

June 9, 1931.

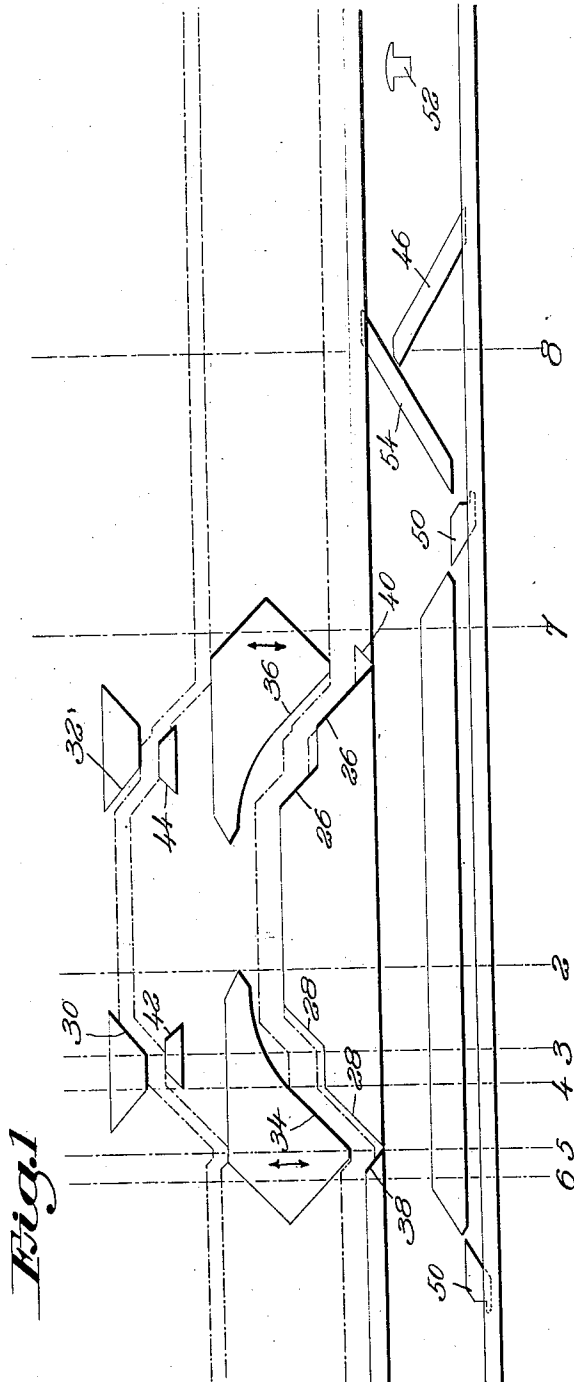
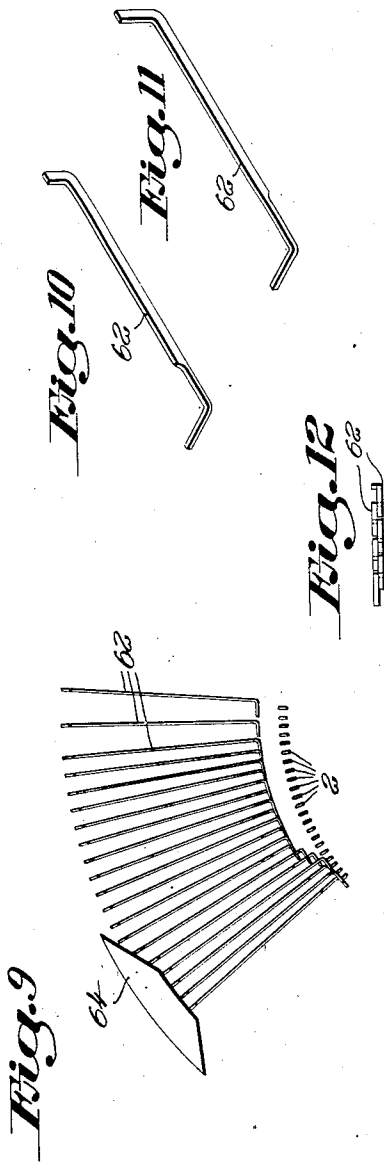
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KNITTING MACHINE

Original Filed April 10, 1923

2 Sheets-Sheet 1



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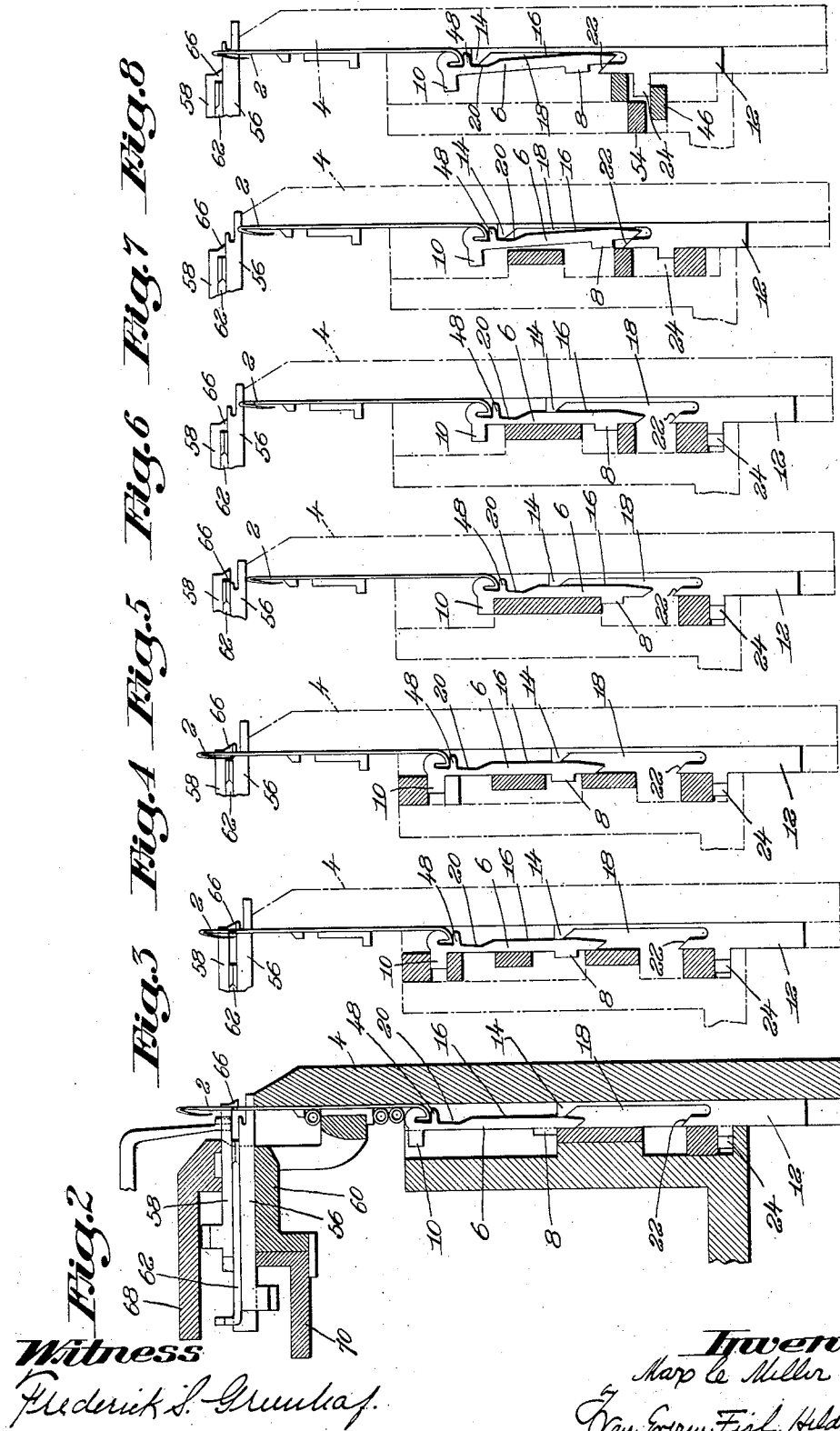
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KNITTING MACHINE

Application filed April 10, 1923, Serial No. 631,071. Renewed February 28, 1930.

The invention relates to knitting machines and more particularly to the means for actuating, controlling and pressing the needles of an independent spring needle machine.

The object of the invention is to provide novel and improved devices for actuating, controlling and pressing the needles which are well adapted for use in a machine provided with sinkers for measuring the yarn fed to the needles and with web holders for casting off and holding the fabric and to this end the invention comprises the features of construction and combination of parts hereinafter described and set forth in the claims.

A preferred form of the invention applied to a circular machine for knitting seamless hosiery is illustrated in the accompanying drawings in which Fig. 1 is a view showing somewhat diagrammatically the interior of the cam supporting cylinder, Figs. 2 to 6 are sectional views on lines 2 to 6 respectively of Fig. 1, Fig. 7 is a sectional view on line 7, Fig. 1 showing one of the needles which is rendered active and inactive in narrowing and widening and the position of its operating jack when the needle is rendered inactive, Fig. 8 is a sectional view on line 8, Fig. 1, showing one of the instep needles which is rendered inactive during the knitting of the heel or toe and its operating jack when the needle is rendered inactive, Fig. 9 is a diagrammatic plan view showing diagrammatically the arrangement of the presser slides which press the beards of the needles and one of the presser actuating cams, Figs. 10 and 11 are perspective views showing two adjacent presser slides, and Fig. 12 is a detailed view showing the overlapping needle engaging faces of the needle pressers.

As shown in the drawings the spring needles 2 are mounted in grooves in the needle cylinder 4 which may be rotated and oscil-

lated by any suitable mechanism such as is usually employed for rotating and oscillating the needle cylinder of a seamless hosiery machine. Each needle is actuated and controlled by a jack 6, the upper end of which is recessed to receive the hook-shaped bent lower end of the needle so that the needle may be advanced and retracted by lengthwise movement of the jack and so that the jack may be swung radially inward and outward about the lower end of the needle to render the corresponding needle inactive or active. Each jack is provided with two outwardly projecting butts 8 and 10 for engaging the knitting cams which advance and retract the needles. The jacks are normally held with their butts projecting from the needle grooves into position to be acted upon by the knitting cams by sliders 12 mounted in the needle grooves and provided at their upper ends with forwardly extending projections 14 underlying guiding surfaces 16 on the inner sides of the jacks which are of sufficient length to remain in engagement with the projections 14 during the forward and retracting movements of the jacks and needles. Below the projections 14 each jack is cut away or recessed at 18 to permit the lower end of the jack to swing inward when the projection 14 is caused to register with the recess 20 formed in the back of the jack beyond the upper end of the guiding surface 16. Near the lower end of the recess 18 the slider is provided with a cam surface 22 arranged to engage the inclined lower end of the jack when the projection 14 registers with the recess 20 and acting to positively swing the lower end of the jack radially inward to remove the butt 8 of the jack from active relation to the cams which normally act thereon while permitting the butt 10 of the jack to remain in active projecting position. The jack and needle controlling sliders 12 are provided near their lower ends with projecting butts 24 arranged to be engaged and acted upon by controlling cams and devices, the

sliders corresponding to the instep needles being provided with long butts while the sliders corresponding to the needles which are operated in knitting the heel and toe are provided with short butts.

The knitting cams for forming the knitting waves in the needles comprise needle advancing cams 26 and 28 arranged to engage the lower butts 8 of the needle jacks and acting to advance the needles from their normal level to the clear level, cams 30 and 32 arranged to engage the upper butts 10 and retract the needles to the pressing level, stitch cams 34 and 36 arranged to engage the butts 8 and complete the retracting of the needles to the stitch drawing point and side cams 38 and 40 arranged to engage the butts 8 and advance the needles to their normal level immediately after they have been drawn to the knitting point by the stitch cams. Guard cams 42 and 44 are arranged under the cams 30 and 32 to prevent overthrow of the needles by the cams 30 and 32 and to thus accurately determine the pressing level of the needles. The upper surfaces of the stitch cams 34 and 36 are so arranged or adjusted with relation to the points of the stitch cams that they will act as guard cams or plates for engaging the under sides of the upper butts 10 of the needle jacks and preventing overthrow of the needles by the stitch cams. The normal level of the ends of the needles is slightly above the stitch drawing level and slightly below the level of the sinkers as indicated in Fig. 6.

During rotary knitting the stitch cam 36 is raised out of the path of the butts 8 so that it will not act to draw the needles idly to the stitch level and during reciprocary knitting the stitch cams 34 and 36 are alternately raised and lowered so that only that cam corresponding to the knitting point acts to draw the needles to the stitch level during each stroke of the needle cylinder. The paths of the butts of the needle operating jacks during rotary knitting and during the forward stroke of the needle cylinder in reciprocary knitting is indicated in dotted lines in Fig. 1. As the needles approach the knitting point the lower section of the cam 26 engages the butts 8 and advances the needles from the normal level toward the clear level, the leading end of the guard cam 44 continues the advancing movement of the needles by engaging the butts 10 of the jacks and the upper section of the cam 26 completes the advance of the needles to the clear level by engagement with the butts 8. The position of the needles and jacks at this stage is indicated in Fig. 2. After the yarn is kinked about the needles by the sinkers the cam 30 engages the butts 10 of the needle jacks and draws the needles down to the pressing level where their beards are acted upon by the pressers (Figs. 3 and 4) and then the butts 8 of the jacks engage the stitch cam 34 which

acts to draw the needles to the stitch level (Fig. 5). The cam 38 then acts on the butts 8 to return the needles to the normal level (Fig. 6). By utilizing a separate cam such as the cam 30 or the cam 32 for drawing the needles to the pressing level adjustment of the stitch cams which draw the needles to the stitch level may be made as, for instance, in varying sizes of yarn without affecting the pressing level of the needles which should remain the same whatever the extent to which the needles are finally drawn by the stitch cams.

The instep needles which are inactive during the knitting of the heel and toe are rendered inactive by swinging the corresponding jacks 6 radially inward to withdraw their butts 8 from active relation to the knitting cams. For this purpose a cam 46 is arranged for radial movement into and out of the path of the long butts 24 on the controller sliders 12. When the cam is moved into the path of the long butts it will raise the long butt sliders from the position indicated in Fig. 6 to the position indicated in Fig. 8. This movement of the sliders will bring their upper ends into the recesses 20 of the needle operating jacks and will cause the cam surfaces 22 on the sliders to engage the lower ends of the jacks and swing them positively inward to withdraw the butts 8 from the path of the knitting cams. During the final upward movement of the sliders their upper ends will engage the shoulders 48 on the jacks at the upper ends of the recesses 20 and raise the needles into the position indicated in Fig. 8 so that the instep needles will remain idle during the knitting of the heel and toe with their upper ends slightly above the level of the sinkers. Since the level of the idle instep needles is above the sinker level the sinkers corresponding to these needles should be rendered inactive during the knitting of the heel or toe to avoid idly kinking the yarn about these needles.

The fashioning needles are rendered inactive during the narrowing by narrowing pickers indicated at 50 which act on the butts of the short butt sliders and raise them successively from the position indicated in Fig. 6 to the position indicated in Fig. 7, thus rendering the corresponding needles inactive by withdrawing the butts 8 of the needle operating jacks from the path of the knitting cams. These needles are thus positioned when inactive with their upper ends below the level of the sinkers. These needles are successively returned to the active series by a widening picker 52 arranged to engage the butts of the sliders and return them successively from the position indicated in Fig. 7 to the position indicated in Fig. 6. The inactive needles are returned to the active series at the completion of the heel or toe by a radially movable cam 54 which is moved into po-

sition to engage the butts of the sliders and return them from the position indicated in Fig. 8 or in Fig. 7 to the position indicated in Fig. 6. When the sliders are returned to normal position to render the corresponding needles active the upper end of each slider moves down out of the recess 20 of the corresponding jack and positively returns the jack to active position and supports it in this position until the slider is again moved to positively swing the jack inward to render the corresponding needle inactive.

The radially movable web holders 56 and sinkers 58 are mounted in grooves in a dial 60 secured to the upper end of the needle cylinder and these web holders and sinkers, as well as the radially movable pressers to be described, are provided with short and long butts corresponding to the short and long butts of the needle controlling sliders 12 for the purpose of rendering inactive that series of these knitting elements which corresponds to the instep needles so that the instep needles which are partially up during the knitting of the heel or toe will not have yarn kinked about them or be pressed or have the loops of the fabric held thereby strained by the web holders. These knitting elements may be rendered active and inactive by cams corresponding to the cams 46 and 54 which act on the butts of the needle controlling sliders 12.

The means for pressing the beards of the needles forms one of the important features of the invention and comprises a series of radially movable pressers, the beard engaging portions of which overlap to form a continuous pressing surface movable toward and from the needles. As shown the pressing means consists of a series of sliders 62 mounted in the grooves of the dial 60 above the web holders 56 and below the sinker 58. The presser sliders are provided at their outer ends with upwardly projecting butts, the instep pressers having long butts and the pressers which are active during the knitting of the heel and toe having short butts. The needle pressers are advanced to press the needles by cams, one of which is indicated at 64 in Fig. 9, these cams being arranged to engage both the long and short butts. The pressers are retracted by the corresponding sinkers, the forward ends of which are provided with depending portions 66 arranged to engage the forward ends of the pressers during the backward movement of the sinkers. The inner or needle engaging ends of the pressers are bent at right angles to the sliding portions to form overlapping needle engaging surfaces which are preferably curved to conform to the needle circle. Alternate pressers (Fig. 11) have their laterally bent ends arranged above and overlying the laterally bent ends (Fig. 10) of the intermediate pressers. The

overlapping needle engaging surfaces of the pressers thus form a continuous pressing surface, as indicated in Fig. 12, surrounding the needles and this surface is moved into and out of engagement with the beards of the needles by the forward and return movement of the individual pressers. With this construction the danger of mispressing due to the deflection of any needle slightly out of line with the corresponding presser is avoided and the proper and uniform pressing of the needle beards throughout the knitting is insured. The cams for advancing the pressers are arranged to advance the pressers after the needles have been drawn down to the pressing point by cam 30 or cam 32 (Fig. 3) and before the downward movement of the needles is continued by the stitch cam 34 (Fig. 4). The pressers remain in advanced position until the sinkers are withdrawn when the downwardly projecting end 66 of the sinkers act against the inner ends of the pressers to withdraw them to inactive position (Fig. 6).

The cams for operating and controlling the sinkers and pressers are carried by a stationary cam ring or support 68 and are arranged to operate upon the upwardly projecting butts of these knitting elements. The cams for operating and controlling the web holders are mounted on a cam ring underlying the web holders, and these cams are arranged to engage the downwardly projecting butts of the web holders. The cams for advancing and retracting the web holders are preferably so arranged that the web holders after being withdrawn at the point where the active stitch cam draws the needles to the stitch level are not again advanced until the point is reached where the needles are advanced by the active needle advancing cam, thereby avoiding subjecting the loops held by the needles which are at the normal level between these points to unnecessary strain. This is permissible since the needles after passing the active stitch cam are not raised sufficiently to require the web holders to be moved inward until they reach the active needle advancing cams, but remain at an idle level only slightly above the level to which they are drawn by the active stitch cam.

While the invention has been shown and described as applied to a circular machine in which the needles are mounted to move vertically in the grooves of a needle cylinder it will be understood that it is not confined in its application to a machine of this character but may be embodied in machines having other forms of needle supports and that the broader features of the invention may be applied to other types of machines.

Certain features of the invention relating more particularly to the means for pressing the needles are not claimed herein but form

the subject-matter of a divisional application, No. 520,810, filed March 7, 1931.

What is claimed is:

1. In a knitting machine spring needles,
5 a stitch cam for drawing the needles to the stitch level adjustable to vary the stitch level, a separate cam for drawing the needles to the pressing level, and means for pressing the needles.
- 10 2. In a knitting machine, spring needles, a stitch cam for drawing the needles to the stitch level movable lengthwise of the needles, a fixed cam for drawing the needles to a fixed pressing level, and means for pressing the needles.
- 15 3. In a knitting machine, spring needles, two stitch cams alternately movable in opposite directions lengthwise of the needles during reciprocatory knitting, an independently mounted cam corresponding to each
20 stitch cam for drawing the needles to the pressing level, and means for pressing the needles.
4. In a knitting machine, needles, a needle
25 bed, needle operating jacks, cams for actuating the jacks, and sliders mounted in the needle bed acting when moved in one direction to positively move the jacks out of active relation to the cams and when moved in the
30 opposite direction to return the jacks to active relation to the cams.
5. In a knitting machine, needles, a needle bed, needle operating jacks provided with butts, cams for engaging the butts, sliders
35 mounted in the needle bed provided with means for positively moving the jack butts out of and into the cam path.
6. In a knitting machine, needles, a needle bed, needle actuating elements, cams for actuating the needle elements, and sliders mounted
40 in the needle bed and movable lengthwise of the needles to remove the needle elements positively from active relation to the cams.
7. In a knitting machine, needles, needle
45 operating jacks, cams for actuating the jacks, sliders back of the jacks for normally supporting the jacks in active relation to the cams, cam surfaces formed on the sliders, and means for moving the sliders lengthwise of
50 the jacks to cause the cam surfaces to engage with and to remove the jacks from active relation to the cams.
8. In a knitting machine, needles, needle
55 operating jacks, cams for actuating the jacks, sliders back of the jacks for normally supporting the jacks in active relation to the cams, and provided with means for moving the jacks positively out of and into active relation to the cams, and means for advancing and retracting the sliders lengthwise of
60 the needles.
9. In a knitting machine, needles, needle operating jacks, cams for actuating the jacks, sliders back of the jacks having long and
65 short butts, means for advancing the long butt sliders to render the instep needles inactive, pickers for acting on the sliders at the ends of the active series to render corresponding needles inactive and active, and means for retracting the inactive sliders at
70 the end of the widening.
10. In a knitting machine, needles, needle operating jacks, each provided with two projecting butts, cams for acting on projecting
75 butts in each series, and means acting on the jacks to withdraw one butt from normal active relation to the cams normally acting thereon without withdrawing the other butt.
11. In a knitting machine, a needle, a needle operating jack connected to the end
80 of the needle, a projecting butt near the needle engaging end of the jack, a second projecting butt near the free end of the jack, cams for engaging the butts, and means for swinging the free end of the jack inward to
85 withdraw the butt at this end from the action of the corresponding cam.
12. In a knitting machine, a needle support provided with needle grooves, needles therein, needle operating jacks therein provided with butts, sliders in the grooves provided with means for supporting the jacks
90 in outer active position and for swinging the jacks positively in and out, cams for operating on the jack butts when the jacks are
95 in their outer position, and means for advancing and retracting the sliders.
13. In a knitting machine, a rotary and reciprocating needle support, spring needles mounted therein, knitting cams for operating
100 the needles, sinkers for sinking the yarn to the needles, means for rendering the instep needles inactive in a plane above the plane of the sinkers while the corresponding sinkers are inactive, and means for rendering the
105 fashioning needles inactive during the narrowing in a plane below the sinkers.
14. In a knitting machine, a needle support provided with needle grooves, needle elements therein provided with projecting
110 butts, needle operating cams for acting on the projecting butts, and means including pickers for causing certain needle operating butts to be drawn within the grooves.
15. In a knitting machine, a needle support provided with needle grooves, needle elements therein provided with projecting
115 butts, needle operating cams for acting on the projecting butts, and narrowing and widening means including pickers for causing certain of the needle operating butts to be drawn
120 within and thereafter to be again protruded from the groove.
16. In a knitting machine, for knitting
125 narrowed and widened fabric a needle cylinder, needles and operating butts therefor, cams for operating the needles acting on the butts protruding from the cylinder, and means comprising pickers for causing cer-
130

tain of the needle operating butts to be drawn within the cylinder.

17. In a knitting machine, needles, a
5 needle bed, needle actuating elements, cams
for actuating the needle elements, and slid-
ers mounted in the needle bed movable length-
wise of the needles, having each a raised
portion to support a needle element in active
relation to the cams, a recessed portion to
10 permit the needle element to be moved out of
active relation to the cams on the forward
movement of the slider and a cam surface to
move the needle elements positively out of
operative position.

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