of the positioning disc 120 and to hold the needle 22 in its uppermost position.

Referring now to Figs. 6 and 7 of the drawings, a positioning arrangement generally identified by the reference numeral 96*a* is there illustrated and is intended to replace the positioning arrangement 96 described above when it is desired to provide for the selective positioning of the needle of the sewing machine in either its uppermost position or its lowermost position. As in the first described embodiment of the present invention, a positioning disc 120*a* is fixed to the grooved hand wheel 24*a* of the sewing machine 10*a* for slow rotation with the hand wheel in the manner previously described following disengagement of the clutch and application of the brake interposed in the transmission between the driving electric motor and the hand wheel 24*a*. The positioning disc 120*a* has notches 122*a* and 122*b* cut in the opposite sides of the periphery thereof and terminating in shoulders 124*a* and 124*b* facing in the direction of rotation of the hand wheel as indicated by the arrow 126*a* on Fig. 7. The shoulders 124*a* and 124*b* are circumferentially spaced apart on the disc 120*a* and correspond to the uppermost and lowermost positions, respectively, of the reciprocating needle of the associated sewing machine 10*a*.

The positioning arrangement 96*a* is operative to selectively engage in one or the other of the notches 122*a* or 122*b* in order to halt the slow rotation of the hand wheel 24*a* in the position corresponding to the uppermost or lowermost position of the needle. In order to achieve such operation, the positioning arrangement 96*a* includes a support 98*a* extending from a bracket 100*a* which is secured to the back of the stock 14*a* of the sewing machine, and an arm 102*a* extending rearwardly from the bracket 100*a* and carrying two spaced apart solenoids 104*a* and 104*b* having their armatures connected by a common cross member 108*a*. Each of the solenoids 104*a* and 104*b* is of the type that retracts its armature in response to energization thereof, and the solenoids 104*a* and 104*b* are intended to be alternatively energized so that, when the solenoid 104*a* is energized, the cross member 108*a* is moved toward the left, as viewed in Fig. 6, and, when the solenoid 104*b* is energized, the cross member 108*a* is moved toward the right. The solenoids 104*a* and 104*b* are provided for actuating a latch 112*a* which is pivoted on the support 98*a*, as at

114*a*, and which has a forked end defining projections 182*a* and 182*b* loosely embracing, and normally spaced from, the periphery of the positioning disc 120*a*. A link 184 is pivotally connected at its opposite ends, as at 186 and 188, to the center of the cross member 108*a* and to the latch 112*a*, respectively, and the link 184 is provided with a cross member 190. Tension springs 192*a* and 192*b* are connected between the opposite ends of the cross member 190 and laterally spaced anchoring lugs on an extension 194 of the latch 112*a*. The springs 192*a* and 192*b* are balanced so that, normally, such springs tend to maintain the link 184 in alignment with the latch 112*a*, that is, in a condition where a line extending through the pivots 186 and 188 also passes through the pivot 114*a* of the latch.

When both of the solenoids 104*a* and 104*b* are simultaneously deenergized, the several parts of the positioning arrangement 96*a* are disposed in the positions illustrated in Fig. 6, that is, with the projections 182*a* and 182*b* spaced from the opposite sides of the positioning disc 120*a* so that the positioning arrangement will not interfere with rotation of disc 120*a* and normal operation of the sewing machine can be effected. However, when the solenoid 104*a* is energized and thereby draws the cross member 108*a* toward the left, as viewed in Fig. 6, the link 184 and springs 192*a* and 192*b*, forming a yieldable connection between cross member 108*a* and latch 112*a*, tend to rock the latter in the counter-clockwise direction, as viewed in Fig. 6, thereby to urge the projection 182*a* against the adjacent side of the peripheral portion of disc 120*a*. If the disc 120*a* is simultaneously being slowly rotated with the hand wheel 24*a* in the manner described in detail in connection with the first embodiment of the present invention, the projection 182*a* will finally be received in the recess or notch 122*a* and, upon engagement of the shoulder 124*a* with the projection 182*a* of the latch, the latter will prevent further rotation of the hand wheel beyond the position thereof corresponding to the uppermost position of the needle. Conversely, if the solenoid 104*b* is energized, the projection 182*b* of the latch will be urged against the adjacent side of the peripheral portion of disc 120*a* and eventually received in the notch 122*b* to stop the slow rotation of the hand wheel with the needle in its lowermost position when the shoulder 124*b* of the positioning disc engages against the projection 182*b* of the latch. Thus by controlling the selective energization of the solenoids 104*a* and 104*b* while the hand wheel 24*a* is slowly rotated, the needle of the sewing machine may be brought to rest in either its uppermost or lowermost position. It is apparent that the springs 192*a* and 192*b* permit instantaneous action of the solenoids 104*a* and 104*b* even though the full movement of the latch 112*a* may not occur for some time after energization if one or the other of the solenoids, that is, until the positioning disc 120*a* has been slowly rotated to a position wherein one or the other of the projections 182*a* and 182*b* of the latch is receivable in a related notch of the positioning disc.

Figs. 8 and 9 illustrate a switch assembly which is generally identified by the reference numeral 126*a* and is intended to replace the switch assembly 126 in the arrangement of Fig. 1 when the positioning arrangement 96*a* of Figs. 6 and 7 is substituted for the positioning arrangement 96 of Figs. 2 and 3.

The switch assembly 126*a* includes a microswitch 130*a* which corresponds to the switch 130 of assembly 126 and is connected in a circuit for energizing the solenoids so that, when the switch 130*a* is actuated, solenoid 90 is deenergized while solenoids 78 and 104*a* are both energized to cause slow rotation of the hand wheel 24*a* and to operate the positioning arrangement 96*a* in the direction for halting the sewing machine in its needle-up position. The assembly 126*a* further includes microswitches 196*a* and 196*b* which are adapted to be simultaneously actuated for deenergizing the solenoid 90 and simultaneously energizing the solenoids 78 and 104*b* so that the slow rotation of the hand wheel 24*a* is then halted in a position corresponding to the lowermost position of the sewing machine needle. The structure of the switch assembly 126*a* for selectively actuating the switch 130*a* or the switches 196*a* and 196*b* is substantially the same as that provided in the switch assembly 126 for the similar purpose and, therefore, includes a plunger 128*a* longitudinally slidable in bearings 134*a* and 136*a* within a housing 132*a*, and a pawl 138*a* pivotally mounted, at 140*a*, upon the plunger 128*a* and having an extension 142*a* engageable against a stop 144*a* by the action of a spring 146*a*. The pawl 138*a* actuates the finger 148*a* of switch 130*a* only during movement of the plunger from left to right, as viewed in Fig. 8 and the pivoted mounting for the pawl permits the latter to slide under the finger 148*a* without actuating the latter during the return movement of the plunger 128*a*. The switches 196*a* and 196*b*, which are mounted in tandem, are placed at the side of plunger 128*a* remote from switch 130*a* and disposed so that actuating fingers 198*a* and 198*b* thereof are engageable by a lateral bar 200 and displaced by the latter only after the plunger 128*a* has been depressed into the housing 132*a* to the full extent possible at which time the pawl 138*a* has moved past and released the finger 148*a*. Thus, depending upon the extent of the depression or longitudinal movement imparted to the plunger 128*a*, either the switch 130*a* or the switches 196*a* and 196*b* will be actuated, and the longitudinal movement of the plunger may be effected, as in the first described embodiment, by a pressure applied thereagainst by the operator's knee so that the operator's hands will remain free to manipulate the fabric being sewed.

As seen in Fig. 10, which illustrates a suitable electric circuit for obtaining the above described energization of the solenoids 78, 90, 104*a* and 104*b* under the control of the switches 130*a*, 196*a* and 196*b*, the switch 130*a* includes a movable contact 150*a* normally engaging a fixed contact 152*a* and moved into engagement with another fixed contact 154*a* by displacement of its finger 148*a*, while each of the switches 196*a* and 196*b* also includes a movable contact 202 normally engaging one fixed contact 204 and movable into engagement with another fixed contact 206 in response to actuation of the related finger 198*a* or 198*b*.

A branched conductor 208 extends from one side of a source of electric current, for example, from one line terminal 156, to one end of the coil in each of the solenoids 78 and 90 and also to the movable contact 202 of switch 196*b*. A conductor 210 extends from the other line terminal 158 to the movable contact 150*a* of switch 130*a* and has the safety switch 164 interposed therein for the purpose described in connection with the first embodiment of the invention. A conductor 212 extends from the fixed contact 152*a* to the movable contact 202 of switch 196*a*, and a conductor 214 extends from one end of the coil of solenoid 104*a* to fixed contact 204 of switch 196*b*. A conductor 216 extends from the other fixed contact 206 of switch 196*b* to one side of the coil of solenoid 104*b*. A branched conductor 218 extends from the other end of the coil of each of solenoids 78, 104*a* and 104*b* to the fixed contact 206 of switch 196*a*, and to the fixed contact 154*a* of switch 130*a*, while the other end of the coil of solenoid 90 is connected to the fixed contact 204 of switch 196*a* by a conductor 220.

When the switch 164 is closed and switch 130*a* is actuated, while the switches 196*a* and 196*b* remain in their illustrated normal conditions, a completed circuit is established from line terminal 158 through switch 164, contacts 150*a* and 154*a* of switch 130*a* and conductor 218 to one end of the coils of solenoids 78 and 104*a*, and from the other sides of such coils by way of the conductor 208 directly back to line terminal 156 and by way of conductor 214, contacts 204 and 202 of switch 196*b*, and conductor 208 back to line terminal 156, so

that the solenoids 78 and 104*a* are energized, in parallel, while energization of the solenoid 90 is interrupted by breaking of its circuit as a result of the movement of contact 150*a* away from contact 152*a* in switch 130*a*

On the other hand, when switches 196*a* and 196*b* are simultaneously actuated while the switch 164 is closed, energization of solenoid 90 is interrupted and solenoids 78 and 104*b* are then energized, in parallel. The interruption of the normal energization of solenoid 90 results from the movement of contact 202 away from contact 204 in switch 196*a*. The energization of solenoid 78 is effected by the completed circuit between terminals 158 and 156 made up of conductor 210 having switch 164 therein in closed condition, contacts 150*a* and 152*a* of switch 130*a*, conductor 212, contacts 202 and 206 of switch 196*a*, conductor 218, the coil of solenoid 78 and conductor 208, while the circuit for energizing the solenoid 104*b* is made up of conductor 210, contacts 150*a* and 152*a* of switch 130*a*, conductor 212, contacts 202 and 206 of switch 196*a*, the coil of solenoid 104*b*, conductor 216, the contacts 206 and 202 of switch 196*b* and conductor 208. It will be apparent that the described arrangement of the switches 196*a* and 196*b* in association with the switch 130*a* prevents the simultaneous energization of the solenoids 104*a* and 104*b* so that, at no time, can the latter be made to work against each other.

Further, it is apparent that, with the positioning arrangement 96*a* (Figs. 6 and 7) and the switch assembly 126*a* (Figs. 8 and 9), the sewing machine needle can be moved to either its uppermost or lowermost position at the conclusion of a sewing operation. If the movement of the needle to its uppermost position is for the purpose of permitting operation of a thread cutting or trimming device of the kind disclosed in United States Letters Patent No. 2,707,927, the operation of that auxiliary device may be controlled by a switch apart from the switch assembly 126*a*.

In providing for the movement of the needle to its lowermost position, the embodiment of the present invention appearing in Figs. 6 to 10 of the drawings facilitates the sewing of garments along sharply bent lines or corners. In that connection, when the needle reaches such a sharp bend or corner and the presser foot of the sewing machine must be released to permit turning of the garment prior to renewal of the sewing operation, the operator need only fully depress the plunger 128*a* with a knee applied pressure against the latter after the brake has been applied, and this action will automatically move the needle to its lowermost position penetrating the garment so that, upon release of the presser foot, the garment can be turned about the needle and no gap will appear in the line of stitches at the sharp bend or corner. Since the plunger 128*a* is actuated by a knee applied pressure exerted thereagainst, the operator's hands remain free to guide the garment and to release and clamp the presser foot and the fatigue and wasted time resulting from the usual manual rotation of the hand wheel 24*a* is thereby avoided.

Although particular embodiments of the invention have been described in detail herein and shown in the accompanying drawings, it is to be understood that the invention is not limited to such embodiments, and that various changes and modifications may be effected therein without departing from the scope or spirit of the invention, except as defined in the appended claims.

What is claimed is:

1. In combination with a sewing machine having a substantially vertical reciprocated needle, mechanism for reciprocating said needle including a rotatable hand wheel, a motor, a clutch plate driven by said motor, a brake plate spaced axially from said clutch plate, a rotatable pressure plate movable axially between said clutch and brake plates to alternatively engage the latter, transmission means between said pressure plate and hand wheel so that the latter is driven by said motor when said pressure and clutch plates are engaged and rotation of the hand wheel is halted when said pressure and brake plates are engaged, a rockable lever, means connecting said lever to said pressure plate for moving the latter axially in response to rocking of said lever, a foot operated treadle, connecting means between said treadle and said lever having first electro-magnetic means interposed therein which only when operative, permits rocking of said lever by said treadle, second electro-magnetic means connected to said lever and operative to rock the latter in the direction for moving the pressure plate lightly against said clutch plate, operator controlled means capable of only alternately operating said first and second electro-magnetic means so that, when said second electro-magnetic means is operated, said first electro-magnetic means is rendered inoperative and said second electro-magnetic means can cause movement of the pressure plate into light engagement with the clutch plate independent of said treadle to effect slow rotation of the hand wheel, and positioning means operated only simultaneously with said second electro-magnetic means to positively halt rotation of the hand wheel at a predetermined position corresponding to a desired vertical position of said needle.

2. In combination with a sewing machine having a substantially vertical reciprocated needle, mechanism for reciprocating said needle including a rotatable hand wheel, a motor, a clutch plate driven by said motor, a brake plate spaced axially from said clutch plate, a rotatable pressure plate movable axially between said clutch and brake plates to alternatively engage the latter, transmission means between said pressure plate and hand wheel so that the latter is driven by said motor when said pressure and clutch plates are engaged and rotation of the hand wheel is halted when said pressure and brake plates are engaged, a rockable lever, means connecting said lever to said pressure plate for moving the latter axially in response to rocking of said lever, a foot operated treadle, connecting means between said treadle and said lever having first electro-magnetic means interposed therein which, only when operative, permits rocking of said lever by said treadle, second electro-magnetic means connected to said lever and operative to rock the latter in the direction for moving the pressure plate lightly against said clutch plate, a positioning member rotatable with said hand wheel in fixed angular relation to the latter and having at least one peripheral notch therein corresponding to a predetermined vertical position of said needle, a movable latch member engageable in a related notch of said positioning member and normally spaced from the latter, third electro-magnetic means connected to said latch member and operative to urge the latter against the periphery of said positioning member for engagement in said related notch when said needle is in said predetermined vertical position thereof, and operator actuated control means capable of only alternately operating said first electro-magnetic means and said second and third electro-magnetic means so that, when said first electro-magnetic means is operated the movement of said pressure plate is controlled by said treadle and, when said second and third electro-magnetic means are operated, said hand wheel is slowly rotated until said latch member engages in said related notch to halt the slow rotation of the hand wheel with said needle in said predetermined vertical position.

3. The combination as in claim 2; further comprising safety means responsive to movement of said treadle and rendering said operator actuated control means effective only when said treadle is positioned to apply said pressure plate against said brake plate so that said needle can be halted in said predetermined vertical position only after normal operation of the sewing machine has been concluded.

4. The combination as in claim 2; wherein said posi-

tioning member has a single notch therein corresponding to the uppermost vertical position of said needle, and said third electro-magnetic means includes a single solenoid having a movable armature and resilient connecting means between said armature and said latch member.

5. The combination as in claim 2; wherein said positioning member has two notches at circumferentially spaced apart locations in the opposite sides of the peripheral portion thereof corresponding to the uppermost and lowermost vertical positions, respectively, of said needle, and said latch member is rockable in opposed directions to engage the opposite sides of said peripheral portion; and wherein said third electro-magnetic means includes two oppositely acting, alternately energized solenoids having interconnected armatures, and resilient means connecting said interconnected armatures to said latch member so that said latch member is urged against a selected one of the sides of the peripheral portion of said positioning member to engage in the related notch in response to selective energization of the related one of said two solenoids.

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