

[54] **NEEDLE BAR RELEASE DEVICE**

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[51] Int. Cl. **D05b 55/16**

[58] Field of Search..... 112/221, 220, 218 R, 158 R

[56] **References Cited**

UNITED STATES PATENTS

3,782,311	1/1974	Adams et al.	112/158 R
3,815,529	6/1974	Adams et al.	112/221 X

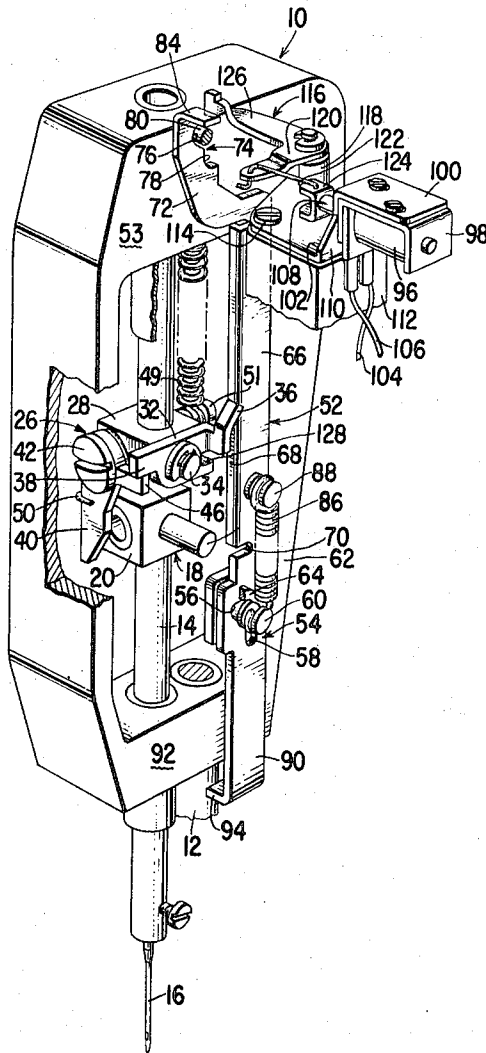
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[57]

ABSTRACT

A needle bar release device having a latch release member that is manually movable, or automatically movable by a solenoid, into engagement with a coupling member to unlatch the coupling member from a needle bar drive member. The latch release member is pivoted by the solenoid during automatic operation and slidably displaced on a frame during manual operation. The device also includes biasing springs for reversing the manually imposed slidable movement and automatically imposed pivotal movement of the latch release member.

11 Claims, 4 Drawing Figures



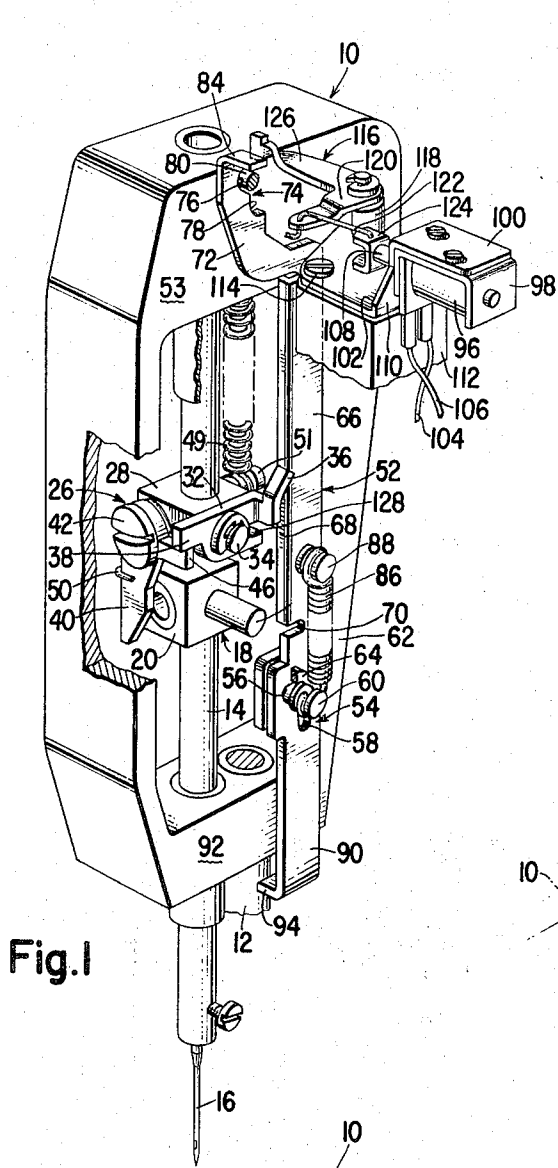


Fig. 1

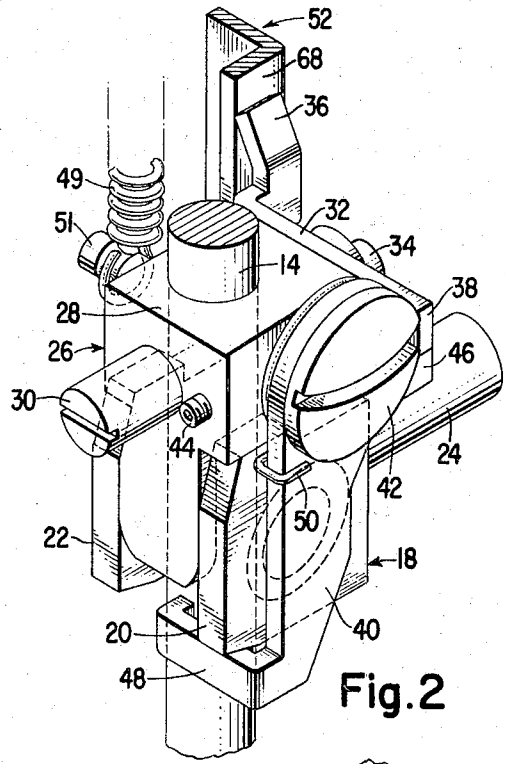


Fig. 2

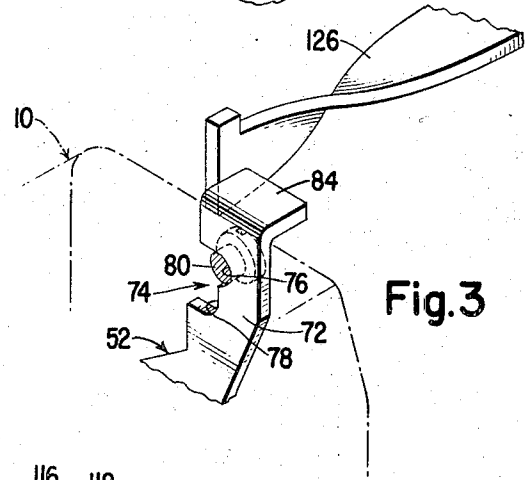


Fig. 3

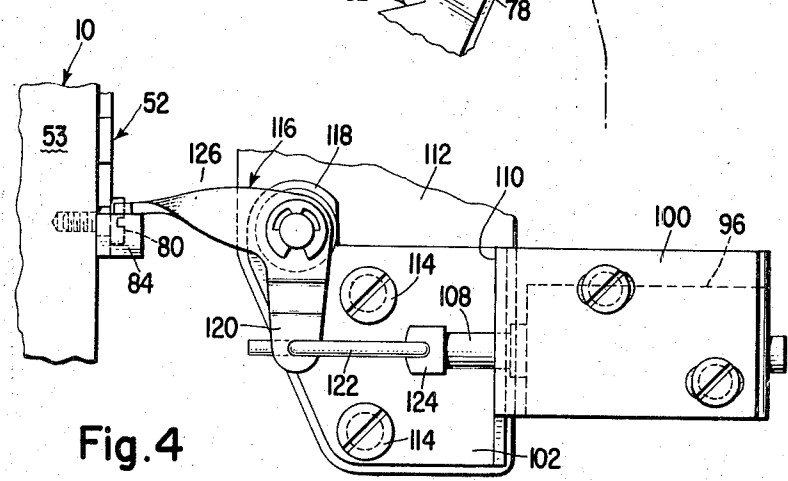


Fig. 4

NEEDLE BAR RELEASE DEVICE

BACKGROUND OF THE INVENTION

This invention relates to devices for interrupting the regular formation of stitches in a sewing machine and more particularly to a solenoid actuated needle bar release mechanism in a skip stitch device.

The usual skip stitch device in a sewing machine is normally dormant during regular sewing and is generally activated only when a basting operation is required. One known way of obtaining a skip stitch function in a sewing machine is to release a coupling between the needle bar and the needle bar drive means at prescribed intervals corresponding to a desired extended spacing between basting stitches. The needle bar coupling can be released automatically, for example, by a cam controlled mechanism as disclosed in U.S. Pat. No. 3,782,311 issued Jan. 1, 1974, or manually, for example, by shifting a slide bar as disclosed in U.S. Pat. No. 3,815,529 issued June 11, 1974.

It has been found desirable to include both a manual and automatic needle bar release device in one sewing machine such as disclosed in U.S. Pat. No. 3,815,529. However, the inclusion of separate manual and automatic needle bar release devices in one sewing machine requires an intricate arrangement of parts because each device employs a separate member for releasing the coupling between the needle bar and the needle bar drive means.

It is thus desirable to provide a needle bar release device which can be manually or automatically operated in a convenient manner by a single latch release member to disengage the coupling between the needle bar and the needle bar drive means.

Among the several objects of the present invention may be noted the provision of a novel needle bar release mechanism for a skip stitch device; a novel needle bar release mechanism wherein a single latch release member can be actuated manually or automatically as desired; a novel needle bar release device actuatable by a solenoid; and a novel needle bar release device having a latch release member that is manually slidable or automatically pivotable with respect to a sewing machine head frame. Other objects and features will be in part apparent and in part pointed out hereinafter.

SUMMARY OF THE INVENTION

The present invention relates to a novel needle bar release mechanism for a sewing machine skip stitch device. The release mechanism, in the preferred embodiment, includes a latch release member pivotally mounted to, and slidable on a frame that accommodates reciprocatory movement of an endwise reciprocable needle bar. One end of the latch release member is engageable with a solenoid actuated lever that pivots the latch release member against a spring biased latching arrangement on a needle bar coupling member to detach the coupling member from a needle bar drive member. The latch release member also includes cam slots that guide slidable movement of the latch release member against the coupling member when the latch release member is manually pushed in opposition to a second biasing spring. A retraction spring connected between the coupling member and the frame spaces the coupling member from the needle bar drive member when the two members are manually or automatically disconnected by the latch release member.

The invention accordingly comprises the constructions hereinafter described, the scope of the invention being indicated in the following claims.

DESCRIPTION OF THE DRAWING

In the accompanying drawing:

FIG. 1 is a perspective view of a needle bar release device incorporating the present invention;

FIG. 2 is an enlarged perspective view of the needle bar coupling mechanism;

FIG. 3 is an enlarged fragmentary perspective view of the latch release member and the solenoid actuated lever; and

FIG. 4 is a top view of the needle bar release device.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawing.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to the drawing for a detailed description of the present invention, the head frame portion of a straight stitch sewing machine is generally indicated by reference number 10. A shiftable presser bar 12 and a needle bar 14 for carrying a needle 16 are mounted in the frame 10 in the usual manner as disclosed in detail in the U.S. Pat. No. 2,822,771 of Feb. 11, 1958. A needle bar drive member 18 for providing endwise reciprocation of the needle bar 14 in the frame 10, as disclosed in detail in the U.S. Pat. No. 3,815,529, issued June 11, 1974, is slidably mounted on the needle bar 14 for reciprocation by any suitable drive means (not shown) such as disclosed in detail in U.S. Pat. No. 2,822,771. The needle bar drive member 18 includes a pair of spaced flanges 20 and 22, and a drive pin 24 engageable by the previously referenced drive means (not shown).

A coupling member 26 such as disclosed in U.S. Pat. No. 3,815,529 comprises a block portion 28 fixed to the needle bar 14 by a screw 30. The coupling member 26 includes latching means for releasably connecting the coupling member 26 to the needle bar drive member 18. The latching means comprise a first latch member 32 pivotally mounted on a post 34 affixed to the block portion 28. A trigger extension 36 at one end of the first latch member 32 is bent away and upwardly from the block portion 28 and an arm 38 is formed at the opposite end of the first latch member 32 extending beyond the block portion 28. The latching means further comprise a second latch member 40 pivotally mounted on a shoulder screw 42 that is locked to the block portion 28 by a lock screw 44. A stub 46 formed on the second latch member 40 extends toward the arm 38 of the first latch member 32. A latch extension 48 (FIG. 2) formed on the second latch member 40 is bent toward the needle bar 14, and biased into engagement with the flange 20 of the needle bar drive member 18 by a biasing spring 50 on the shoulder screw 42. The biasing spring 50 effects movement of the stub 46 into engagement with the arm 38 of the first latch member 32. A retraction spring 49 is connected at one end to the block 28 by means of a post 51 on the block 28 or any other suitable connecting point on the block 28. The opposite end of the spring 49 is connected to an upper cross member 53 of the frame 10.

An elongated latch release member 52 having a cam slot 54 with upper and lower cam portions 56 and 58 respectively is supported at the slot 54 on a post 60 in

a leg 62 of the frame 10. A retaining washer 64 shown fragmentarily in FIG. 1 is disposed on the post 60 adjacent the latch release member 52. The latch release member 52 includes a main body portion 66 having a narrow flange section 68 terminating at a notch 70 in the main body portion 66.

An upper scoop shaped free end portion 72 of the latch release member 52 is formed with a cam recess 74 having upper and lower cam portions 76 and 78 with contours identical to the upper and lower cam portions 56 and 58 of the cam slot 54. A guide member comprising a shoulder screw 80 is disposed on the upper cross member 53 of the frame 10 for engagement with the cam recess 74. The upper free end portion 72 of the latch release member 52 also includes a bent portion 84 projecting away from the upper cross member 53.

A return spring 86 has an upper end connected to the main body portion 66 of the latch release member 52 at a post 88 and an opposite lower end connected to the frame leg 62 at the post 60. Under this arrangement the return spring 86 urges the upper cam portions 56 and 76 of the cam slot 54 and the cam recess 74 into engagement with the post 60 and the shoulder screw 80.

The latch release member 52 also includes a tail portion 90 depending from the main body portion 66 below a lower cross member 92 of the frame 10. A lower end flange 94 of the tail portion 90 is bent under the lower cross member 92.

Control means for automatically actuating movement of the latch release member 52 include a solenoid 96 mounted in a solenoid frame 98 that is suspended from a cantilevered arm 100 of a support plate 102. The solenoid includes electrical leads 104 and 106 connected to any suitable known switching device (not shown), and an armature 108 extending through an opening (not shown) in a flange 110 of the support plate 102. The support plate 102 is anchored to a base 112 by screws 114, the base 112 being formed as an adjunct to or as part of the frame 10.

A link member 116 is pivotally supported on a post 118 affixed to the support plate 102. The link member 116 includes an arm 120 connected by a rod 122 to a collar 124 on a free end of the solenoid armature 108. The link member 116 also includes an arm 126 extending toward the upper cross member 53 for engagement with the upper bent portion 84 of the latch release member 52.

When the needle bar release mechanism is not in operation the trigger extension 36 under the influence of the biasing spring 50 bears against the flange 68 to urge the free end portion 72 of the latch release member 52 against the shoulder screw 80. For automatic operation of the needle bar release mechanism the solenoid 96 is energized by any suitable known instrumentality to cause the armature 108 to retract and pivot the link arm 126 against the upper bent portion 84 of the latch release member 52. The latch release member 52 responsively pivots in a counterclockwise direction (FIG. 1) about the post 60 in opposition to the force of the biasing spring 50 to permit the narrow flange 68 to engage the trigger extension 36 of the first latch member 32 thus causing the first latch member 32 to pivot in a counterclockwise direction (FIG. 1) about the post 34.

The arm 38 of the first latch member 32 pivots against the stub 46 of the second latch member 40 in opposition to the force of the spring 50 causing clockwise movement of the second latch member 40 (FIG.

1). The latch extension 48 (FIG. 2) of the second latch member 40 thus pivots away from the flange 20 of the needle bar drive member 18 to disconnect the coupling member 26 from the needle bar drive member 18. With the coupling member 26 thus free of the needle bar drive member 18 the retraction spring 49 elevates the coupling member 26 and the needle bar extension 14 with respect to the upper and lower cross members 53 and 92 of the frame 10. The needle bar drive member 18 then reciprocates on the needle bar 14 without influencing reciprocation of the needle bar 14.

Each time the needle bar drive member 18 completes an upper stroke on the needle bar 14 the flange 20 is positioned for relatching by the latch extension 48 under the influence of the biasing spring 50. However such relatching cannot occur while the solenoid is energized because the interaction between the solenoid lever arm 126, the latch release member 52, the first latch member 32 and the second latch member 40 maintains the latch extension 48 away from the needle bar 14 to prevent engagement between the latch extension 48 and the flange 20.

Deenergization of the solenoid 96 permits the biasing spring 50 to urge the second latch member 40 to pivot in a counterclockwise direction about the shoulder screw 42 and allow the latch extension 48 of the second latch member 40 to move toward the needle bar 14 for coupling engagement with the flange 20 of the needle bar drive member 18. Such reengagement permits further reciprocation of the needle bar 14 by the needle bar drive member 18. The biasing spring 50 also influences movement of the stub 46 of the second latch member 40 against the arm 38 of the first latch member 32 to cause the trigger extension 36 to bear against the flange 68 of the latch release member 52 enabling the free end portion 72 to again contact the shoulder screw 80. A lower lip 128 (FIG. 1) on the first latch member 32 below the trigger extension 36 is bent around the block portion 28 toward the post 51. The lower lip 128 can thus engage the block 28 to limit clockwise pivoting of the first latch member 32 under the influence of the biasing spring 50.

It should be noted that as the biasing spring 50 and the return spring 86 maintain the latch release member 52 in a position wherein the upper cam portions 56 and 76 normally engage the post 60 and the shoulder screw 80 the latch release member 52 undergoes pivotal movement about the post 60 during energization and deenergization of the solenoid 96. It should also be noted that the notch 70 is formed at a predetermined position on the main body 66 of the latch release member 52 below the reciprocatory stroke of the trigger extension 36 to avoid entrapment of the trigger 36 in the notch 70.

To manually operate the needle bar release mechanism the lower end flange 94 of the latch release member 52 is pushed upwardly in opposition to the return spring 86 to enable the cam slot 54 and the cam recess 74 on the latch release member 52 to slide with respect to the frame 10 until the lower cam portions 58 and 78 of the cam slot 54 and the cam recess 74 engage the post 60 and the shoulder screw 80. As the latch release member 52 is moved upwardly with respect to the post 60 and the shoulder screw 80 against the force of the spring 86 it also moves laterally toward the needle bar 14 against the force of the spring 50 to enable the narrow flange 68 to engage the trigger extension 36.

Movement of the trigger extension 36 by the latch release member 52 uncouples the needle bar drive member 18 from the coupling member 26 in a manner previously described.

When pressure is removed from the lower end of the flange 94 of the latch release member 52, the return spring 86 urges the member 52 downwardly to its initial position wherein the upper cam portions 56 and 76 of the cam slot 54 and the cam recess 74 engage the post 60 and the shoulder screw 80, enabling the coupling member 26 and the needle bar drive member 18 to re-connect for further reciprocation of the needle bar 14 by the drive member 18 in a manner previously described.

It will be apparent to those skilled in the art that the needle bar release mechanism disclosed herein can be adapted to zig-zag sewing machines such as the type disclosed in U.S. Pat. No. 3,815,529. It will be further apparent that the biasing spring 50 furnishes one force component on the latch release member 52 which pivots the member 52 back against the pin 80 after the solenoid 96 has been deenergized. The return spring 86 furnishes a second force component on the latch release member 52 which lowers the member 52 after manual pressure on the lower end flange 94 has been removed. Thus the separate force components of the springs 50 and 86 on the latch release member 52 operate substantially at right angles to each other. Therefore the solenoid 96 which moves the latch release member 52 at substantially right angles to the force of the spring 86 essentially opposes the force of the biasing spring 50 and need not overcome the total force of the spring 86 in urging the latch release member 52 pivot against the trigger extension 36.

Some advantages of the novel device disclosed herein include a novel needle bar release mechanism that can be used for automatic or manual release of a needle bar coupling. The mechanism can be automatically actuated by a relatively low powered solenoid to overcome the resistance of the biasing spring 50 and less than the total resistance of the return spring 86.

In view of the above it will be seen that the several objects of the invention are achieved and other advantageous results obtained.

As various changes can be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawing, shall be interpreted as illustrative and not in a limiting sense.

Having thus set forth the nature of the invention, what is claimed herein is:

1. A needle bar release device for a sewing machine comprising, an endwise reciprocable needle bar, frame means for accommodating reciprocatory movement of said needle bar, a reciprocating drive member slidably mounted on said needle bar, a coupling member fixed to said needle bar for continuous movement with said needle bar, said coupling member including latching means for releasably connecting said coupling member to said drive member to transmit reciprocatory movement of said drive member to said needle bar, said latching means including a latch extension movable in a first direction toward said drive member to permit said coupling member to connect to said drive member, said latch extension being movable in a second direction away from said drive member to permit said cou-

pling member to disconnect from said drive member, said latching means further including first biasing means for urging said latch extension to move in said first direction, latch release means mounted on said frame means for pivotal movement against said latching means to move said latch extension in said second direction, said first biasing means continuously urging said latch release means to pivot away from said latching means, and a solenoid member mounted on said frame means, said solenoid member having actuating means for causing pivotal movement of said latch release means against said latching means to cause movement of said latch extension in said second direction to disconnect said coupling member from said drive member whereby said drive member slides on said needle bar without influencing reciprocatory movement of said needle bar.

2. A needle bar release device as claimed in claim 1 wherein said latch release means includes a pivot member on said frame and an elongated latch release member mounted to said pivot member for pivotable movement toward and away from said latch release means.

3. A needle bar release device as claimed in claim 2 further comprising second biasing means connected to said elongated latch release member and wherein said elongated latch release member is formed with a slot engageable with said pivot member to permit slidable movement of said latch release member with respect to said pivot member, said spring being connected to said latch release member to continuously urge said latch release member to position one end of said slot against said pivot member.

4. A needle bar release device as claimed in claim 3 wherein said elongated latch release member further includes cam means comprising a first cam surface formed in said slot for cooperation with said pivot member to guide said latch release member against said coupling member when said latch release member is slidably moved with respect to said pivot member in opposition to the force of said second biasing means.

5. A needle bar release device as claimed in claim 4 further including a guide member on said frame spaced from said pivot member, said elongated latch release member being engageable with said guide member under the influence of said first biasing means.

6. A needle bar release device as claimed in claim 5 wherein said elongated latch release member is slidable with respect to said guide member, said cam means further including a second cam surface on said elongated latch release member engageable with said guide member.

7. A needle bar release device as claimed in claim 6 wherein said elongated latch release member includes a tail portion extending from said frame in the direction of said needle for manual access to permit exertion of manual pressure on said tail portion to slide said latch release member on said frame against the force of said second biasing means to move the first and second cam surfaces with respect to the pivot member and the guide member, the interaction between the first and second cam surfaces and the pivot and guide members guiding said latch release member against said coupling member.

8. A needle bar release device as claimed in claim 1 wherein said solenoid actuating means include a plunger member and a lever movable by said plunger member against said latch release means when said so-

lenoid is energized such that said latch release means moves against said latching means to cause movement of said latch extension away from said drive member to disconnect said coupling member from said drive member, de-energization of said solenoid permitting said latch release means to move away from said latching means under the influence of said first biasing means.

9. A needle bar release device as claimed in claim 1 further including a resilient member having one end connected to said frame means and an opposite end connected to said coupling member for retracting said needle bar and coupling member in said frame means when said coupling member is disconnected from said drive means.

10. A needle bar release device as claimed in claim 9 wherein said coupling member includes a block portion, said latch arm being pivotally mounted to said block portion, and said opposite end of said resilient member being connected to said block portion.

11. A needle bar release device for a sewing machine

comprising, an endwise reciprocable needle bar, frame means for accommodating reciprocatory movement of said needle bar, needle bar drive means for reciprocating said needle bar in said frame, coupling means for forming a detachable connection between said needle bar and said needle bar drive means, a coupling release member pivotally mounted on said frame for engagement with said coupling means to effect an uncoupling of said coupling means from said needle bar drive means such that said drive means does not influence reciprocatory movement of said needle bar, said coupling release member being normally disposed in a first position wherein said coupling means remains coupled to said needle bar drive means and being pivotally movable from said first position to a second position for effecting uncoupling of said coupling means from said needle bar drive means, and electrical actuating means for pivotally moving said coupling release member from its first position to its second position.

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