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Weisz et al.

[11] **3,815,532**

[45] **June 11, 1974**

[54] **NEEDLE BAR RELEASE AND RAISING MECHANISMS**

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[73] Assignee: **The Singer Company**, New York, N.Y.

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[21] Appl. No.: **347,984**

[52] **U.S. Cl.** ..... **112/221**, 112/158 R, 112/237

[51] **Int. Cl.** **D05b 55/16**, D05b 3/02

[58] **Field of Search** ..... 112/78, 79, 79.5, 158 R, 112/167, 221, 237, 240

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Attorney, Agent, or Firm—Marshall J. Breen; Chester A. Williams, Jr.; Edward P. Schmidt

[57] **ABSTRACT**

A mechanism for use in a sewing machine having a latch mechanism affixed to a needle bar and connecting the needle bar to an endwise reciprocating driving mechanism. The mechanism is supported by a guide block of a presser mechanism and is effective, when the presser mechanism is super-elevated, to disconnect the needle bar from its endwise reciprocating driving mechanism. In the preferred embodiment, a supporting member affixed to the presser bar guide block pivotably supports a bell crank, one arm of which contains a series of teeth. As the presser bar is being super-elevated a spring bias is applied to the bell crank causing the bell crank to be rotated, placing the teeth in contact with an arm of a latch lever of the latch mechanism affixed to the needle bar. Continued elevation disconnects the needle bar from its driving mechanism and also raises the needle bar a slight amount. Concurrently the presser foot is brought to a super-elevated position.

7 Claims, 10 Drawing Figures

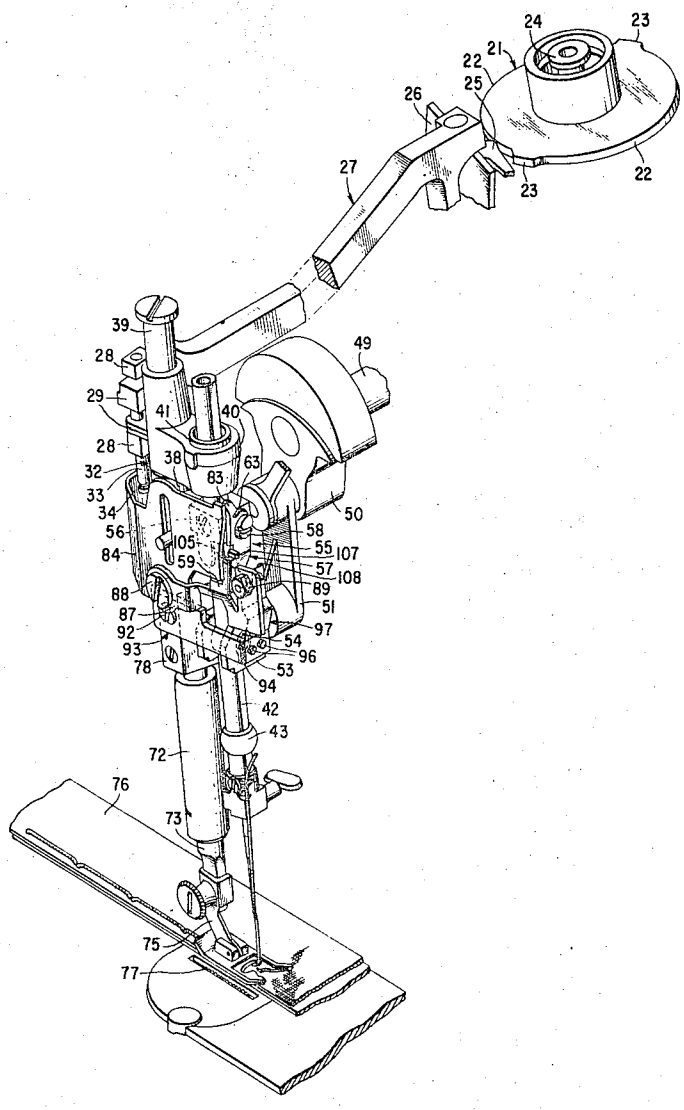


Fig. 2

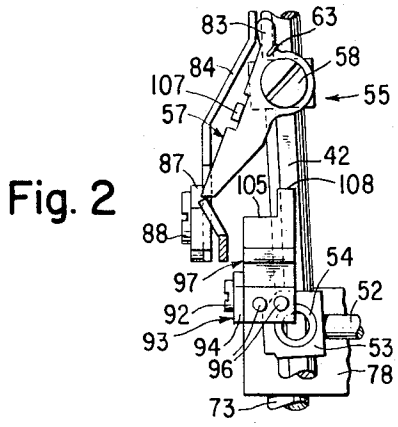


Fig. 1

Fig. 3

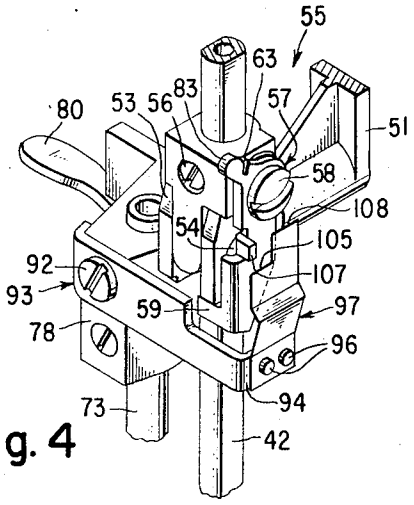


Fig. 4

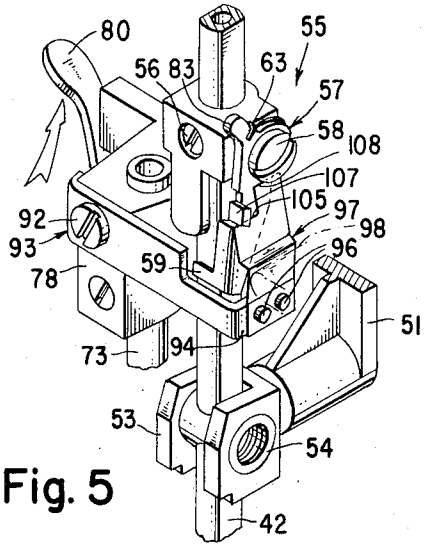


Fig. 5

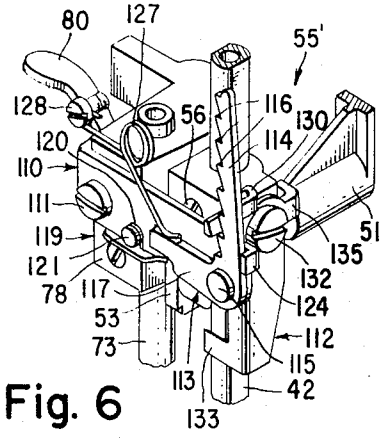


Fig. 6

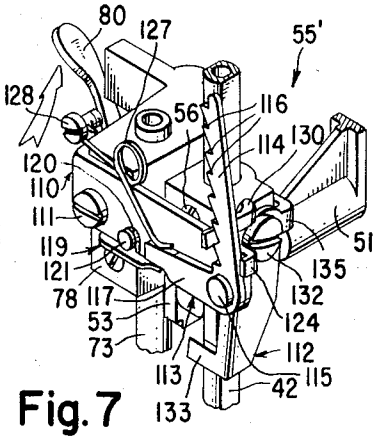


Fig. 7

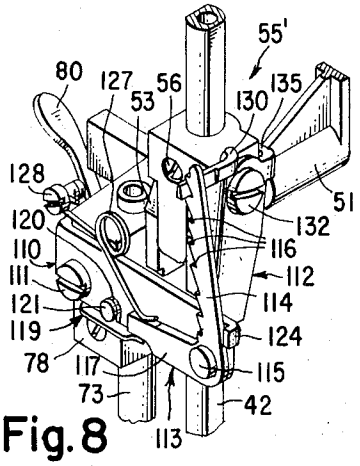


Fig. 8

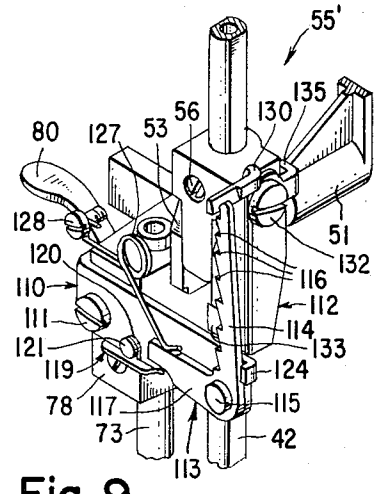


Fig. 9

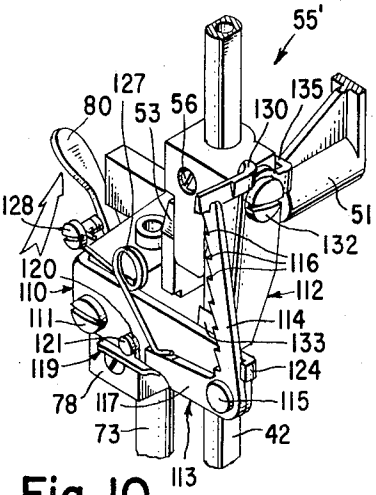


Fig. 10

NEEDLE BAR RELEASE AND RAISING MECHANISMS

BACKGROUND OF THE INVENTION

The invention pertains to a device in a sewing machine which will super-elevate a needle above a super-elevated presser foot in order to permit the ready insertion of modern bulky fabrics such as the compressible knits and compressible laminated knits.

There are devices in the sewing machine art wherein the needle bar and needle may be elevated out of the work material when the presser foot is lifted from the work material. Such a device is disclosed in the U.S. Pat. No. 709,354, Sept. 16, 1902, to O'Donnell which discloses a sewing machine having a clutch between an oscillating horizontal arm shaft and a crank for reciprocating a needle bar. Raising of a presser device also declutches the oscillating shaft from the crank and, on further elevation, rotates the crank to elevate the needle bar to an extra high position. This device is characterized by its complexity and the expense of its component parts.

Other devices have been proposed which also accomplish the above mentioned desired result but, again, in complicated and expensive fashion, for example, by the use of extensive, space consuming linkage. What is required is a simple and inexpensive device compatible with a modern sewing machine which will allow the sewing needle to be elevated an extra amount corresponding to the extra elevation given to a presser foot in order to insert compressible knit fabrics or the like.

SUMMARY OF THE INVENTION

The invention is a mechanism which operates on a basting stitch device as originally set out in the U.S. Pat. No. 3,559,601, Feb. 2, 1971 to E. J. Tullman, wherein a zig-zag sewing machine having a latch mechanism attached to a needle bar, and connecting the needle bar to a reciprocating drive mechanism, may be caused to unlatch the needle bar from its driving mechanism during an extreme excursion of the zig-zag mechanism beyond the normal zig-zag sewing range of the sewing machine. The above noted patent discloses a bracket attached to a sewing machine frame which is struck by a part of the latch mechanism mounted on the needle bar when the needle bar is made to undergo an extreme excursion under the influence of a special basting cam. A latch lever part of the latch mechanism attached to the needle bar is caused to rotate about its pivot by the impact, thereby, disconnecting the needle bar from its driving mechanism. A second keeper bracket is utilized to trap the latch lever and the attached needle bar, in an elevated position, until the needle bar is returned from its extreme excursion by a special basting cam, whereupon a stitch is made.

To a machine containing a basting stitch device as described above, the invention adds a supporting member attached to a presser bar guide block, which member supports instrumentalities cooperating with the basting mechanism, when the presser bar guide block is lifted above the normal raised position, to unlatch the needle bar from its driving mechanism and raise the needle bar an extra amount corresponding to the extra lift imparted to the presser bar guide block and the presser foot.

In the preferred embodiment, a bell crank is pivoted on the supporting member attached to the presser bar guide block, with one arm upstanding adjacent the latch mechanism carried by the needle bar. This upstanding arm has serrations on an edge in a position to cooperate with an arm extension of the latch lever, when the bell crank is rotated into a position to cause interference between the arm extension and the serrations. A spring mounted on the sewing machine frame is positioned to strike the second arm of the bell crank and cause it to rotate as soon as the presser bar guide block and support member on which the bell crank is pivoted is elevated beyond normal lift position. Cooperation of the serrations on the upstanding arm and the arm extension of the latch lever is immediately effected, the latch lever is caused to rotate separating the needle bar from its driving mechanism and the needle bar is further elevated by the continued upward motion of the presser bar guide block and member affixed thereto. On lowering of the presser bar guide block, a second spring affixed to the supporting member attached to the guide block overcomes the force exerted on the bell crank by the frame mounted spring, causing the bell crank to release the arm extension of the latch lever, and allow the relatching of the latch lever and needle bar to its driving mechanism. In this embodiment if the presser foot is super-elevated with the needle bar in a lowered position, separation of the needle bar from its driving mechanism is effected and the needle bar may be driven to its normal elevated position by rotating the hand wheel of the sewing machine. If the presser foot is super-elevated when the needle bar is already in its normal elevated position, extra lift is given to the needle bar corresponding to the extra lift imparted to the presser foot by super-elevating the presser bar guide block. On lowering of the presser bar guide block, the needle bar and latch mechanism attached thereto return by gravity to a position from which the needle bar may be relatched to its driving mechanism.

DESCRIPTION OF DRAWINGS

FIG. 1 represents a perspective view of a skip stitch mechanism including only portions of the salient mechanisms of a sewing machine and illustrating the needle bar held in an elevated skip stitch position;

FIG. 2 is a front elevational view of a portion of the needle bar recriprocation interrupting means of FIG. 1 showing the latch means on the needle bar disengaged from the needle bar reciprocating drive means and interengaged with a keeper bracket for retaining the needle bar substantially at the top of its stroke;

FIG. 3 is an end elevational view of the head portion of a sewing machine showing the presser foot in a super-elevated position and the mechanism of this invention holding the needle bar in a super-elevated position after having disconnected the needle bar from its driving mechanism;

FIG. 4 is an enlarged perspective view of the needle bar latch mechanism and a portion of the presser mechanism showing the needle bar in its normal needle up position and connected to its driving mechanism;

FIG. 5 is an enlarged perspective view similar to FIG. 4 but showing the presser mechanism in a superelevated position and the needle bar in a super-elevated position, having been disconnected from its driving mechanism by the mechanism of this invention;

FIG. 6 is an enlarged perspective view of a second embodiment of the invention showing a portion of the presser mechanism and the latch mechanism affixed to a needle bar in the needle down position and with the needle bar shown connected to its driving mechanism;

FIG. 7 is a view corresponding to FIG. 6, but with the presser mechanism in a super-elevated position and the latch mechanism affixed to the needle bar disconnected from the needle bar driving mechanism;

FIG. 8 is a view corresponding to FIG. 7 showing the latch mechanism in a normal elevated position after having been driven to this position by the driving mechanism for the needle bar;

FIG. 9 is a view similar to FIG. 6, but with the needle bar in the needle up position and connected to its driving mechanism;

FIG. 10 is a view similar to FIG. 9, but with the presser mechanism in a super-elevated position and the latch mechanism affixed to the needle bar disconnected from the needle bar driving mechanism and also superelevated.

The mechanism of this invention may be applied to any sewing machine having a needle bar connected to the driving mechanism of the sewing machine through a latch mechanism carried by the needle bar.

In FIG. 1 is shown a basting stitch cam 21 having a cam track composed of valleys 22 and lobes 23. The cam 21 is supported and rotated on a camshaft 24 affixed to the frame of the sewing machine. A cam follower 25 is interposed between the cam track 22, 23 and an integrating plate 26. The integrating plate 26 is supported by a driving arm 27, the other end of which is bifurcated as at 28, to clasp a rear extension 29 of a gate 32. Connections of the bifurcation 28 to the rear extension 29 of the gate 32 is by means of a pin 33. The lower end of the pin 33 contains a groove 34 which receives an end of a spring 35 which spring provides a bias maintaining the connection between the integrating plate 26, cam follower 25 and cam track 22, 23 of the cam 21.

The gate 32 is supported for lateral vibration on a stud 39 held thereto by a collar 38. The stud 39 is affixed to a split portion 36 of the sewing machine frame 20 by screw 37 (see FIG. 3). A forward extension 40 of the gate 32 supports in an upper spherical bearing 41 a needle bar 42. A lower spherical bearing 43 is mounted in a socket (not shown) attached to the sewing machine frame 20 by a screw 44. The upper 41 and lower 43 spherical bearings support the needle bar 42 for endwise reciprocation while allowing lateral jogging to be imparted by the cam 21.

Endwise reciprocation of the needle bar 42 is effected in the usual manner by means of a rotating armshaft 49 having a crank 50 at one end, which crank is connected by a connecting link 51 to a driving stud 52. The driving stud 52 has a forked end 53 which clasps a pivot pin 54 freely slidable on the needle bar 42. The needle bar 42 has a latch mechanism 55 affixed thereto by screw 56. A latch lever 57 is pivotally attached by a shoulder screw 58 to the latch mechanism 55. The latch lever 57 has a lower tang 59 spaced a sufficient distance beneath the latch mechanism 55 to clasp the forked end 53 of the driving stud 52 in intimate contact with the latch mechanism. A torsion spring 63 continuously urges the lower tang 59 of the latch lever 57 into engagement with the forked end 53 of the driving stud 52. Thereby, reciprocation of the driving stud 52, by means of the connecting link 51 and crank 50 affixed to the rotating armshaft 49, is transmitted to the needle bar 42 through the latch lever 57 clasping the forked end of the driving stud 52 to the latch mechanism 55 affixed to the needle bar 42.

Held in the sewing machine frame 20 behind the needle bar 42 by a screw 71 is a presser bar bushing 72. A presser bar 73 is journalled in the presser bar bushing 72, and, is urged by a spring (not shown) in a downwardly direction to force a presser foot 75 and work material 76 into engagement with a feed system 77 of the sewing machine. A presser bar guide block 78 on the end of the presser bar 73 opposite the presser foot 75 is arranged to be acted on by a presser bar lifting lever 80 so as to bring the presser foot 75 out of engagement with the work material 76 at the operator's discretion, to a normal or high lift position of the presser foot.

From the foregoing it is apparent that when the latch lever 57 of the latch mechanism 55 is engaged with the forked end 53 of the driving stud 52, needle bar reciprocation ensues. FIGS. 1 and 2 show the latch lever 57 disengaged from the forked end 53 of the driving stud 52. Referring to FIG. 2, the latch lever 57 contains an abutment ear 83. Visible in FIG. 1 and FIG. 2 is a bracket 84 supported by the sewing machine frame. When the needle bar 42 is caused to undergo a lateral vibration to the left as viewed in FIG. 2 the abutment ear 83 of the latch lever 57 strikes the bracket 84 and rotates the latch lever 57 out of engagement with the forked end 53 of the driving stud 52. Such a lateral vibration to the left is caused by a valley 22 on the basting stitch cam 21 (see FIG. 1). A second keeper bracket 87 affixed to the first bracket 84 by screw 88 and capable of lateral adjustment with respect to the frame by means of screw 89, may be adjusted laterally to catch the lower tang 59 of the latch lever 57 as indicated in FIG. 2 when the needle bar 42 undergoes such a lateral vibration to the left. When this occurs the pivot pin 54 which is captured by the driving stud 52 slides freely on the needle bar 42 without causing endwise reciprocation thereof if the armshaft 49 continues to rotate. When a lobe 23 of the basting stitch cam 21 contacts the cam follower 25 the needle bar is deflected to the right as viewed in FIG. 2 carrying the latch lever 57 away from the keeper bracket 87, allowing the latch lever to rotate counter-clockwise due to the urging of the torsion spring 63 whereupon the latch lever will be re-engaged with the forked end 53 of the driving stud 52 and the needle bar 42 will resume endwise reciprocation.

To a mechanism as described above the mechanism of this invention is added. Visible in FIGS. 1 thru 5 the presser bar guide block 78 has attached thereto by a screw 92 a supporting member 93 having a portion 94 thereof extending in front of the needle bar 42. On this portion 94 is affixed, as by rivets 96, a resilent latch release element 97 presenting a shaped profile. A cam 98 on the sewing machine frame 20 cooperates with the shaped profile of the resilent member 97 when the presser bar lifting lever 80 raises support member 93 and the latch release element 97 to a high lift position, beyond that required to raise the presser foot 75 to a normal position. Concurrently, the presser foot 75 is also elevated to a high lift or super-elevated position (see FIG. 3). The cooperation of the cam 98 with the

latch release element 97 forces the latch release element inwardly to have an edge 105 thereof interfere with an ear 107 on the latch lever 57. Since the ear 107 of the latch lever 57 is located off center with respect to shoulder screw 58 mounting the latch lever to the latch mechanism 55, the latch lever undergoes a rotation clockwise, as received in FIG. 2, disconnecting the lower tang 59 of the latch lever 57 from the forked end 53 of the driving stud 52. When the latch lever 57 has been disengaged from the forked end 53 of the driving stud 52 a second edge 108 of the latch release element 97 spaced from the first edge 105 of the element contacts the outer diameter of shoulder screw 58 and lifts the latch mechanism 55 and the needle bar 42 to which it is attached to an elevated position corresponding to the super-elevation imparted to the presser foot 75. This position of the mechanism is shown in FIG. 5 which also shows the forked end 53 of the driving stud 52 in a lowered position to clarify the view and specifically point out the separation of the needle bar from its driving mechanism.

A study of FIGS. 3, 4 and 5 will indicate that this embodiment will separate the needle bar 42 from its driving mechanism and elevate the needle bar only if the needle bar is in the immediate vicinity of its normal up position. When the operator chooses to remove a bulky fabric from underneath the presser foot 75 she is merely required to rotate the hand wheel until the needle bar is in its normal up position. At that time she may super-elevate the presser bar lifting lever 80, further than that required to normally elevate the presser foot 75, thereby disconnecting the needle bar from the driving mechanism and further elevating the needle bar while at the same time super-elevating the presser foot (see FIG. 3). She may then remove the bulky fabric beneath the presser foot without snagging the fabric with the point of the needle.

In a second embodiment depicted in FIGS. 6 thru 10 the operator may super-elevate the presser foot thereby disconnecting the needle bar 42 from its driving mechanism at any position of the needle bar, and, if required may further elevate the needle bar by rotating the hand wheel of the sewing machine to drive the needle bar 42 to its normal up position. Similar to the embodiment just described, however, if the needle bar 42 is already located in its upper most position when the operator elevates the presser bar lifting lever 80 to a high position thereby super-elevating the presser foot 75, the needle bar 42 will also be further elevated an amount corresponding to the super-elevation of the presser foot. This embodiment will now be described.

Referring to FIG. 6 it will be noted that a somewhat different support member 110 is affixed by a screw 111 to the presser bar guide block 78, to extend adjacent a latch mechanism 55' attached to the needle bar 42. Pivoted on the support member 110 adjacent a latch lever 112 of the latch mechanism 55' by means of a shouldered rivet 115 is a bell crank latch release element 113. The bell crank 113 has a first arm 114 normally disposed parallel to the needle bar 42. The inner edge of the arm 114 is formed with a series of teeth 116. A second arm 117 of the bell crank 113 extends substantially along the support member 110. A leaf spring 119 having a bent over portion 120 is attached to the support member 110 by a rivet 121 and projects under the support member 110 at the bottom edge thereof. The leaf spring 119 impinges on the outer edge of the second arm 117 of the bell crank 113, forcing the bell crank in a clockwise direction (see FIG. 6). A transverse ear 124 on the end of support member 110 prevents rotation of the bell crank 113 beyond that required to maintain the first arm 114 approximately parallel to the needle bar 42. A torsion spring 127 having an end held by a screw 128 to the sewing machine frame 20 has its other end biased against the inner edge of the second arm 117 of the bell crank 113. Thus, the torsion spring 127 and the leaf spring 119 exert balanced opposing forces on the bell crank 113. The correct balance is achieved by rotating the torsion spring 127 about the screw 128 until the force exerted by the torsion spring on the bell crank 113 is just less than that exerted by the leaf spring 119 on the bell crank when the presser foot is located in its normal up position. The torsion spring 127 is adjusted properly when, as the presser foot begins to move from its normal up positon to a super-elevated position, the bell crank 113 is forced by the increased force applied by the torsion spring 127 because of the slight compression thereof to cam the bell crank in a counter-clockwise direction as viewed in FIG. 6. Referring to FIG. 7 it is apparent that as the bell crank 113 is cammed in a counter-clockwise direction the teeth 116 on the first arm 114 of the bell crank impinge on an arm 130 of the latch lever 112. Further upper motion of the bell crank 113 and the first arm 114 of the bell crank having the teeth 116 on an inner edge thereof will lift the arm 130 causing rotation of the latch lever 112 about the screw 132, thereby, separating lower tang 133 of the latch lever from the forked end 53 of the driving stud 52. Referring to FIG. 8 it is apparent that although the forked end 53 of the driving stud 52 is separated from driving engagement with the latch mechanism attached to the needle bar 42, rotation of the hand wheel may be utilized to drive the latch mechanism to which it is attached to its normal elevated state.

In FIGS. 9 and 10 can be seen the effects of superelevating the presser foot when the needle bar is already at its normal up position. With the various parts in this position, the super-elevation imparted after disconnection of the latch lever from the driving mechanism from the needle bar can be used to elevate the needle bar. For this purpose the latch lever 112 also has an ear 135 which prevents further rotation of the latch lever 112 after disconnection from the forked end 53 of the driving stud 52. Thereby further lift imparted to the bell crank 113 by its connection to the presser bar guide block 78 by the support member 110 is converted to lifting motion of the latch mechanism and needle bar 42.

It is apparent that further advantages ensue from this second embodiment. In a sewing machine having instrumentalities allowing winding of the bobbin in place as disclosed in U.S. Pat. No. 3,693,566 dated Sept. 26, 1972 of Ketterer, the bobbin may be rewound with the work material in place. The needle may be allowed to penetrate the fabric once to carry the upper thread to the lower empty bobbin after which the presser bar lifting lever 80 may be super-elevated prevent further needle penetrations while allowing the machine to operate and draw the upper thread through the hole thus created to fill the bobbin. When winding is completed, the presser foot is lowered and sewing can resume. Further it excessively bulky fabric is inserted beneath the

presser foot which does not allow the presser foot to lower sufficiently to release the bell crank from engagement from the arm **130** of the latch lever **112** the needle bar will not have been released from the rack and will not move. This serves as a warning signal to the operator that an overload condition exists and that sewing is not possible.

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

1. In a sewing machine having a frame, a needle bar endwise reciprocable in said frame, needle bar reciprocating mechanism including a drive link carried in said frame, a latch mechanism carried on said needle bar for selectively coupling said drive link to said needle bar, a presser mechanism including a work engaging presser foot, the improvement comprising an operator influenced presser lifting element on said sewing machine for selectively lifting said presser mechanism to raise said presser foot to a normal lifted position or to a super-elevated position, a latch release element arranged in said sewing machine so as to be raised with said presser mechanism by said presser lifting element, and camming means on said sewing machine frame operatively engageable with said latch release element upon raising movement of said presser mechanism above said normal lifted position for shifting said latch release element into effective position releasing said latch mechanism.

2. In a sewing machine as set forth in claim **1** in which said latch mechanism on said needle bar includes a latch lever, an arm projecting from said latch lever and partaking of reciprocatory movement within a predetermined plane during needle bar reciprocation in response to said needle bar reciprocating movement, in which said latch release element includes an arm portion extending substantially parallel to said predetermined plane of movement of said latch lever arm, and means operative in said effective position of said latch release element for positioning said arm portion within the path of motion of said latch lever arm in any position of reciprocation of said needle bar.

3. In a sewing machine as set forth in claim **2** in which said means for lifting said presser mechanism includes a first position for influencing a normal raised position of said presser foot and a second position for influencing a super-elevated position of said presser foot, and in which said camming means is arranged to shift said latch release element into effective position releasing said latch mechanism as said presser lifting means is shifted from said first to said second position and in which said latch release element comprises a member pivotally supported on said presser mechanism, in which said camming means is arranged when said presser lifting means is shifted from said first to said second position to engage and turn said pivotally supported latch release element to bring said arm portion within the path of motion of said latch lever arm.

4. In a sewing machine as set forth in claim **2** in which said arm portion of said latch release element is formed with serrations to engage and sustain said latch lever arm from descending.

5. In a sewing machine as set forth in claim **4** in which means are provided whereby said latch release arm portion is resiliently shifted into the path of motion of said latch lever arm, and in which said serrations in said latch release arm portion take the form of ratchet teeth with upwardly inclined lower edges to accommodate elevation of said needle bar to the top of its stroke subsequent to release of the latch mechanism in any lower position of the needle bar.

6. In a sewing machine as set forth in claim **1** in which means are provided effective after release of said latch mechanism, for rendering said presser lifting mechanism effective to impart lifting movement to said needle bar.

7. In a sewing machine as set forth in claim **1** in which abutment means are provided effective before the presser mechanism attains said second position for limiting the unlatched position to which said latch mechanism may be shifted under the influence of said latch release element for causing said latch release element to elevate said needle bar during movement of said presser foot into said super-elevated position.

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