Feb. 22, 1966 J. M. MEDYNSKI ETAL 3,236,201

NEEDLE BAR POSITIONING MECHANISM FOR SEWING MACHINES

Filed Jan. 22, 1964 4 Sheets-Sheet 1

FIG. 1

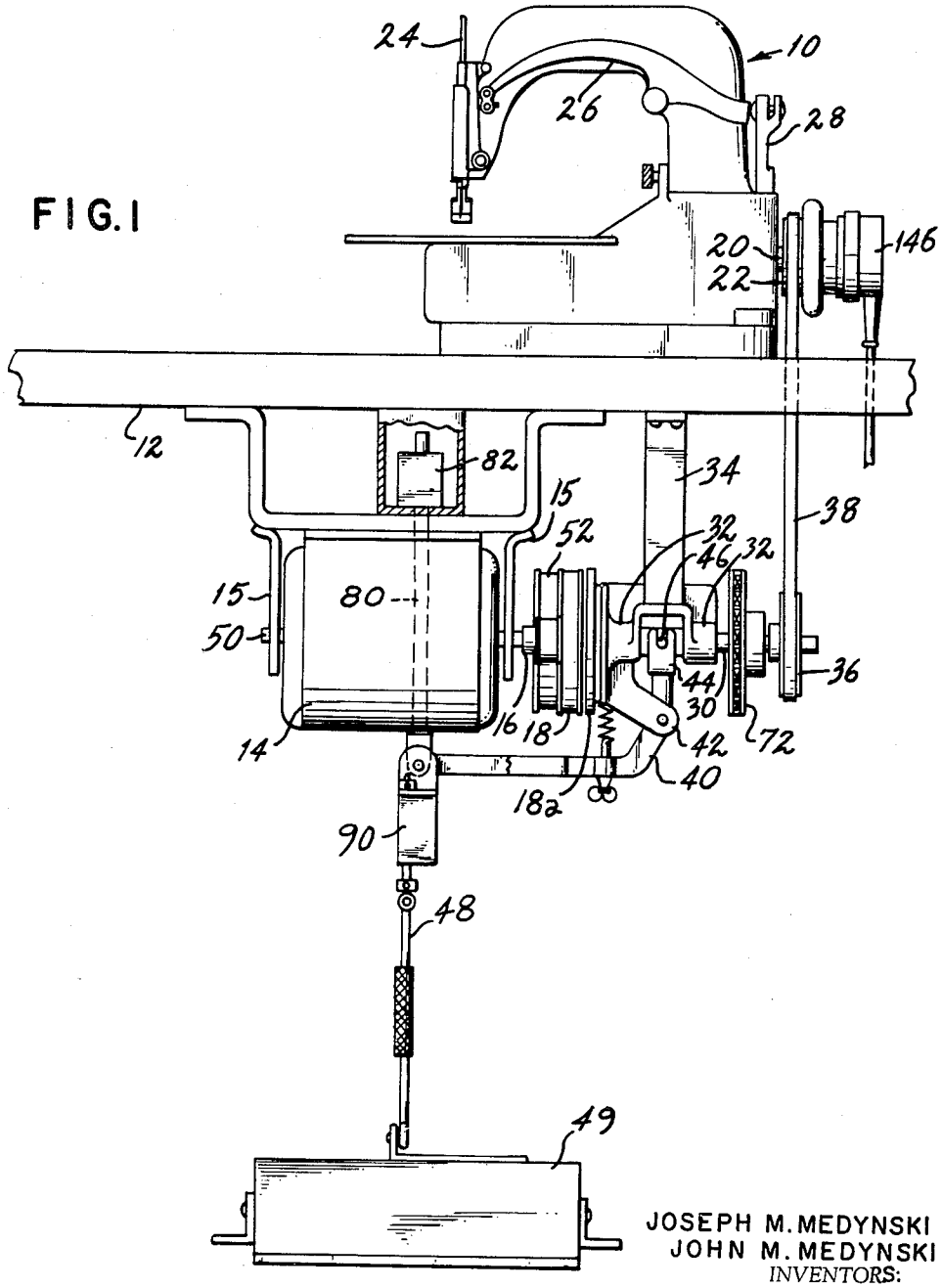

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FIG. 2

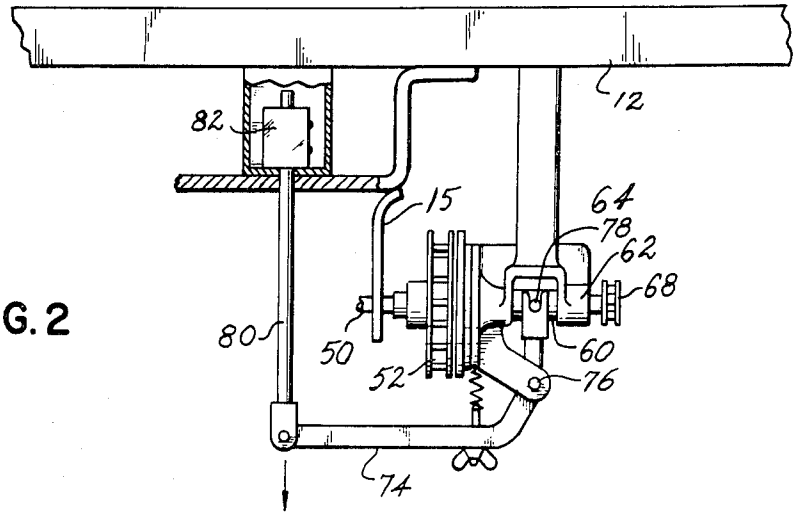
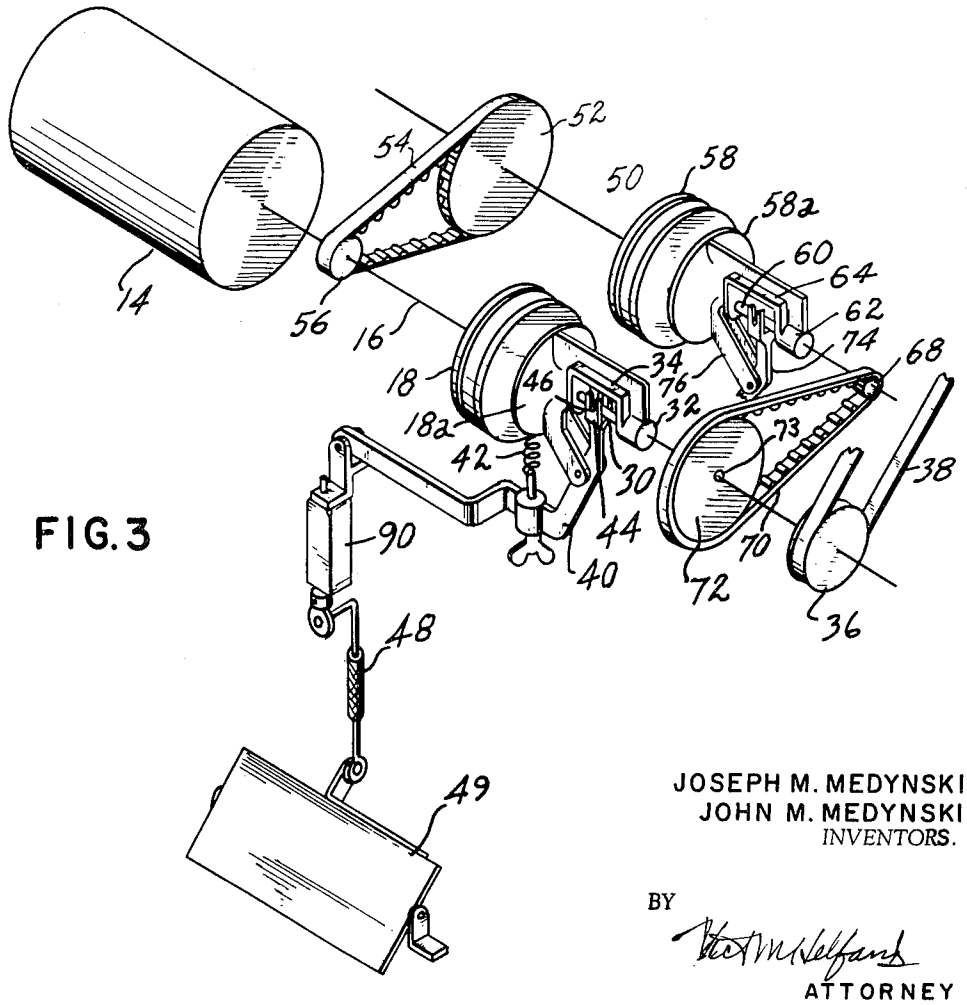


FIG. 3



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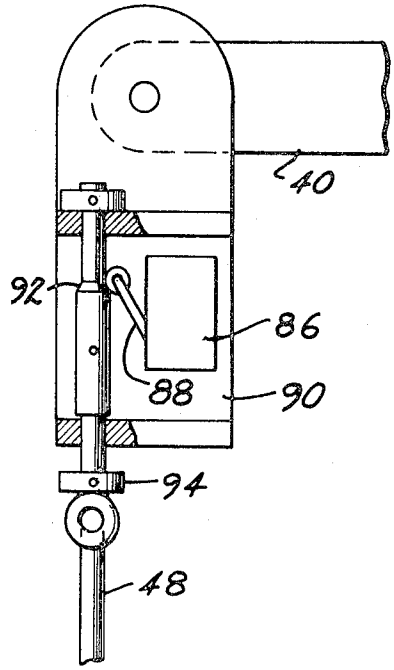

FIG. 4

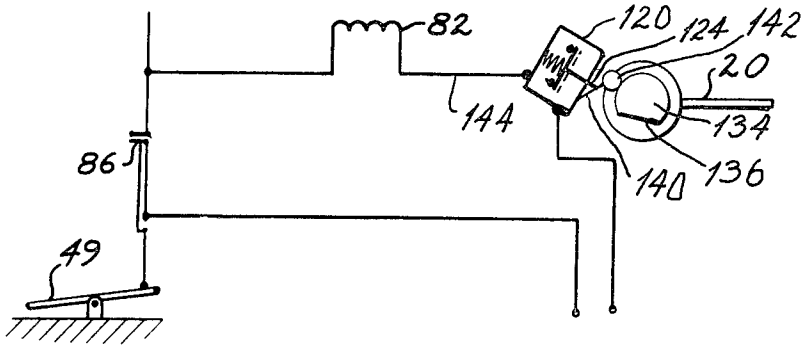

FIG. 8

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NEEDLE BAR POSITIONING MECHANISM FOR SEWING MACHINES

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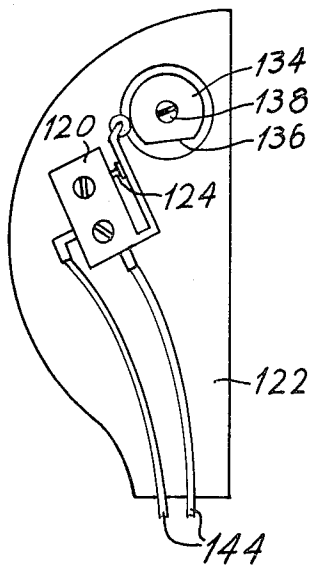

FIG. 5

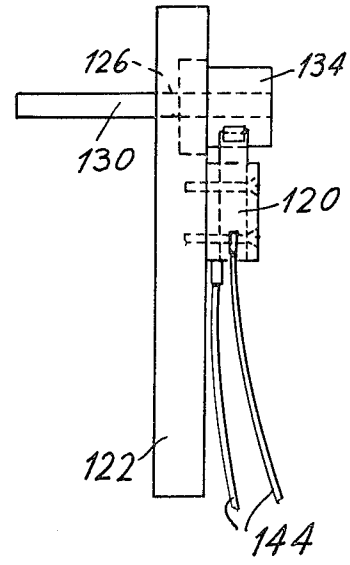

FIG. 6

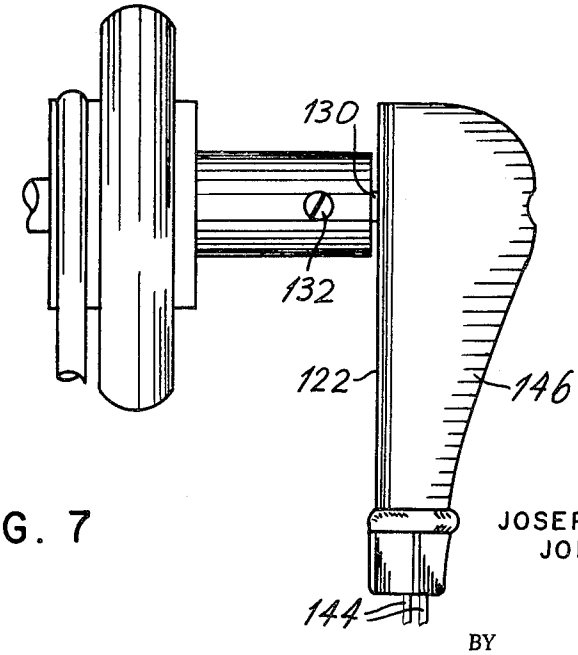

FIG. 7

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3,236,201

NEEDLE BAR POSITIONING MECHANISM FOR SEWING MACHINES

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Filed Jan. 22, 1964, Ser. No. 339,548
9 Claims. (Cl. 112—219)

The present invention relates to an improvement in sewing machines; especially to an improvement in sewing machines intended for industrial use, and more particularly to the provision of an improvment in such sewing machines whereby the needle bar of the machine will always be disposed in the same predetermined position, whenever the operation of the sewing head is stopped. This application is a continuation-in-part of our pending application, Serial No. 284,210, filed May 29, 1963.

In performing the sewing operation, especially in industrial sewing, a great deal of time is wasted by the operator of the machine when he stops the operation of the sewing head in order to remove and replace the work on the machine. To be able to remove the work and to replace it, the work must be free of the needle, and, to that end, the needle bar must be in its retracted or uppermost position. As, in the greater number of instances the needle bar will not end up in the required work-freeing position when the sewing machine head is halted, the operator is required, in most instances, to adjust the machine to raise the needle bar to the desired position by the slow, manual procedure of turning the fly-wheel of the sewing machine head until the needle bar is moved sufficiently to free the needle from the work. This relatively slow, manual adjustment consumes a great deal of the operator's time and adds materially to the labor costs of the article on which he is working. Also, where the operator works on a piece basis, it can cut materially into his earning capacity.

In our said co-pending application we have described and claimed a sewing machine having a mechanism for automatically disposing the needle bar of the machine head in uppermost, work freeing position, each time the operation of the sewing machine head is halted.

The present invention is directed to an improvement of the sewing machine of our said co-pending application, with a view of rendering the same less likely to go out of order and, therefore, more sure and certain in its operation and freer from stoppages and the need for repair and maintenance services.

The present invention is also directed to the provision for the sewing machine of the invention of needle bar stopping mechanism which is of simplified construction, easy, convenient and simple to adjust, and more economical to produce.

The foregoing and other objects and advantages of the sewing machine of the present invention will become more readily apparent to those skilled in the art from the embodiment thereof more or less diagrammatically shown in the accompanying drawing and from the description following. It is to be understood, however, that such embodiment is shown by way of illustration only, to make the principles and practice of the invention more readily comprehensive, and without any intent of limiting the invention to the specific details therein shown.

In the drawings:

FIG. 1 is a front, elevational view of the material portion of a sewing machine embodying the present invention;

FIG. 2 is a fragmentary rear elevational view of the sewing machine of FIG. 1; with the sewing head omitted;

FIG. 3 is an exploded view of the sewing machine head driving and needle bar positioning mechanism of the invention;

FIG. 4 is a fragmentary view, on an enlarged scale, taken on line 4—4 of FIG. 1, showing a pedal-actuated switch in the electrical circuit of the needle bar positioning mechanism;

FIG. 5 is a side elevational view of our new switch mechanism for controlling the position of the needle bar at each halting of the machine head operation;

FIG. 6 is an edge view of the same; and

FIG. 7 is a fragmentary front elevational view showing the same installed on the drive shaft of the sewing machine head.

FIG. 8 is a schematic showing of the switches and associated wiring.

Referring now in great detail to the embodiment of the invention illustrated in the drawing, the same show a sewing machine of one conventional type frequently used in the industry, which includes the sewing machine head, generally designated as **10**, mounted on the work table **12** and having the continuously running electric motor **14** supported from the underside of the table as on brackets **15** and provided with the driving shaft **16** carrying a clutch member or disc **18** at its end.

The sewing head **10** includes the main shaft **20** carrying a driving pulley wheel **22** and the vertically reciprocable needle bar **24** operatively connected to shaft **20** by the lever **26** and the reciprocating arm **28** connected to shaft **20**, in the conventional manner.

Motor shaft **20** is intermittently operatively connectable to the motor **14** by a clutch-drive system which includes the driven shaft **30** which is rotatably and axially slidably journalled, coaxially with shaft **16** in spaced bearings **32** at the end of bracekt **34** dependently secured on the underside of table **12**. Driven shaft **30** carries a pulley wheel **36** at one end which is connected by belt **38** to the sewing head pulley wheel **22**, and carries at its other end a clutch member or disc **18***a*, which may be moved to contact cooperating clutch member **18** on shaft **16** by axial displacement of shaft **30**. Engagement and release of the clutch may be effected by means of a rocker arm **40**, pivotally supported on extension **42** of bracket **34**, whose one forked end **44** engages over a pin **46** set into shaft **30** between bearings **32**, and whose other end is pivotally connected to one end of a rod **48**, whose other end is pivotally secured on the rear or inner edge of a treadle **49**. The rocker arm **40**, rod **48** and treadle **49** are so arranged that depressing of the rod-connected edge of the treadle will displace shaft **30** toward the motor and close the clutch, to operate the machine head **10** and the elevation of the rear end of the treadle will release the clutch to stop operation of the sewing head **10**.

It may be here stated that the foregoing is descriptive of only one conventional form of a clutch-drive sewing machine for which the needle bar positioning mechanism of the invention may be adapted. Such mechanism includes a secondary or over riding clutch-drive system for the relatively slower, limited rotation of the shaft **30** and **20**, and is set into operation upon the release of the clutch of the main drive system to rotate the shaft **20** from whatever position it may have been at on the inactivation of the main drive system, to the position where the needle bar is in predetermined position, as in the uppermost position.

Such secondary or overdrive system includes a secondary shaft **50** journalled in spaced brackets **15** and is rotated, preferably at lower speed, from the motor drive shaft **16**, as by the relatively large pulley wheel **52**, carried on shaft **50**, which is connected by belt **54** to the relatively smaller pulley wheel **56**, carried on shaft **16**. Shaft

50 also carries a clutch member or disc 58 at one end. The overdrive system also includes a driven shaft 60 rotatably and axially slidably journalled, coaxially with shaft 50 in spaced bearings 62 on the end of bracket 64, depending from table 12. The shaft 60 carries on its end facing shaft 50, a cooperating clutch member or disc 58*a*, and at its other end a relatively small pulley wheel 68, which is connected by belt 70 to a relatively larger pulley wheel 72 mounted on shaft 30 for idling when the latter is rotated by the motor shaft 16 and for engaging it for rotation with shaft 60 when the main drive clutch is released as by ratchet means or by overdrive clutch 73 more or less diagrammatically shown in FIG. 3, in a manner well known to persons skilled in the art and thought unnecessary to be specifically illustrated. It may here be stated that instead of the toothed pulley wheels and toothed belts for connecting the shafts of the overdrive with the shafts of the main drive, especially for connecting shaft 60 with shaft 30, ratchet wheels and a ratchet chain may be used.

The overdrive shaft 60 may be axially displaced into and out of clutch engaging position by means similar to that used in the main drive; namely, by a rocker arm, 74, pivoted on extensions, 76, of bracket 64, having a forked end which engages over the pin 78 set into shaft 60 between bearings 62, whose other end may be tilted to slide shaft 60 axially toward and away from shaft 50. To effect such tilting, the other end of rocker arm 74 is connected to a rod 80 which is connected to or continuous with the armature of a solenoid 82. The solenoid 82 is connected in an electric circuit in such manner that when the circuit is closed and the solenoid is activated, rod 80 will be moved to tilt the rocker arm 74 in a direction to displace shaft 60 into clutch engaging position.

The electric circuit of the overdrive system may include a normally open switch which is operated to close the circuit through solenoid 82, either automatically, by the movement of the machine mechanism to disconnect the transmission from the motor 14 to the sewing head shaft 22, as by the movement of the mechanism releasing the clutch of the main drive, as treadle 49; or by a separate substitute or alternate mechanism that may be actuated by the operator at the same time, or immediately before or after operation of the treadle. The circuit through the solenoid 82 also includes a switch associated with the sewing head shaft 22 which is closed at all times, except when the shaft 22 is rotated by the overdrive to the position where it holds the needle bar 24 in the desired, predetermined position, as in the uppermost position; at which point such switch is automatically opened to break the solenoid circuit and thus release the overdrive clutch 58 and stop the operation of the sewing head at the instant that the needle bar is in predetermined position.

The latter switch may comprise a switch normally tensed to be open, such as a micro switch 120 mounted on a plate 122. The switch 120 includes a push pin 124 which is normally spring tensioned, to maintain the switch in open position (FIG. 9). The plate is provided with an opening 126 through which projects a rod 130 which is insertable into a suitable recess formed in the end of the drive shaft 20 and is fixedly held in place within such recess by a set screw 132 so that such rod 130 rotates with the shaft 20. The rod 130 extends to the other, switch-supporting side of the plate 122, where it carries generally a disc-shaped cam, 134, having a flattened surface portion 136 and adjustably secured on the end of the rod 130 by the adjusting screw 138 which is engaged in the end of rod 130.

The housing of the switch 120 has connected thereto, by one end, a resilient arm 140 which overlies the push-pin 124 and is normally resiliently biased away from the push-pin 124, to permit the latter to assume its normal switch-opening position. The arm 140 preferably carries on its free end a roller 142. The switch 120, arm 140 and cam 134 are so mounted and arranged that when roller 142 engages the circular portion of the cam 134 the resilient arm 140 is pressed against the push-pin 124 to push it inwardly to hold it in switch-closing position, and when it engages against the flat portion of the cam surface, spring arm 140 swings outwardly to permit the push-pin 124 to be tensed into switch-opening position.

Switch 120 is connected by conductor wires, 144, into the circuit of the solenoid 82. The switch 120 and cam 134 may be enclosed within a housing, 146, that fits over in edge of the plate 122 and is provided with an opening, 148, through which screw 138 may be engaged to adjust the position of the cam 134.

It will be clear that when the machine is normally operated, shaft 20 rotates at a high rate of speed and cam 134 rotates with it at the same high rate of speed. At such high rate of speed of rotation, the contact of roller 142, at the end of spring arm 140 is of such short duration that arm 140 is not given sufficient time to assume normal position to release the push-pin 124 for outward movement. However, when the operator moves to stop the machine and the rotation of driving shaft 20 is taken over by the overdrive system, to rotate it at a greatly reduced rate of speed, the time interval in which the roller 142 engages against the flat cam surface portion 138 is sufficiently long to permit the spring arm 140 to move away from the housing a sufficient length of time to release the movement of the push-pin 124 into switch-opening position.

It will be clear that if the flat surface portion 136 of the cam 134 is adjusted by adjusting screw 138 to engage on roller 142 when the needle bar is in uppermost position, the machine head will be brought to a complete halt only when the needle bar is in such position.

For treadle actuation, the normally open switch of the solenoid circuit may be a mercury type switch 86 having the tilting arm of control pin 88. The switch 86 is preferably mounted in a frame 90 secured to the end of the rocker arm 49 with the pin 88 tilted by gravity into switch-opening position. The treadle 49 passes through the bottom of frame 90 and is provided, in the portion thereof, disposed within the frame, with a shoulder 92, arranged to engage and tilt pin 88 into switch-closing position when rod 48 is moved upwardly to clutch-releasing position, a collar 94 is mounted on rod 48, immediately below frame 90 arranged to engage the frame to move it upwardly with rod 48 to complete the movement of tilting rocker arm 40 to release clutch 18.

It will be clear that while the main drive or transmission is connected to the motor and the sewing is in operation, the secondary transmission or overdrive will remain idle and stationary, for the reason that its clutch 58–58*a* is open. This is made possible by the fact that pulley wheel 72, which is connected to drive shaft 60 of the overdrive, is free wheeling or idling. When switch 86 is closed as by movement of treadle 49 to release clutch 18–18*a*, overdrive clutch is engaged and its driven shaft 60 is rotated. Since shaft 60 rotates at lesser speed than shaft 30, pulley wheel 72 will still idle. When upward movement of rod 48 is completed, clutch 18–18*a* is released and shaft 30 disconnected from motor 14. It will then be driven by shaft 60 through pulley wheels 68 and 72, the latter no longer idling, to rotate at a relatively low speed. Shaft 30 will, in turn, rotate sewing head shaft 20. If switch 86 is closed at the instant when shaft 20 is holding the neeedle bar 24 in predetermined position, rotary switch 120 will then be open, the circuit through solenoid 82 will remain open, and the overdrive, whose action is not when needed, will remain inactive. However, if, when switch 86 is closed when shaft 20 is at any other position, switch 120 will be in closed position and the circuit through the solenoid will be completed, thus activating solenoid 82 and tilting rocker arm 74 to close clutch 58–58*a*, activating the secondary drive to rotate shaft 20, as described above, to the point where it will move the needle bar 24 to predetermined position,

at which point switch 84 will be automatically opened to break the circuit through the solenoid 82 and de-activate it and release clutch 58–58*a*. It will be understood, of course, that the maximum period of operation of the overdrive will be minimum.

This completes the description of the improved sewing machine and, particularly, of the improved rotary switch of the present invention. It will be readily apparent that such rotary switch provides improved, reliable automatic means for positioning the needle bar of the sewing machine in any predetermined position, each time the sewing machine is stopped. Such switch is an improvement over the rotary switch described in our said copending application for the reason that the latter switch operates by reason of a gap formed in a circular contact member which gap is apt to be filled with oily waste material to render the contact means and the continuously electro-conductive and thereby render the switch inoperative. Such condition is not possible with the switch of the present invention. It will also be apparent that the switch of the present invention is more conveniently and more easily adjustable to effect accurate positioning of the needle bar.

It will also be further apparent that numerous modifications and variations may be made in the sewing machine of the present invention, by anyone skilled in the art, in accordance with the principles of the invention, hereinabove set forth and without the exercise of any inventive ingenuity. We desire, therefore, the protection of the patent laws for any and all such modifications and variations that may be made within the spirit of the invention and the scope of the claims hereto appended.

What we claim is:

1. In a sewing machine, including a sewing head, said sewing head having a rotary drive shaft and a needle bar operatively connected with said drive shaft, an electric motor, a transmission operatively connected to said drive shaft for rotating said drive shaft at a relatively high rate of speed, clutch means for operatively connecting said transmission to said motor, a secondary transmission operatively connected to said drive shaft for rotating the same at a relatively low rate of speed, clutch means connecting said secondary transmission to a motor, electrically operated means connected in an electric circuit operating said clutch of said secondary transmission to connect it to a motor upon disconnecting of said first-named clutch means, said circuit including a switch biased to a normally open position, means mounting said switch adjacent said drive shaft, means on said drive shaft, and rotatable therewith, engaging said switch for maintaining said switch in closed position when said drive shaft is rotated at said relatively high rate of speed, and a cam surface on said means for allowing movement of said switch into open position when said shaft is rotated by said secondary transmission at said relatively low rate of speed.

2. The sewing machine of claim 1, wherein said switch includes a spring-tensioned push pin normally resiliently tensed to maintain said switch in open position, said means engaging said switch engaging said push pin to maintain it in switch-closing position.

3. The sewing machine of claim 2, wherein said switch-engaging means comprises a cylindrical body having a flattened surface, the peripheral surface of said cylindrical body engaging said push pin.

4. The apparatus of claim 3, wherein said switch includes a housing and an arm connected to said housing by one end in position to overlie said push pin, said arm resiliently biased away from said housing, the other end of said arm engaged on the surface of said cam to be thereby pressed against said push pin.

5. The sewing machine of claim 4, wherein said other end of said arm has a roller mounted thereon, said roller contacted by said peripheral surface of said cylindrical body.

6. In an apparatus, including a driven shaft, disengageable means engaging said shaft for rotation at a relatively high rate of speed, means automatically engaging said driven shaft for rotating the same at a relatively low rate of speed upon disengagement of said first-named shaft-rotating means, means connected in an electric circuit for automatically disengaging said second shaft-rotating means, said circuit including a switch normally resiliently tensed to be open, a cylinder mounted on said driven shaft, said cylinder engaging said switch to maintain it in circuit-closing position and a flattened surface portion on said cylinder releasing said switch to open position upon rotation of said shaft at said relatively low rate of speed, said flat surface portion being insufficient in size to release said switch when said shaft is rotated at said relatively high rate of speed.

7. The apparatus of claim 6, wherein said switch includes a spring-tensed push pin, said switch mounted adjacent said cylinder in position to have said cylinder engage said push pin for moving the same to switch-closing position and to have said flat surface portion release said push pin into normal, switch-opening position.

8. The apparatus of claim 6, wherein said switch includes a housing, a push pin extending from said housing, said push-pin tensed to maintain said switch in normally open position, an arm connected by one end to said housing and overlying the projecting end of said pin, said arm resiliently biased away from said housing to permit said push pin to be disposed in switch-opening position, means supporting said housing in position with the other end of said arm pressed against the circular surface of said cylinder to thereby press said arm against said push pin to maintain it is switch-closing position, said cylinder having a flattened surface portion disposing said arm in push pin-releasing position; said flattened surface being of a length insufficient to permit said push pin to move into switch-opening position when said shaft is rotated at said relatively high rate of speed.

9. The apparatus of claim 8, wherein said cylinder is rotatably adjustably supported on said drive shaft.

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