

[54] NEEDLE POSITIONING MECHANISM FOR SEWING MACHINES

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[58] Field of Search 112/219 R, 219 A, 219 B, 220, 112/67, 87

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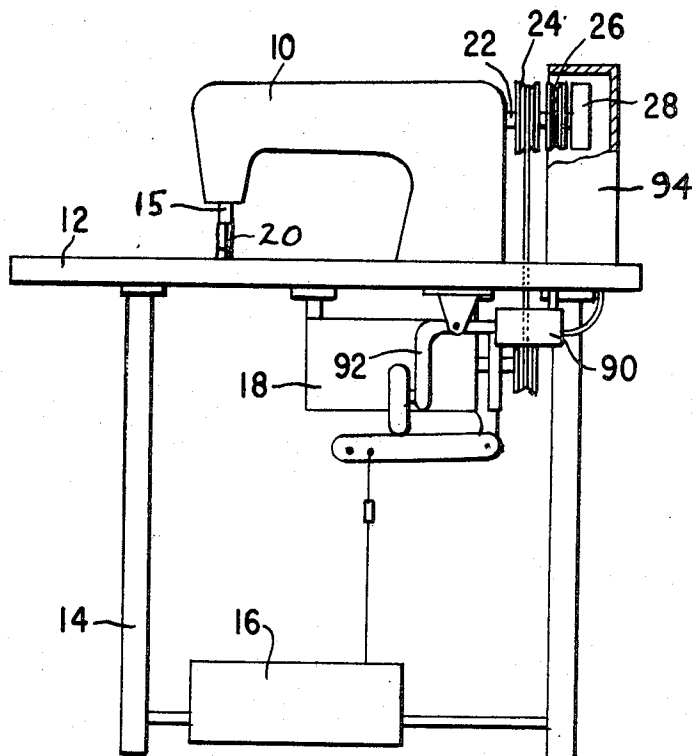
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[57] ABSTRACT

A needle positioning mechanism for a sewing machine in which the needle driving shaft of the sewing head mounts a pair of pulley wheels and a lock wheel. The pulley wheels are mounted with overriding clutches for independently driving the shaft; one pulley wheel connected to the main motor of the machine and the other to an auxillary motor having juxtaposed switches in its circuit; one normally open and the other normally closed. A lock arm having a detent projection at one end is movable by a solenoid energized by an operator into contact with the lock wheel which is provided with at least one detent recess. In its movement against the lock wheel, the lock arm closes the normally open switch as it contacts the surface of the lock wheel, to activate the auxillary motor, and then closes the normally open switch to deactivate the auxillary motor as its projection engages within the detent recess of the lock wheel.

12 Claims, 8 Drawing Figures



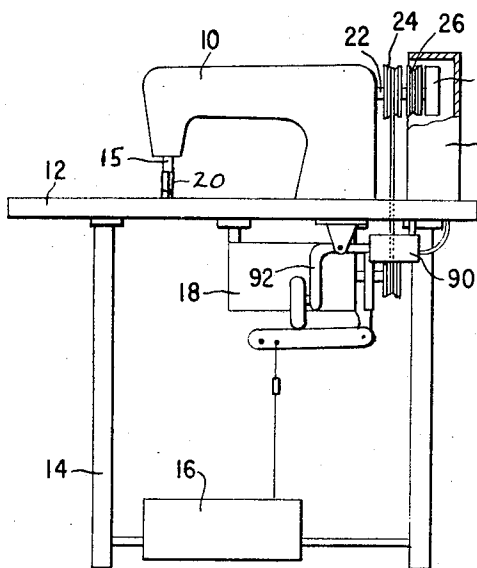


Fig. 1

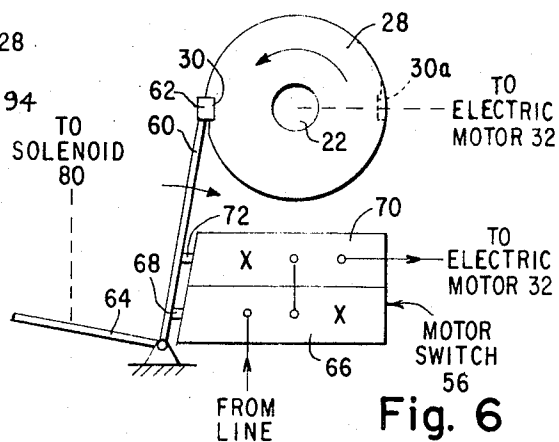


Fig. 6

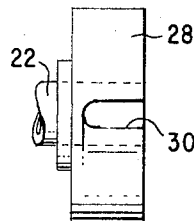


Fig. 7

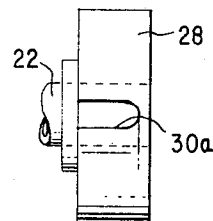


Fig. 8

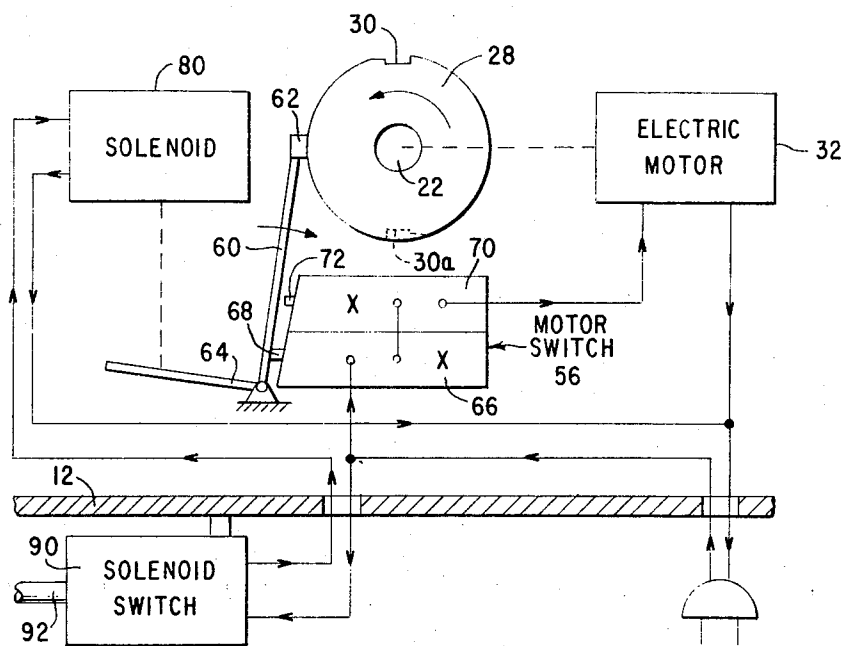


Fig. 5

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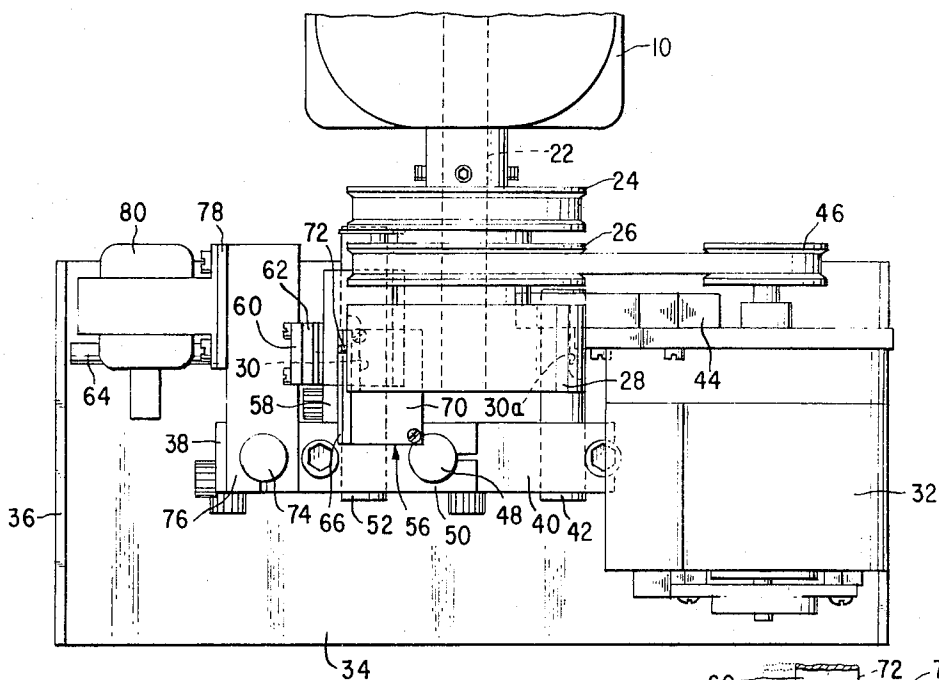


Fig. 2

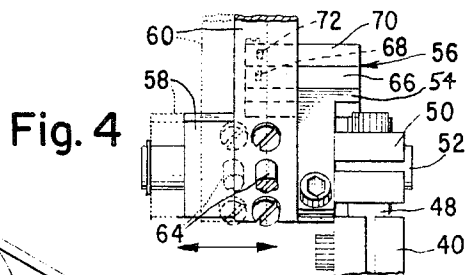


Fig. 4

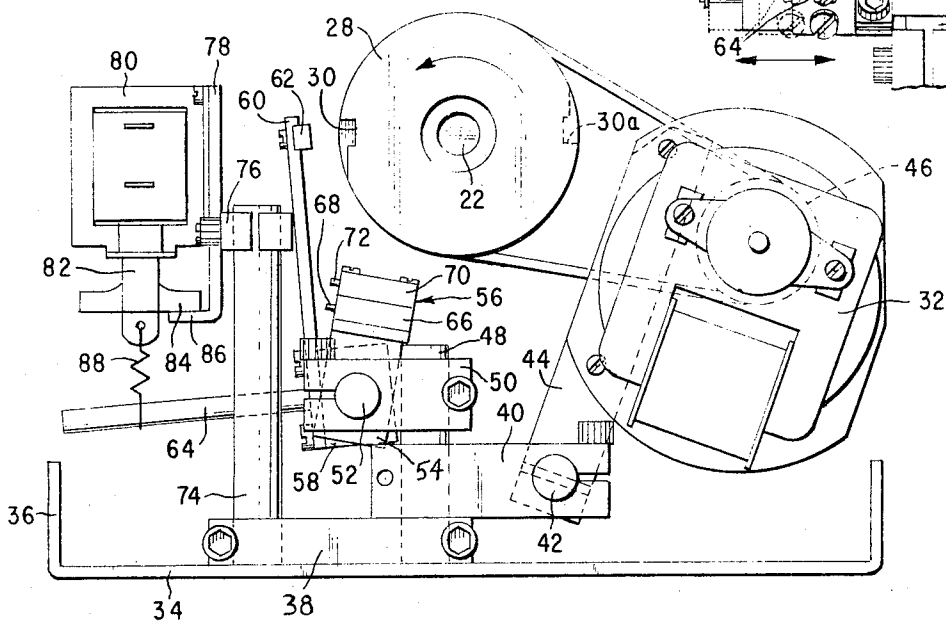


Fig. 3

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NEEDLE POSITIONING MECHANISM FOR SEWING MACHINES

The present invention relates to a sewing machine attachment or accessory. More particularly, this invention relates to an attachment or accessory for a sewing machine for use in automatically stopping a sewing machine with the needle thereof in a pre-set position.

Sewing machine attachments, of the character described, enable the automatic stopping of a sewing machine, with its needle either in the lowermost position, to enable the operator to turn the work in place for changing the direction of sewing; or, in uppermost position, to facilitate the removal of the work from the machine.

In both instances the operator is saved the act for manually turning the hand wheel of the machine and adjusting it to dispose the needle in desired position; thereby saving the operator's time and also leaving the operator's hands free for the better and more efficient handling of the work.

Needle positioning devices for sewing machines, of the general character described, because of their time and labor saving advantages, have been accepted and proven of value in the needle trade industries. However, for a number of reasons, such acceptance has not been commensurate with their proven value. Needle positioning devices of the prior art have been of various designs. Some of these devices have been electronic and therefore, difficult to service by the usually available sewing machine mechanics. Others have been pneumatically operated, and required clumsy and space-consuming compressed air installations; equipment that is generally not available in needle industry plants. Of the mechanical type, many are of complex and cumbersome construction; cluttering the underside of the sewing machine table. Some of the prior art devices are limited in their usefulness because they provide only for a single position stop.

All of the above prior art devices share one disadvantage in common; namely, the initial high cost and costly maintenance. As a result of these drawbacks, these devices have not had acceptance in the needle industry to the extent that their merits would justify.

The present invention is, therefore, directed to the provision of a needle positioning mechanism or device, of the character described, which will overcome the foregoing drawbacks of the prior art needle positioning devices which have heretofore stood in the way of their wider and more general acceptance in the needle trade industry.

It is an object of the present invention to provide a needle positioning mechanism or device, of the character described, which is of simple and compact construction and is simple and easy to assemble with and install on substantially any type of sewing machine; thereby making the mechanism economical to produce and to install.

Another object of the present invention is to provide a needle positioning mechanism, of the character described, which may be installed on a sewing machine with a minimum alteration of its general construction, and which may be installed and readily serviced by a sewing machine mechanic at the place of operation, and without the cost and machine-time waste that may result from sending the machine to an outside machine shop.

It is also an object of the present invention to provide a needle positioning mechanism, of the character described which is substantially foolproof and safe from malfunction; to thereby greatly reduce the cost of labor and waste of time required for maintenance.

It is a further object of the present invention to provide needle positioning mechanism, of the character described, which may be automatically actuated by a sewing machine operator in the normal procedure for stopping the sewing machine; requiring no additional movement or effort on the part of the operator.

A still further object of the present invention is to provide needle positioning devices for sewing machines, of the character described, which may serve to position the machine needle at either of its two extreme positions and that may be

simply, quickly and easily adjusted to vary the stopping of the sewing machine needle from one extreme position to the other, without the use of tools and within a minimum of time.

It is yet a further object of the present invention to provide a needle positioning device, of the character described, which will be smooth and quiet in operation and will not jar itself or the machine on which it is installed.

The foregoing and other objects and advantages of the needle positioning devices of the present invention will become more readily apparent to those skilled in the art from the embodiment shown in the accompanying drawings and from the description following. It is to be understood, however, that such embodiment is shown by way of illustration only, to make the principle and practice of the invention more readily comprehensible, and without intent to limiting the invention to specific details therein shown.

In the drawings:

FIG. 1 is a more or less schematic, front elevational view of a sewing machine provided with a needle positioning mechanism of the present invention;

FIG. 2 is a fragmentary, enlarged, top plan view of the driving end of the sewing machine of FIG. 1;

FIG. 3 is a side elevational view of the sewing machine end, as shown in FIG. 2;

FIG. 4 is a fragmentary, detailed view of the lock arm mounting means of the mechanism;

FIG. 5 is a schematic depiction of the electric circuit of the needle positioning mechanism of the invention;

FIG. 6 is a more or less schematic, detailed view of the locking wheel, lock arm and circuit controlling switches of the mechanism;

FIG. 7 is an elevational view of the edge of the locking wheel, viewed from one side; and

FIG. 8 is an elevational view of the edge of the locking wheel, viewed from the diametrically opposed side thereof.

Generally stated, the invention resides in the provision of a needle positioning device operable by an individual motor. The needle shaft of the machine is provided with a pair of pulley wheels mounted thereon with overrunning clutches; one of the pulley wheels connecting with the main machine motor and the other with a separate, individual motor. The needle driving shaft also mounts a cam or lock wheel having at least one peripheral indentation. The circuit of the electric motor of the device includes a pair of juxtaposed switches arranged in series; one normally open and the other normally closed. A cam follower or lock arm is provided which is normally held out of contact with the cam wheel and, which when moved into contact with such wheel by a solenoid actuated by the movement of the operator after the main motor is shut off, will first close the normally open switch, as it contacts the periphery of the cam wheel, and thus start the auxiliary motor, and then will open the normally closed switch, as its detent end enters the indentation in the cam wheel periphery, to stop the auxiliary motor.

Referring more specifically to the accompanying drawings, illustrating the invention, there is shown a conventional sewing machine of the counterclockwise running type. Such machine includes a sewing head, 10, mounted on a table, 12, which is supported on frame, 14, that includes the pedal, 16. The sewing head includes a presser foot, 13, and a needle shaft, 15. A main motor, 18, is mounted on the underside of table 12, and also a knee-operated presser foot lifting lever, 20.

The sewing machine departs from the conventional in that there is mounted on the needle driving shaft, 22, thereof, pair of pulley wheels, 24 and 26, both of which are mounted on the shaft 22 with overrunning clutches that will permit each to drive the shaft independently of the other. As any suitable, conventional type of overrunning clutch may be utilized for the purpose, and as the specific construction of such clutches does not constitute any part of the present invention, it is not thought necessary to specifically illustrate the same.

Needle driving shaft also mounts, preferably at its end, the cam or lock wheel, 28, which is of appreciable thickness and has at least one detent recess formed in its periphery, as at 30.

Pulley wheel 24 is operatively connected to the main motor 18 of the sewing machine. Pulley wheel 26, preferably the one closest to the cam wheel 28, is operatively connected to a second, low power, auxiliary motor, 32, of the needle positioning mechanism, which will now be described in detail.

In the illustrated embodiment, the needle positioning mechanism of the invention is shown to comprise a unit that is suitable for mounting on the table 12. The unit comprises a base plate, 34, securable to the table and preferably formed with upstanding flanges, 36, at opposed ends. Plate 34 supports a horizontal block, 38, into which is set an upright post, 48, on which is mounted a second block, 40, in rearwardly overlapping relation, in the overhanging end of which there is secured a rod, 42, by one of its ends which, in turn, has secured thereto, at its other end, an upwardly and outwardly rearwardly canted arm, 44, on which is secured the auxiliary motor 32, which is provided with the pulley wheel, 46. The plate and the several blocks and arm are so arranged that motor 32 is supported rearwardly of shaft 22 and pulley wheel 46 is to the rear of an aligned with the pulley wheel 26 of the needle drive shaft 22.

Upright post 48 also supports a forwardly extending horizontally disposed block, 50, in which is set a horizontally disposed rod, 52, which projects therefrom inwardly, in the direction of the sewing head 10. Rod 52 is preferably fixedly, but rotatably adjustably held in place within a suitable opening in the split forward end of block 50 and supports inwardly of block 50, a post, 54, on which is mounted a double switch, generally designated as 56, which will hereafter be more fully described, in position below the lock wheel 28.

Rod 52 has rotatably and slidably mounted thereon a bearing block, 58, to which is secured by its lower end, an upwardly extending lock arm or bar, 60, which is provided, at its upper end with a rearwardly directed detent projection, 62, and at its lower end with a forwardly extending, counterbalancing rod, 64. Rod 52 and bearing block 58 are so arranged that lock arm 60 has its upper end disposed in close proximity to the periphery of the lock wheel 28, but is normally out of contact therewith.

Double switch 56 comprises a lower, normally open switch, 66, having a projecting switch actuating pin, 68, and an upper normally closed switch, 70, having the projecting actuating pin, 72. Switches 66 and 70 are arranged to have their pins 68 and 72 facing and in close proximity to the lock arm 60 with pin 68 relatively closer to arm 60 than pin 72.

Switches 66 and 70 are connected in series in the electric circuit of motor 32 and are so arranged that when lock arm 60 is tilted rearwardly, to bring the detent projection 62 into contact with the periphery of lock wheel 28, it will first engage against pin 68 or switch 66 to press it inwardly to close switch 66 and complete the circuit through motor 32 to set it in operation, and when the detent projection 62 enters a recess in the periphery of the lock wheel 28, it will also engage against pin 72 of switch 70, to move it to break the motor circuit and stop its operation.

Block 38 also supports, at its forward end, an upright post, 74, at the upper end of which there is supported an inwardly extending bar, 76, one edge of which serves as a stop for the lock arm 60, to limit its forward tilting, and the other edge of which supports a bracket, 78, on which is mounted a solenoid, 80, with its axis vertically disposed and with its armature 82 in dependent position, and whose downward movement is limited by its laterally extending arm, 84, coming to rest on the offset end, 86, of the bracket, 78.

Armature 80 is connected to counterbalance rod 64, preferably through the intermediacy of a spring, 88, so that when solenoid 80 is actuated and armature 82 lifted, spring 88 will continue to raise rod 64 and maintain it in raised position, to thereby tilt arm 60 in the direction of lock wheel 28 and maintain it pressed thereagainst, so that projection 62 will enter into recess 30 when in register with it.

Solenoid 80 is connected in an electric circuit which includes a normally open switch, 90, mounted below table 12. Switch 90 may be closed by the operator each time the sewing machine is brought to a stop, in the conventional manner, by releasing the pedal 16. This disconnects the needle driving shaft 22 from the main motor 18, by disconnecting the motor clutch. When the machine is stopped for the purpose of removing or turning the work, the operator simultaneously may actuate the knee operable pressure foot lifting lever, 92, for lifting the presser foot from the work. This knee movement by the operator also closes switch 90 and activates solenoid 80, to tilt lock arm 60 against the periphery of lock wheel 28, to start and then stop the auxiliary motor 32 to turn the needle shaft 22 just the necessary distance to turn shaft 22 to desired positioning of the needle.

As various forms of switches, variously mounted and variously connected to lever 92 may be utilized for controlling solenoid 90, it is not thought necessary to illustrate any one in specific detail.

In operation, lock wheel 28 is set on shaft 22 in position that when its recess 30 is disposed to receive detent 62 of lock arm 60, shaft 22 will dispose the needle rod controlled by it in a pre-selected one of its two extreme positions; namely, either uppermost or lowermost position. While the machine is operated by main motor 18, through pulley 24, pulley wheel 26 remains idle, because of the overrunning clutch by which it is mounted on shaft 22. When the operator disconnects the main motor 18 from the drive shaft 22 and, with his knee, moves the presser-foot lifting lever 92, such lever simultaneously closes switch 90, to activate solenoid 80 and raise its armature 82 and counterbalancing arm 64 and tilt lock arm 60 in the direction of lock wheel 28. AS it is tilted, arm 60 will first strike pin 68 of normally open switch 66 to close the circuit through motor 32 and activate the motor to rotate shaft 22 such further distance as may be required to bring projection 62 into recess 30 and the needle in the desired position. Coincidentally with the entry of projection 62 into recess 30, arm 60 will strike pin 72 of normally closed switch 68, to break the circuit through motor 32 and stop shaft 22 in the desired position.

To make possible the ready adjustment of the device for changing the stopping point of the needle from one extreme position to the other, without need for altering the position of the lock wheel 28 on drive shaft 22, or even for stopping the machine, lock wheel 28 may be formed of appreciable thickness and a second detent recess, 30a formed in its periphery at a point diametrically opposite to recess 30, with the two recesses, 30 and 30a extending only part of the thickness of wheel 28 and being laterally offset relative one another and, preferably, each opening into the most closely adjacent edge of the wheel 28.

It will be clear that if entry of the detent projection 62 into recess 30 will stop the machine with the needle in one of its two extreme positions, entry of the projection 62 into the diametrically opposed recess 30a will stop the needle in its other extreme position.

To enable the detent projection 62 to be selectively positioned for entering either of the two recesses 30 and 30a, rod 52 on which bearing block 58, supporting the locking arm 60 is mounted, may be of a length greater than the thickness of the bearing block 58, so that the block 58 may be laterally shifted thereon, to position the locking arm 60 and its detent projection 62 in register with a selected one of recesses 30 or 30a, for engagement of its projection 62 therein; the solid part of the wheel periphery along the non-selected recess preventing the entry of the projection 62 thereunto.

It may here be stated that the mechanism of the device may be shielded to protect it and protect the operator and the work from it, by an open-bottom cover 94 which may be engaged on the flanges 36 of plate 34, to be held in place over the mechanism.

This completes the description of the sewing machine needle positioning device of the present invention. It will be readily apparent that the device is a relatively simple and economi-

cal construction; that it is compact; that it is effective and fool-proof in its operation and not readily apt to malfunction; that it may be easily installed in position where it is readily accessible for repair and maintenance; and out of the way of the operator's arm and legs; that it may be readily adjusted for stopping the needle in any selected one of the two extreme positions thereof; and that it may operate with a minimum of noise.

It will also be further apparent that numerous modifications and variations in the needle positioning device of the present invention may be made by any one skilled in the art, in accordance with the principles thereof, as set forth above, and without the exercise of any inventive ingenuity.

I claim:

1. A needle positioning mechanism for a sewing machine, said sewing machine including a sewing head having a needle driving shaft and a main motor for continuous rotation of said shaft, said mechanism comprising a pair of pulley wheels mounted on said shaft in spaced relation to one another, each said pulley wheel having an overriding clutch engaging said shaft for rotating the same independently of the other; a second motor; one of said pulleys operatively connected with said main motor and the other of said pulley wheels operatively connected with said second motor; a wheel locking member, means pivotally supporting said locking member adjacent said wheel for movement into and out of contact therewith; means normally maintaining said locking member out of contact with said wheel; means connected in the electric circuit of said second motor moving said locking member into pressured contact with said wheel upon the deactivation of said main motor; cooperating means on said locking member and on said wheel for interlocking one with the other to thereby stop rotation of said needle shaft; the electric circuit of said second motor including a normally open switch and a normally closed switch arranged in series in said circuit, said switches arranged to have said locking arm close the normally open switch as it moves into contact with said wheel to thereby close said second motor circuit, and to open said normally closed switch when it is continuously moved into interlocking relation with said wheel, to thereby break the circuit through said second motor and simultaneously stop rotation of said wheel and the needle shaft on which it is mounted.

2. The mechanism of claim 1, wherein said sewing machine includes a table; said sewing head, said second motor and said locking member are mounted on said table.

3. The mechanism of claim 2, wherein said locking member comprises an arm and means pivotally supporting said arm by one end, and said cooperating interengaging means comprise a recess formed in said wheel and a projection at the other end

of said arm engagable within said recess.

4. The mechanism of claim 1, wherein said locking member comprises an arm pivotally supported by one end and said cooperating interengaging means comprises a detent recess formed in said wheel and a detent projection at the other end of said arm engagable within said recess, and wherein said means normally maintaining said locking member away from said wheel comprises a counterbalancing arm at the pivotally supported end of said locking arm and said means for moving said locking member into contact with said wheel comprises a solenoid and means mounting said solenoid in position of having its armature engage said counterbalancing arm to tilt the same for tilting said locking arm to bring its said other end into contact with said wheel when said solenoid is energized.

5. The mechanism of claim 4, wherein said recess is formed in the periphery of said wheel.

6. The mechanism of claim 3, wherein a pair of detent recesses are formed in the periphery of said locking wheel, each said recess diametrically opposed to and laterally offset relative to the other, and wherein said pivoted end of said locking arm is slidably mounted to have its detent projection register with a selected one of said detent recess.

7. The mechanism of claim 4, wherein said second motor, said locking arm and said solenoid are supported on a common base, said base securable on said table.

8. The mechanism of claim 7, wherein said second motor and said locking arm are mounted in position on said common base whereby said base is securable on said table with said locking wheel disposed between said second motor and said locking arm.

9. The mechanism of claim 7 wherein a bar is supported on said base in elevated relation to said base and above said counterbalancing arm, said bar serving as means limiting the tilting of said locking arm away from said wheel; and wherein a bracket is secured to said bar, said solenoid secured to said bar with the armature thereof vertically disposed and normally projecting downwardly from said solenoid.

10. The mechanism of claim 4, wherein said solenoid is connected in said electric circuit, said circuit including a second normally open switch and means movable by the operator of the sewing machine for closing said second normally open switch as said operator stops said first named motor of said sewing machine.

11. The mechanism of claim 4, wherein said armature of said solenoid is connected to said counterbalancing arm by a contraction spring.

12. The mechanism of claim 3, wherein said recess is formed in the periphery of said wheel and said arm is pivotally supported for movement in the plane of said wheel.

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