April 27, 1948. W. R. SPILLER ET AL 2,440,618

STITCHING MACHINE

Filed July 20, 1944 2 Sheets-Sheet 1

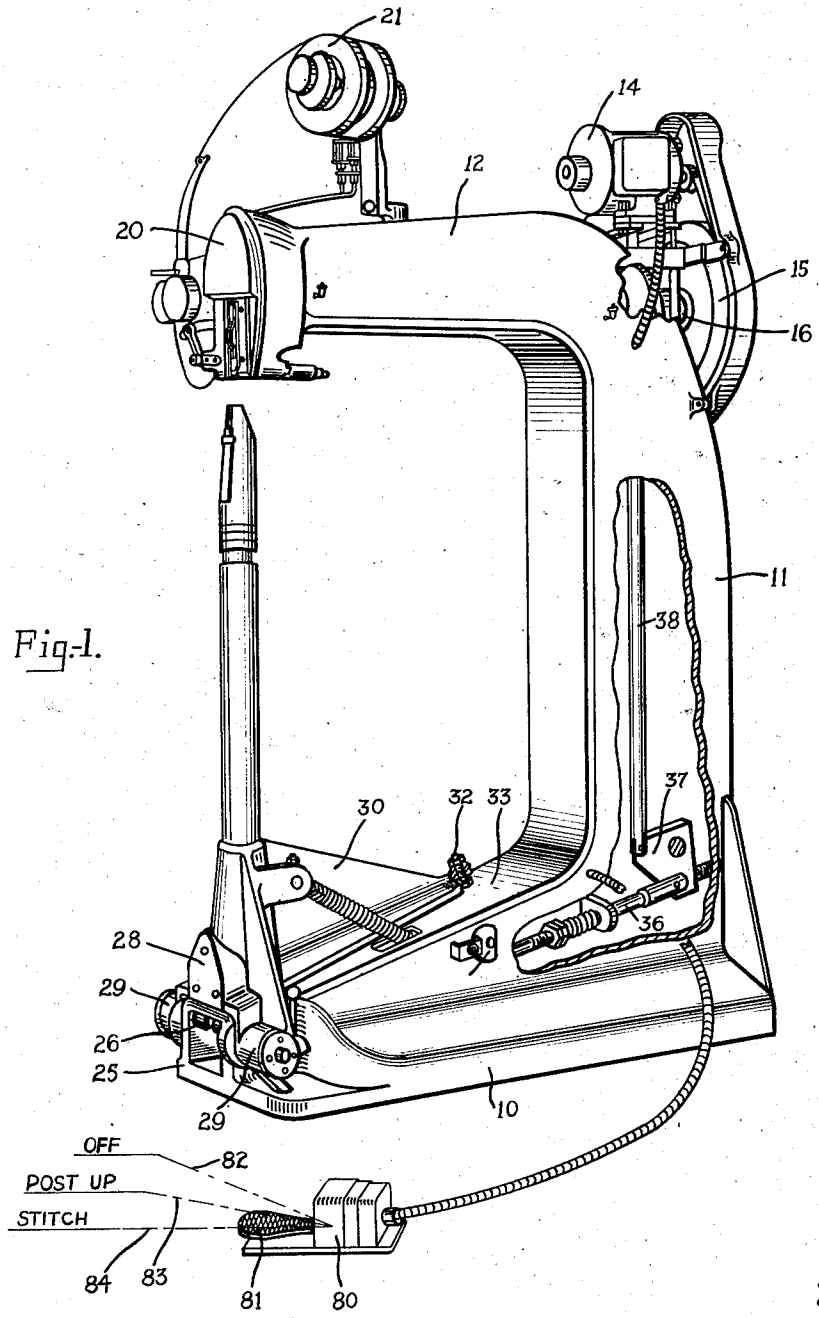


Fig. 1.

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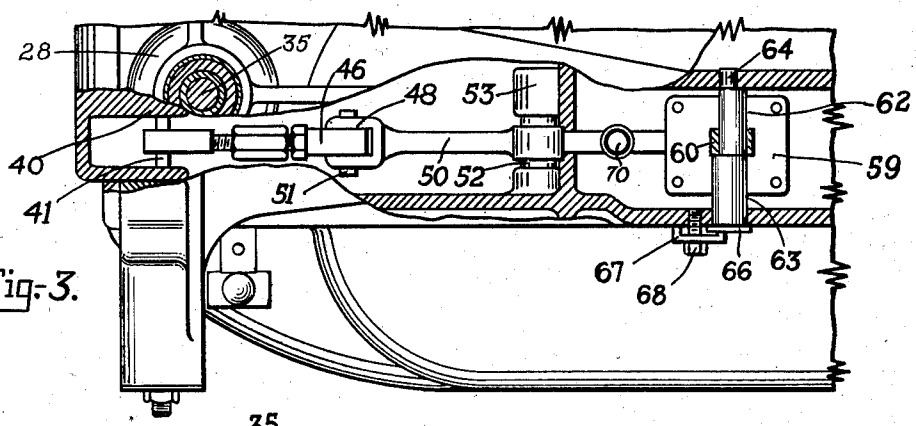


Fig.-3.

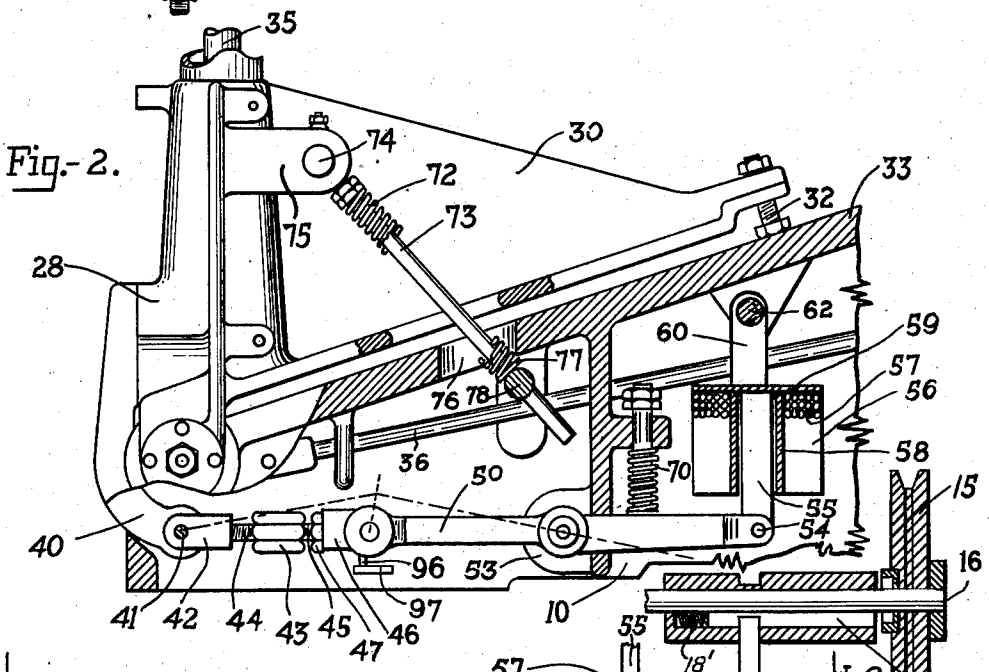


Fig.-4.

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2,440,618

STITCHING MACHINE

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Application July 20, 1944, Serial No. 545,863

9 Claims. (Cl. 1—15)

1

This invention relates to wire stitching machines.

It is the principal object of the invention to provide a wire stitching machine having a movable post which is power actuated to its operative position and in which the stitching operation can be performed under the control of the operator only after the post has been moved fully into such operative position.

It is a further object to provide a mechanism for effecting the movement of the post which is simple and inexpensive in construction, which is positive and accurate in operation, and which securely holds the post in operative position against the forces encountered during the stitching operation.

It is a still further object to provide a control for an automatic post stitching machine which provides for the forming and driving of stitches only after the post has been moved fully into its operative position and in which a number of stitches can be made under the operator's control while the post remains in such operative position.

Other objects and advantages will be apparent from the following description, the accompanying drawing and the appended claims.

In the drawing,

Fig. 1 is a perspective view of a stitching machine constructed in accordance with the present invention with certain parts being broken away to show the construction and with the several positions of the foot treadle marked with legends to indicate the corresponding operations of the machine;

Fig. 2 is a broken side elevational view through the lower part of the machine showing the mechanism for actuating the post to its two positions;

Fig. 3 is a broken plan view showing the same mechanism; and

Fig. 4 is a diagrammatic view of the circuit control mechanism which is utilized for securing the proper operation of the machine.

Referring to the drawing which discloses a preferred embodiment of the invention, the machine is shown as having a main frame including a base portion 10, an upwardly projecting pedestal 11, and an overhanging head 12. The drive motor 14 is mounted in the rear portion of the head and is belt connected to a driven pulley 15 which may be clutch controlled to operate the main drive shaft 16. The clutch control member is shown at 17 and when withdrawn under the action of solenoid 17' allows clutch bolt 18 to be moved forward by spring 18' to clutch

2

engaging position, thereby establishing a driving relation with shaft 16. Shaft 16 extends through the head to the front part thereof where the mechanism for forming and driving the stitch is located, the position thereof being indicated by reference numeral 20. A coil of wire 21 is mounted in a convenient location on the head and the wire feeds into the stitch forming mechanism in the usual way where it is formed into an inverted U-shaped stitch, the two legs of the stitch being driven downwardly into and through the work material received beneath the head.

For certain types of work, particularly where it is desired to apply stitches to the work material which is either partly or wholly fabricated or formed into shape and hence not in flat or sheet form where it can be handled by a stitching machine incorporating a fixed arm, it becomes desirable to utilize a machine incorporating a post, over which the work material can be received. Preferably the post is mounted for adjustable movement so that it can be withdrawn to a forward position clear of the stitcher head for receiving and discharging the work material, and returned to a rearward or operative position where the post together with the work supported thereon are moved into position directly beneath the stitching head. Such movement is conveniently effected by the pivoting of the post so that it swings forward to an inclined position where the work can be telescoped or otherwise conveniently positioned over the upper end thereof, the post being then returned with a swinging movement to its upright position where the work is supported in proper position beneath the head, for receiving the stitch.

To provide for mounting the post for such adjusting movement, the base 10 of the machine is formed at its forward end with an integral bracket portion 25 with a shaft consisting of a relatively heavy rod 26 being passed through the spaced arms of the bracket, the shaft extending beyond the arms of the bracket and providing spaced overhanging end portions at either side thereof.

The base of the post assembly comprises a yoke 28 of relatively heavy construction, preferably of cast metal so that along with the heavy cast base, pedestal and head construction above described, a firm and rigid supporting structure is provided. The yoke 28 is formed with laterally projecting extensions 29 which are internally bored to provide bearings adapted to be received over the ends of shaft 26, to pivotally support the yoke thereon. As will be apparent

from the drawing the two bearings thus provided for the yoke are each spaced a substantial distance laterally of the central vertical axis of the post, thereby providing a firm and rigid support for the post, capable of preventing lateral shifting and giving adequate support to the post in the course of the operation of the machine. The outwardly spaced location of the bearings also makes it possible to adjust the position of the post and to maintain that adjustment with a high degree of accuracy. The yoke 28 is also provided with a rearwardly extending web portion 30, preferably formed integrally therewith. Such extending portion 30 threadedly receives an adjusting bolt 32 formed in a suitable boss thereon, the bolt extending through the boss into position where its head comes in contact with the upper face 33 of the base portion of the machine. The bolt therefore serves as a stop to limit the movement of the post into its operative position. The post may if desired carry an internal clincher plunger 35 which is suitably actuated from pull rod 36 extending through the base, and driven through bell crank lever 37 from rod 38, in response to the tripping of the clutch mechanism 17 in the course of the formation of the stitch. The mechanism as thus described is similar to that shown and described in applicants' copending application Serial No. 483,908, filed April 21, 1943, now Patent No. 2,391,488, granted December 25, 1945.

In order to provide for the power actuation of the post from its forward inoperative position to its upright operative position, mechanism is positioned in the base of the machine for effecting this operation under the control of the operator. This mechanism comprises a toggle mechanism which is so arranged as to operate with an increasing mechanical advantage as the post is brought toward and into its final operative position, to balance the forces which are effective upon the post, and also to assure the movement of the post to its operative position with the maximum speed and yet without producing a bump or a sudden jar which might displace the work material previously located upon the post. The toggle mechanism also provides for the locking of the post in its operative position so that it is firmly and securely held therein during the application of the stitch, and against the reaction forces which may be developed in response to either the forming and driving of the stitch, or the operation of the clincher plunger, or both.

For this purpose, the yoke 28 is formed with a downwardly and inwardly extending part 40 in which there is mounted a cross pin 41 to which there is connected the link 42. This link has a threaded end in which there is received member 43, having its opposite ends 44 and 45 threaded. End 44 is adjustably received in link 42 and end 45 is adjustably received in a socket member 46, lock nut 47 providing for securing the member 43 in a predetermined position of adjustment. The parts thus described form a link of adjustable length, which can be set and thereafter maintained in a definite position to provide the proper toggle action. Member 46 is received within the bifurcated arms 48 of a lever 50, to which it is attached by a pin 51 which travels upwardly when the toggle is broken.

Lever 50 is pivotally mounted on pin 52 supported in bearing members 53 formed in the base of the machine, the opposite end of the lever being connected by pin 54 to an armature plunger 55 which is formed as a part of a solenoid 56.

The solenoid has a winding 57, a central core 58, and a base or supporting plate 59, the latter providing for the supporting of the solenoid in position to permit of the swinging thereof as required to accommodate the lateral displacement of the armature 55 in response to the rocking movement of lever 50.

The base of the solenoid 59 is supported from an arm 60 which is freely rotatably mounted upon an eccentric shaft portion 62 which is formed integrally with the main shaft having parts 63 and 64, both of which parts are concentrically formed with respect to the supporting base in which they are mounted. An adjusting disk 66 is mounted on the outer end of shaft portion 63, being exposed on the base as shown in Fig. 1 so that it is accessible for adjustment by the user, and is removably retained in any predetermined adjusted position by means of a clamping member 67 which may be bolted into clamping position by means of bolt 68.

From the above it will be clear that upon the loosening of the clamp 67, the disk 66 may be rotated as desired, this rotation in turn causing the rotation of the eccentric portion 62 which will provide for raising or lowering of the solenoid with respect to armature 55, the solenoid at all times being free to rock about the shaft portion 62 to accommodate itself to the movement of the armature. However by making the adjustment as above described, the armature 55 can be made to bottom or seat itself accurately within the solenoid at the position where the toggle has been locked, thus assuring the secure and firm holding of the post in its operative position and at the same time obtaining an absence of chatter or noise in the solenoid, and reducing the necessary expenditure of electrical energy in the solenoid coil to a minimum so that it will not objectionably heat up.

The toggle mechanism is preferably adjusted so that in response to the energization of the solenoid, the armature 55 will be attracted to form the toggle and to carry it to a position either exactly on center or slightly over center so that a definite locking action is provided, the post at that time being in the precise operative position desired, as determined by the adjustment of member 43 and the eccentric adjustment 66 being set to bring the armature to its fully seated position under those conditions. With this construction it will be seen that in the locked position there is no possibility of loose play or any freedom of movement of the post, the base, the post bracket and all parts of the actuating mechanism being stressed in compression.

Upon deenergization of the solenoid, the toggle is broken by means of a spring 70, which carries the toggle beyond the locked position, and thereafter the post is returned to its inoperative position under the action of a spring 72 through which extends rod 73, having pivotal connection as shown at 74 to a bracket 75 formed as a part of the yoke 28. The opposite end of the rod 73 passes through an aperture 76 in the upper surface 33 of the base of the machine, and the end of spring 72 is caused to bear against a washer 77 loose on rod 73 and which engages a rotatable pin 78 in the base, so that the force of expansion of spring 72 will cause the post to swing away from its upright operative position and into its forwardly inclined and inoperative position.

It will be clear from the above that as the post is moved upwardly into its operative position,

the force of the spring 72 opposing that movement increases. However the solenoid operates through the toggle mechanism with a progressively increasing mechanical advantage, so that it overbalances the increasing resistance and provides for a quick and yet smoothly controlled upward lifting movement of the post which gradually diminishes without abrupt shock to its final position of rest at which it is fully raised and locked, ready for the stitching operation to be performed.

Control of the operation of the machine is preferably effected from a single control mechanism which may take the form of a pedal operated switch indicated at 80. The pedal 81 has an upper position indicated by dotted line 82 to which it is spring urged, and in which the circuits to both the solenoid and the clutch pin for controlling the stitcher head, are deenergized. When the pedal is moved downward to the dotted line position indicated at 83, the first operation is that of energizing the solenoid 56, to raise the post to its operative position. The pedal may then be pressed to the further lowered position indicated by dotted line 84 in response to which the stitcher head is actuated to cause the formation of a stitch. Further where more than one stitch is desired, the pedal may be moved between the positions 83 and 84, resulting in the formation of one stitch for each downward movement of the pedal, while retaining the post at all times in its operative position and assuring against repeat stitches even though the pedal be held down, the incorporation of such non-repeat feature being optional.

It is highly important to assure that even when the pedal is immediately depressed to its lowermost position indicated at 84, the stitcher head will not operate until the post has been brought into its final operative position, as otherwise it will be possible for the stitcher head to begin functioning to form and drive a stitch before the post had been moved to its operative position, thereby endangering both the work and the operator. In accordance with the present invention means are provided which require that the post be in its full operative position before any actuation of the stitcher head can occur.

This means is represented in the control circuit shown in Fig. 4. In this diagrammatic view the two opposite sides of the line are shown at L—1 and L—2 respectively, the treadle being shown at 81, being opposed by the two springs 90 and 91 which provide an indication to the operator so that he can sense the position of the treadle and properly effect the control for the forming of the stitches. Spring 90 normally holds the treadle in the absence of any pressure in the upper position indicated at 82, in which the normally closed switch 93 is held in open circuit position. This switch is in the circuit of the post solenoid 57 so that when the treadle is free, such solenoid is deenergized.

Upon partial depression of treadle 81, however, to the level indicated at 83 where spring 90 is partially compressed and the treadle is brought into initial contact with spring 91, the spring 94 provides for the closing of switch 93 and the first operation that takes place is the energization of solenoid 57 which provides for the movement of the post to its upper position through the mechanism already described. Upon completion of that movement, an interlocking part 96 which may be actuated in any suitable way either from the armature 55, or from some convenient part of the toggle mechanism, is caused to engage a normally open switch 97. This switch is closed and a circuit is thus prepared for energizing the clutch trip solenoid 17'. The circuit through solenoid 17' is not finally closed however until the treadle is depressed to its lowermost position, i. e. the level indicated at 84, at which time both springs 90 and 91 are depressed. Thereupon contacts 98 are engaged by the treadle and are moved from their upper position to their lower closed position, thereby completing the circuit for the energization of the trip solenoid 17', and the stitch is then formed and driven.

In order to prevent repeat operations in case the foot treadle is left in its lowered position, an interlocking connection is made through the normally closed micro switch 100, that switch being opened in response to the tripping of the clutch, thereby deenergizing solenoid 101, and opening the circuit at contacts 102 so that the trip solenoid 17' cannot be again energized until there has been a subsequent release of the foot treadle from position 84 to position 83. In such position with contacts 98 in their upper position, a circuit is reestablished for relay 101, so that a subsequent depression of the treadle to its lowermost position will provide for a further stitching operation while the post is retained in its raised operative position. The non-repeat mechanism is described in the patent to John F. Haunty, Patent No. 2,324,080, assigned to the same assignee as this application.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. In a stitching machine having a stitcher head, a base, a post adjustably mounted on said base, pivotal means for mounting said post providing for movement thereof from an inoperative position to an operative position beneath said head, a toggle mechanism connecting with said post and operative to cause pivotal movement thereof from its inoperative to its said operative position and to lock said post firmly in its said operative position, and an electric solenoid connected to one arm of said toggle mechanism for effecting said operation thereof.

2. In a stitching machine having a stitcher head, a base, a post adjustably mounted on said base and movable from an inoperative position to an operative position beneath said head, toggle mechanism for moving said post from its inoperative to its operative position and for locking said post in the latter position, a solenoid having an armature for operating said toggle mechanism, and means for adjusting the position of said solenoid to provide for the accurate seating of said armature when said toggle mechanism is in locked position.

3. In a stitching machine having a stitcher head, a base, a post adjustably mounted on said base and movable from an inoperative position to an operative position beneath said head, toggle mechanism for moving said post from its inoperative to its operative position and for locking said post in the latter position, a solenoid for operating said toggle mechanism, and means for supporting said solenoid including an adjustable eccentric member for supporting said solenoid in adjustable position upon said base to provide for

the accurate seating of said armature therein when said toggle mechanism is in locked position.

4. In a stitching machine having a stitcher head, a base, a post adjustably mounted on said base and movable from an inoperative to an operative position beneath said head, resilient means tending to move said post into its inoperative position, power actuated means for moving said post to its operative position against the resistance of said resilient means, and a toggle mechanism connecting said power actuated means with said post for developing an increasing force to move said post to its operative position overcoming the resistance of said resilient means, said toggle mechanism being substantially locked in the full operative position of said post.

5. In a stitching machine having a stitcher head, a base, a post adjustably mounted on said base and movable from an inoperative to an operative position beneath said head, toggle mechanism for moving said post from its inoperative to its operative position and for locking the post in the latter position, resilient means for returning said post to inoperative position, a solenoid for operating said toggle mechanism to move the post to its operative position, and resilient means for engaging said toggle mechanism to break the toggle action upon deenergization of said solenoid to provide for return of said post to its inoperative position under the action of said resilient means.

6. In a stitching machine having a stitcher head, a base, a post adjustably mounted on said base and movable from an inoperative position to an operative position beneath said head, toggle mechanism for moving said post from its inoperative to its operative position and for locking said post in the latter position, a solenoid having an armature for operating said toggle mechanism, adjustable means accessible from the exterior of said machine for adjusting the position of said solenoid to provide for the accurate seating of said armature with respect thereto when said toggle mechanism is in locked position, and means for releasably retaining said adjusting mechanism in a predetermined position of adjustment.

7. In a stitching machine having a base and a stitcher head supported thereon, the combination of a post adjustably mounted on said base and movable from an inoperative to an operative position beneath said head, power actuated means for moving said post from its inoperative to its operative position, means under the control of the operator for causing the operation of said stitcher head, means normally preventing the operation of said stitcher head until said post is in said full operative position, and interlocking means constructed and arranged to operate when said post moves into its full operative position for disabling said preventing means to provide for operation of said stitcher head under the control of the operator.

8. In a stitching machine having a base and a stitcher head supported thereon, the combination of a post adjustably mounted on said base and movable from an inoperative position to an operative position beneath said head, power actuated means for moving said post from its inoperative to its operative position, operator actuated means for controlling said power actuated means to move said post to its operative position and for controlling the operation of said stitcher head, means normally arranged for preventing said operation of the stitcher head except when said post is in its full operative position, and interlocking means constructed and arranged to operate only when said post moves into its full operative position for disabling said preventing means to provide for operation of said stitcher head under the control of the operator.

9. In a stitching machine having a stitcher head, a base, a post adjustably mounted on said base and movable from an inoperative position to an operative position beneath said head, a solenoid for effecting movement of said post from its inoperative to its operative position when energized, electric control means for causing the operation of said stitcher head when energized, manual control means for energizing both said solenoid and said electric control means, a normally open switch in circuit between said electric control means and said manual control means preventing the energization of said electric control means except when said post has been moved fully to its operative position, and interlocking means arranged to operate only upon completion of movement of said post to its operative position to connect said switch in closed circuit with said electric control means.

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