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SEWING MACHINE IMPROVEMENTS

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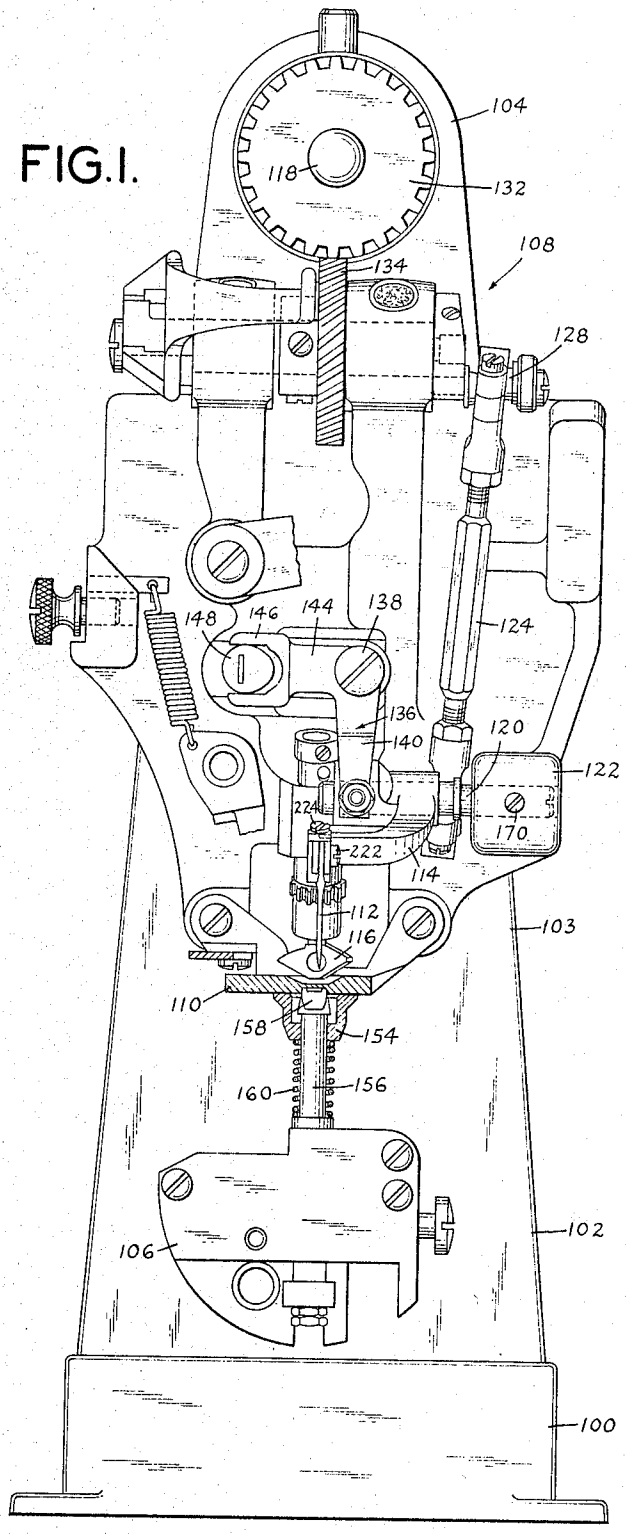
FIG. 1.



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SEWING MACHINE IMPROVEMENTS

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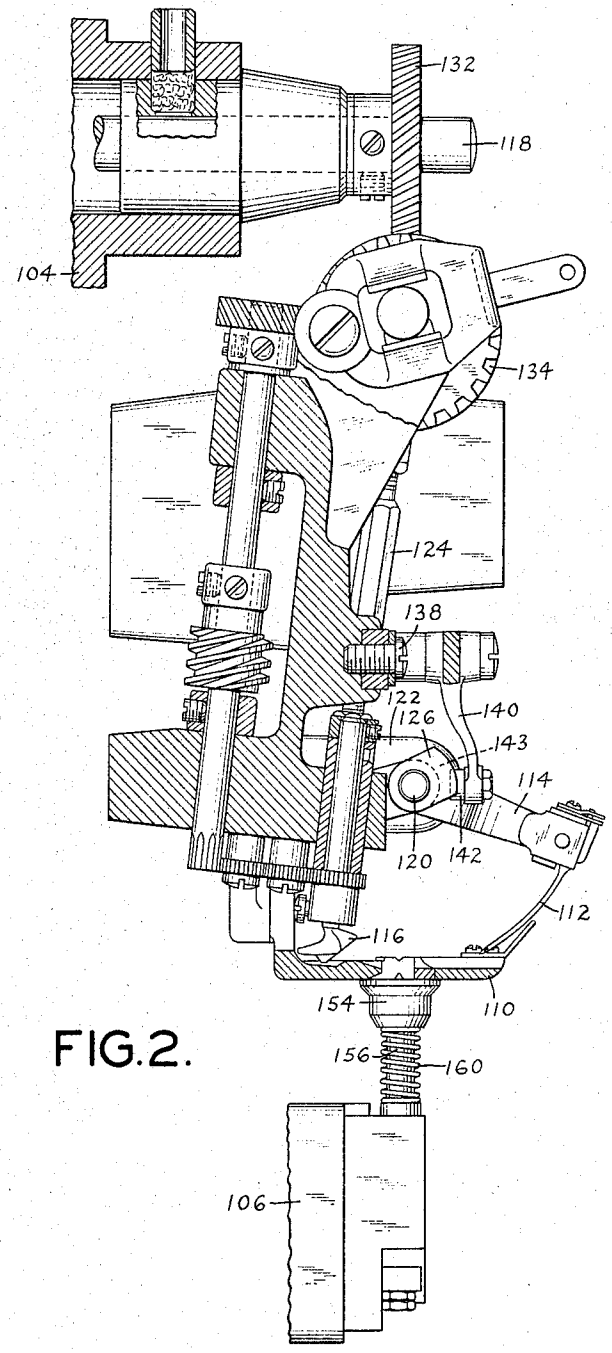

FIG.2.

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SEWING MACHINE IMPROVEMENTS

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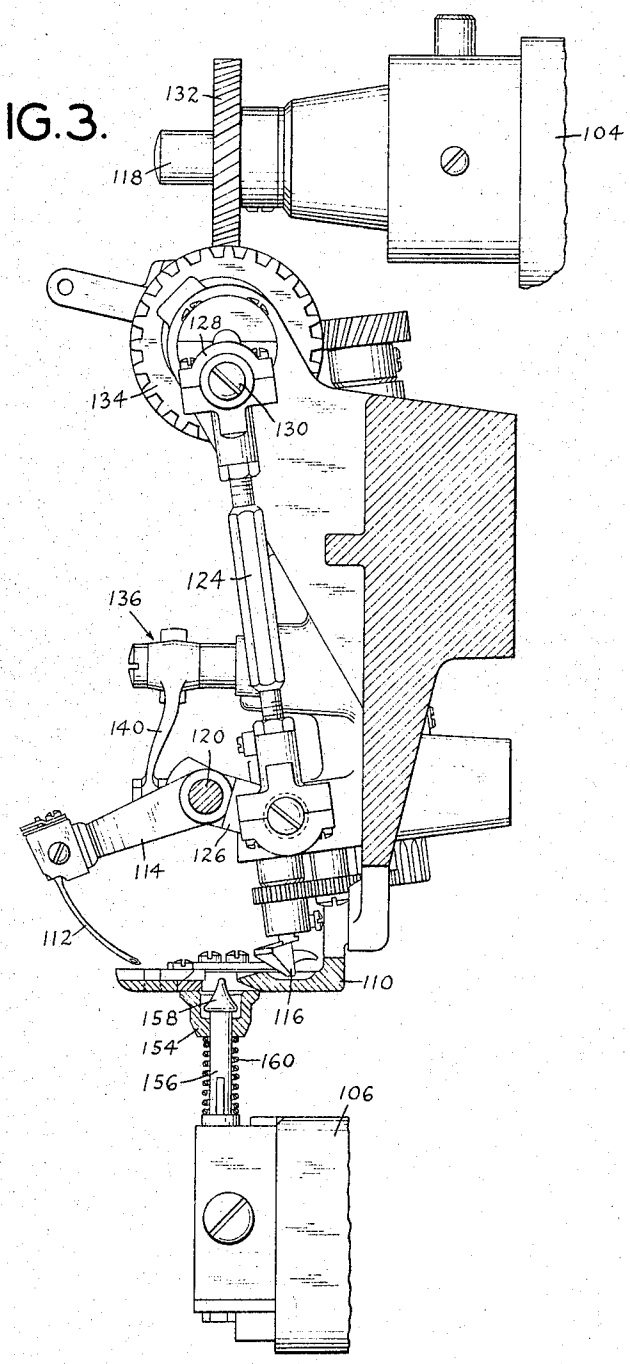
FIG.3.



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SEWING MACHINE IMPROVEMENTS

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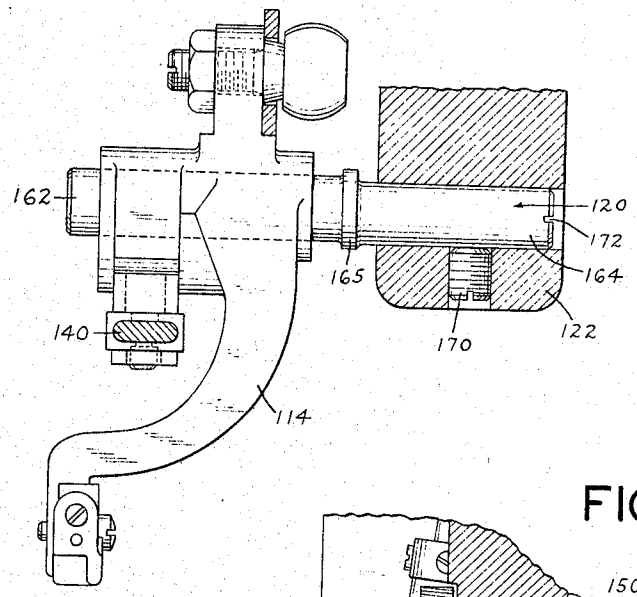


FIG.5.

FIG.4.

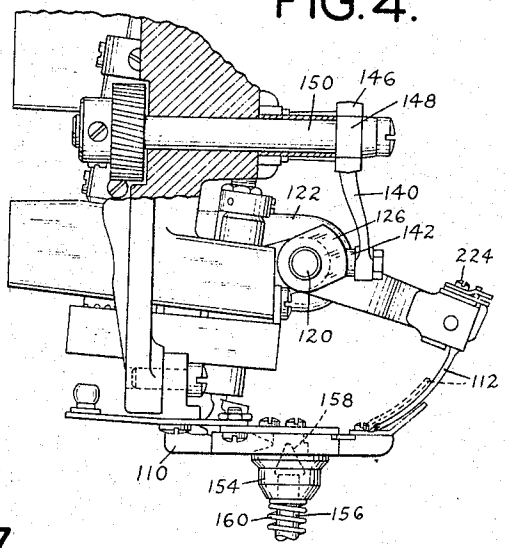


FIG.8.

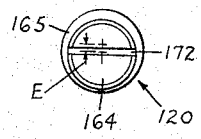


FIG.7.

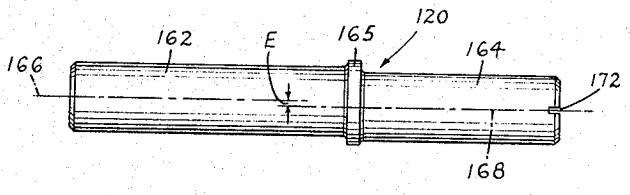
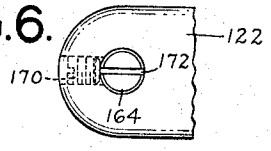


FIG.6.



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SEWING MACHINE IMPROVEMENTS

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FIG.9.

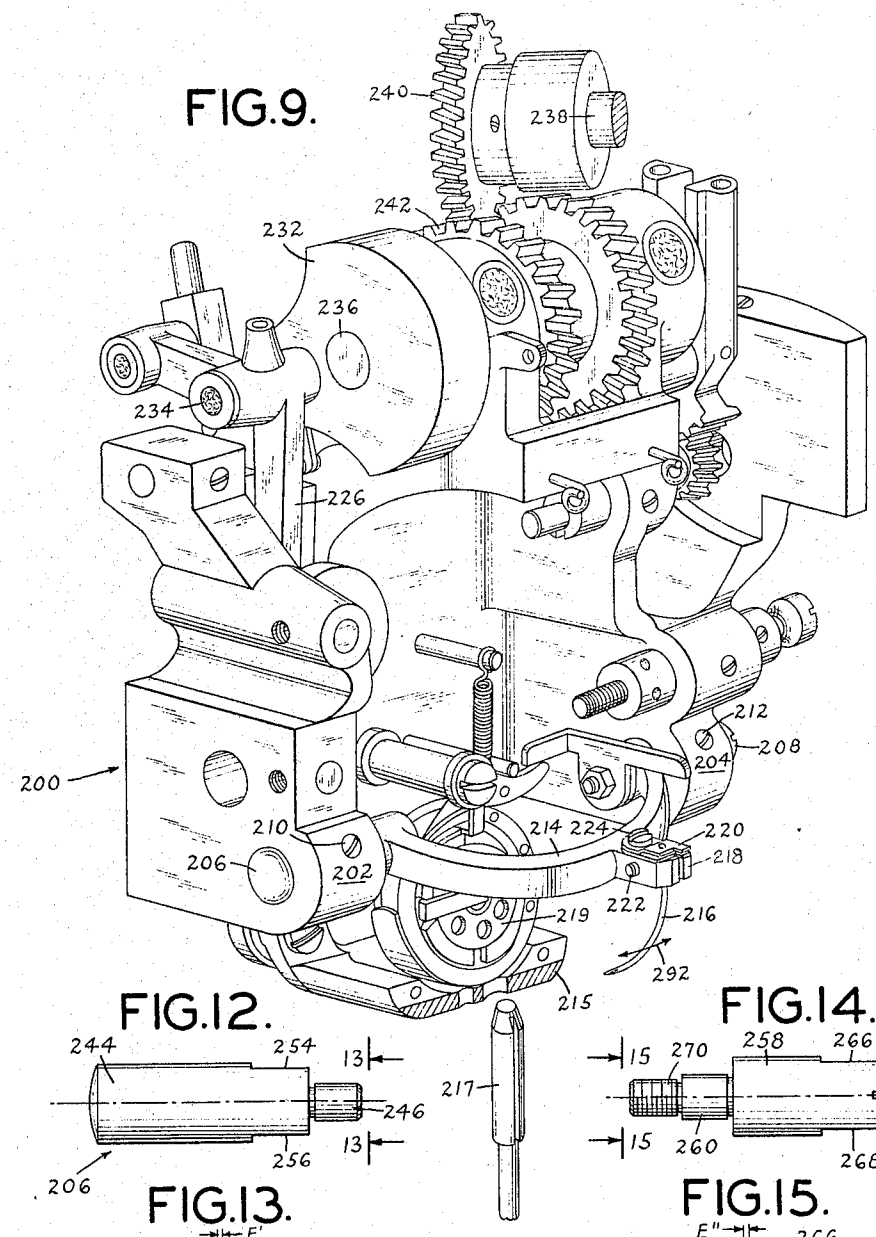


FIG.12.

FIG.14.

FIG.13.

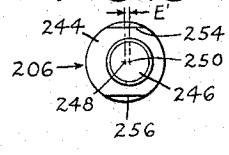
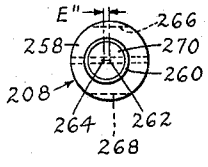


FIG.15.



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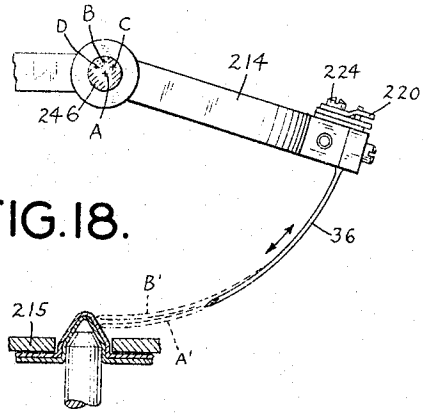


FIG.18.

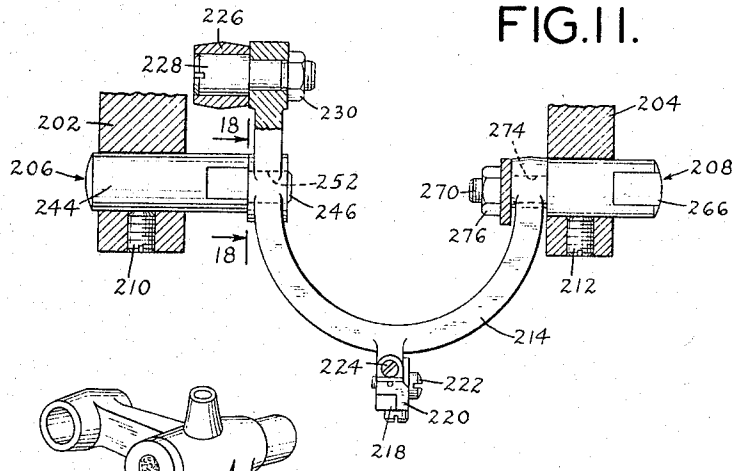


FIG.11.

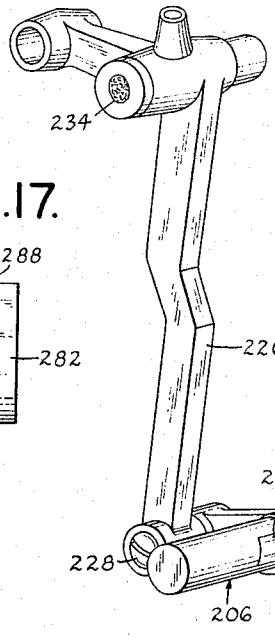


FIG.17.

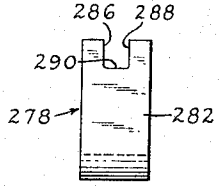


FIG.16.

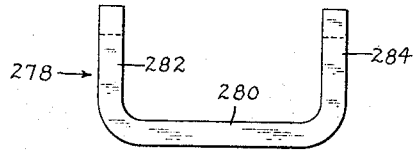
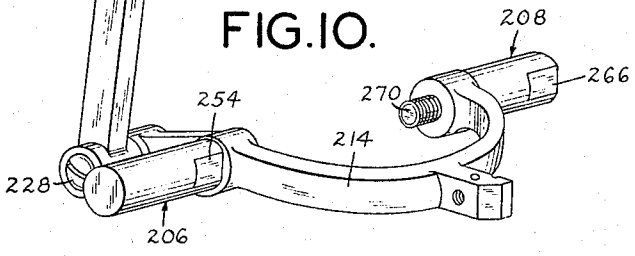


FIG.10.



United States Patent Office 3,286,667 Patented Nov. 22, 1966

3,286,667

SEWING MACHINE IMPROVEMENTS

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Filed Mar. 5, 1964, Ser. No. 349,582
4 Claims. (Cl. 112—176)

This invention relates to needle height adjustment means for sewing machines, and more particularly relates to eccentric means for adjusting the position of the needle bar shaft of sewing machines in order to adjust the position of the needle bar and needle relative to the work on blind stitch sewing machines.

Various devices have been utilized for the adjustment of the position of the needle in a sewing machine. Many devices have taken the general form of a slotted, two part rock arm, or needle bar, in which one part slides on the other and is fastened by a set screw. In such devices, the needle is supported at the end of the arm and may be varied in position by an amount equal to the length of the slot. This type of adjustment is not fully satisfactory for making adjustments of small amounts because there is no positive control of the extent of repositioning while the set screw is loosened.

Another device, which permits positive control of the position of the needle during repositioning, utilizes a shaft recessed at both ends and having an inclined plane on a portion of each of the recesses. A pin freely moveable in a supporting bearing and having a cooperating inclined plane is inserted into each of the recesses. Threaded means, usually in the form of end caps, are provided whereby the pins may be moved toward and away from the shafts, causing the cooperating inclined planes to slide on each other thus effectively raising and lowering the shaft. The device requires two pins located at opposite ends of the stitching mechanism supporting shaft and is not applicable to sewing machines in which the needle bar is supported at one point. No means is provided to simultaneously adjust both of the pins. Such devices have been applied only to sewing machines in which the entire stitching mechanism is moved relative to the work.

It is an object of the present invention to provide apparatus for adjusting the position of the needle in a sewing machine relative to the work while maintaining positive control of the position of the needle during adjustment. The apparatus permits adjustment of the needle bar and the needle supported from it without repositioning the entire stitching mechanism. Where the needle bar is supported at two points, provision may be made for simultaneous adjustment of both points of support so that the introduction of misalignment or skewing is avoided.

It is a further object of this invention to provide apparatus, for use in sewing machines in which a needle bar is supported at two points, for adjusting the position of the needle relative to the work to bring about control of penetration by virtue of the needle being adjusted in proper relation to the needle guide, to provide adjustment of the amount of deflection of the needle, and to provide adjustment of the side-to-side location of the tip of the needle with respect to a node-forming device.

It is another object of the present invention to provide adjusting means so that the position of the axis about which a needle bar is rocked, or oscillated with relation to a work support, and thus with relation to the work, may be adjusted in order that a needle may engage a work node in a predetermined position in order to achieve optimum stitching.

It is still another object of this invention to provide apparatus for adjusting the height of a needle relative to a work node so as to provide a compensation means for the various tolerances involved in the customary large scale production of interchangeable parts which may lead to a displacement of the needle from the ideal position for engaging the node of the work to be stitched.

It is yet another object of this invention to provide improved control of penetration by providing means whereby the needle may be adjusted to the proper relation to the needle guide.

Other objects will be apparent to those skilled in the art from reading the present description taken in conjunction with the appended drawings, in which:

FIGURE 1 is an end view of a machine embodying the invention, with the cover plate removed and part of the mechanism broken away, showing one form of the needle bar and related parts of this invention;

FIGURES 2 and 3 are side elevational views, partly in section, taken from the left and right sides, respectively, of the embodiment of FIGURE 1;

FIGURE 4 is a detail view, partly in section, of the needle bar and operating means therefor embodied in FIGURE 1;

FIGURE 5 is a detail view of the needle bar of FIGURE 1, partly in section, showing the arrangement of the needle bar, eccentric stud and stud support;

FIGURE 6 is a detail view of the stud support boss of FIGURES 1 and 5;

FIGURES 7 and 8 are detail views of the eccentric stud of the embodiment of FIGURE 1;

FIGURE 9 is a perspective view of a stitching head showing another embodiment of the needle bar and its adjustment devices in accordance with this invention;

FIGURE 10 is a perspective view of the U-shaped needle bar of the embodiment of FIGURE 9 with the eccentric studs of this invention in place;

FIGURE 11 is a detail view, partly in plan and partly in section, of the U-shaped needle arm of the embodiment of FIGURE 9, showing the arrangement of the eccentric studs;

FIGURES 12, 13, 14 and 15 are detail views of the eccentric studs employed in the embodiment of FIGURE 9;

FIGURES 16 and 17 are front and side elevational views of a wrench which is useful in simultaneously adjusting the eccentric studs of the embodiment of FIGURE 9; and

FIGURE 18 is an elevational view taken along lines 18—18 of FIGURE 11, with certain parts broken away or shown in section, showing some of the adjustments that may be accomplished with this invention.

The objects of this invention may be accomplished by the use of one or more eccentric studs comprised of two cylindrical portions having different longitudinal axes. One portion of the eccentric stud is mounted in a boss on the needle head and fixedly positioned by means of a set screw. The needle bar is rockably mounted on the other cylindrical portion of the eccentric stud and carries a curved needle adjacent its outer end. An adjustment in the position of the needle bar causes a corresponding adjustment of the position of the needle relative to a work support and thus relative to the work. To adjust the needle bar, the set screw is loosened, and the eccentric stud is rotated in the boss, for instance, by inserting a screw driver into a slot provided at one end or by use of a wrench engaging flattened portions of the stud. The adjustment in height of the needle may be varied over a range equal to twice the eccentricity of the parallel longitudinal axes of the two cylindrical portions of the eccentric stud utilized. One embodiment of the invention

makes use of a single eccentric stud to support the needle carrier arm. The single stud arrangement may be used with sewing machines such as those shown in U.S. Patents 1,740,901 and 2,889,793. However, a double eccentric stud arrangement is preferred for use in conjunction with certain types of sewing machines, for instance, those shown in U.S. Patent 1,588,134.

A typical sewing machine to which the present invention is applicable is shown in FIGURES 1–8 and includes a base 100 which may be secured to a table or other support, and a frame on which all of the operating mechanism is mounted. The frame includes a section 102 that rests upon the base and is pivotally secured thereto. An upright post or column 103 is secured to the section 102 and a horizontal upper arm 104 extends from the upper end of the column above and parallel to a lower arm 106. On the end of the upper arm, there is mounted a needle head 108 which extends downwardly towards the lower arm to a position above the latter. The present invention is concerned broadly with the needle head.

A presser foot 110 is secured to the lower end of the needle head. A curved needle 112 is secured in a needle bar 114 so that the needle cooperates with a rotary looper 116 for forming stitches as the needle bar oscillates. The needle bar and looper are actuated in timed relation by a mechansm driven from a main shaft 118 that extends through and is journalled in the upper horizontal arm 104. The main shaft is driven from a motor by well known means which form no part of this invention.

The needle bar is pivotally and slidably mounted on an eccentric stud 120 which will be further described below. The eccentric stud is fixed in a boss 122 formed on the needle head. Oscillation of the needle bar may be effected, through a connecting rod 124 that is connected through several joints at one end to an arm 126 extending from the needle bar, and at the other end to a crank pin 128 mounted on a transverse shaft 130. Rotation of the transverse shaft may be effected through a gear 132 secured on the end of the main shaft and meshing with a gear 134 fixed on the transverse shaft.

The needle bar 114 may be shifted laterally or shogged. For the purpose of shogging the needle bar, there is provided a bell crank lever 136 that is pivotally secured to the needle head on a pivot screw 138. On one arm 140 of the crank lever there is a roller 142 extending into a slot 143 (shown in phantom in FIGURE 2) formed on the hub of the needle bar 114. The other arm 144 of the crank lever has a bifurcated end section 146 that embraces a cam 148 mounted on the end of a shaft 150. Rotation of the shaft causes actuation of the crank lever and the shogging of the needle bar.

On the end of the lower horizontal arm 106 there is mounted a work support 154, and a node-forming plunger 156 extends through the work support. A node-former 158 is mounted on the end of the plunger and in the raised position of the work support, the node-former extends above the work support and presses a node of the work into the path of the needle. A spring 160 urges the work support against the work. The node-former and work support are manually retractable for inserting and removing work from the machine by well known means, which do not form part of the present invention.

In the operation of the sewing machine, it is essential that the needle engage the work node at a precise position. The position of the node is determined by the location of the node-former and the work support. The point at which the needle engages the work is determined by the distance between the axis of rotation of the needle bar and the work support. An accumulation of manufacturing tolerances may cause the axis of rotation of the needle bar to be displaced a sufficient amount so that inferior results are obtained in the sewing process.

The present invention provides adjusting means so that the relative position of the axis of rotation of the needle bar with relation to the work support and presser foot may be adjusted in order that the needle may engage the work node in a predetermined position in order to achieve the optimum stitching. This is accomplished in the present invention by the use of eccentric stud 120 having two cylindrical portions 162, 164 separated by a ridge 165 and having different longitudinal axes 166, 168. Cylindrical portion 164 of the eccentric stud is mounted in the boss 122 on the needle head 108 and fixedly positioned by means of a set screw 170 (FIG. 6). The needle bar 114 is rockably mounted on the other cylindrical portion 162. When an adjustment in height of the needle is to be made, the set screw 170 is loosened and the eccentric stud rotated by inserting a screw driver into the slot 172 provided at one end. The adjustment in height of the needle may be varied by over a range equal to twice the eccentricity E of the parallel longitudinal axes.

The double eccentric stud embodiment is shown in FIGURES 9–18. As best shown in FIGURES 9 and 11, a needle head 200 contains bosses 202, 204 which are drilled to receive eccentric studs 206, 208 and to permit them to rotate freely within the bosses. Set screws 210, 212 are provided to lock the studs in position after adjustment has been completed. Yoke-shaped needle bar 214 is pivotally supported by the adjustable eccentric studs. A curved needle 216 is supported in spaced relation to a presser foot 215 and a reciprocable node former 217 and cooperates with looper 219. The needle is mounted in the needle bar 214 by means of a bracket 218 and a clamp 220 which are held to the needle bar by screws 222, 224. The needle bar 214 is moved by the reciprocating action of an arm 226 which is connected to the needle bar by a hip bolt 228 and nut 230 and to a counterweighted crank arm 232 by a wrist pin 234. The counterweighted crank arm is carried by a jack shaft 236 which is journaled in the head 200 and is operated from a main shaft 238 by gears 240, 242.

As shown in FIGURES 10–13 the left eccentric stud 206 has two substantially cylindrical portions 244, 246 having respective longitudinal axes 248, 250 spaced apart distance E'. The larger cylindrical portion 244 is formed about axis 248 and in use is mounted in boss 202. The smaller cylindrical portion 246 is formed about axis 250 and in use cooperates with bore 252 in supporting the needle bar 214. The larger cylindrical portion 244 has two parallel planar segments 254, 256 which provide purchase for rotating the stud 206 to adjust the needle bar and needle position as will be described below.

The right eccentric stud 208, as shown in FIGURES 10, 11, 14 and 15, is similar to the left eccentric stud 206, being comprised of large cylindrical portion 258 and small cylindrical portion 260, which are formed about axes 262, 264, respectively, spaced apart distance E''. Portion 258 has planar segments 266, 268. Additionally stud 208 has a threaded segment 270 and a slot 272 for cooperation with a screw driver, or the like. In use the larger cylindrical portion 258 is mounted in boss 204 while the smaller cylindrical portion 260 cooperates with the bore 274 in needle bar 214. As shown in FIGURE 11, nut 276 cooperates with the threaded portion 270 of the right eccentric stud 208 in positioning the needle bar.

The left eccentric stud 206 and the right eccentric stud 208 may be adjusted individually, but it is preferred that both be adjusted simultaneously in order to prevent binding in the pivotal support for the needle lever. A wrench 278, as shown in FIGURES 16 and 17, is used for carrying out the simultaneous adjustment of the two eccentric studs. The wrench 278 is a substantially U-shaped flat bar having a main portion 280 and two arms 282, 284 parallel to each other and at substantially right angles to the main portion. At the end of each of the arms 282, 284, distal to portion 280 is a slot made up of sides 286, 288, 290. Sides 286 and 288 of the slot cooperate with the planar segments 254, 256 and 266, 268 in adjusting the position of the needle bar 214.

As shown in FIGURE 18 the location of the axis of the eccentric stud portion **244** may be made to appear in any of the positions A, B, C and D. The change in the axis **250** of the cylindrical portion **246** with relation to the work support **215** causes a corresponding change in the position of the needle **216** with respect to the work support. As shown in FIGURE 18, position A' of the needle is reached by rotating the axis **250** to point A. Similarly, position B' of the needle **216**, shown in phantom, corresponds to the position of the axis **250** of the cylindrical portion **246** at position B.

The axis **250** may appear also at point C and would result in a shift to the right of the needle, while a shifting of the axis **250** to position D would cause a shift of the position of the needle to the left.

It is a feature of the present invention that the side-to-side, or right-to-left location of the tip of the needle with respect to the node-forming device may be accomplished in sewing machines in which the needle bar is supported at two points. This is accomplished by longitudinally adjusting the eccentric studs of this invention used as the support shafts for the needle bar. As is best understood from FIGURES 9, 10 and 11, by loosening setscrews **210** and **212** the eccentric studs **206**, **208**, along with the needle bar **214**, may be shifted longitudinally in the direction of the axes of the studs toward one side or the other in the directions indicated by the arrow **292** to bring about the desired alinement of the tip of the needle with respect to the node former **217** and the looper **219**.

As is best shown in FIGURES 11 and 18 when the eccentric studs are positioned at 90° from the vertical, that is, at positions C or D, the needle bar may be positioned along a substantially horizontal plane. Thus, the control of the depth of penetration of the needle may be accomplished because the needle is moved farther away or closer to the needle guide and the work.

The control of deflection may be accomplished by adjusting the position of the needle point so that it presses against a needle guide portion in front of the presser foot to dampen any vibrations.

The terms and expressions which have been employed are used as terms of description and not of limitation, and there is no intention in the use of such terms and expressions of excluding any equivalents of the features shown and described or portions thereof, but it is recognized that various modifications are possible within the scope of the invention claimed.

What is claimed is:

1. In a blind stitch sewing machine having a curved needle mounted in an oscillating needle bar supported in a head in a position relative to a node former, the improvement comprising at least one eccentric stud having first and second cylindrical portions supporting said needle bar in said head, the longitudinal axes of said cylindrical portions being displaced from one another, said first cylindrical portion being mounted in said head and arranged for rotation therein, said second cylindrical portion pivotally supporting said needle bar, whereby rotation of said eccentric stud varies the position of the axis of rotation of said needle bar relative to said node former and thereby varies the position of said needle relative to the node former and the work.

2. In a sewing machine having a node former, an oscillatory needle bar supported in a needle head and a curved pointed needle supported from the shaft in spaced relation to the node former, the improvement comprising an eccentric stud used to support the needle bar, said stud comprising first and second cylindrical portions having first and second axes respectively, said second axis being parallel to and spaced apart from said first axis, said first cylindrical portion being adjustably fixed in the needle head, the needle bar being pivotally supported on said second cylindrical portion, means connected to said second cylindrical portion to retain said needle bar thereon, said eccentric stud further comprising means to rotate said stud, whereby the position of the needle driving shaft relative to the node former may be adjusted causing a corresponding adjustment in the position of the needle with relation to the node former.

3. In a sewing machine having a node former, an oscillatory needle bar supported in a sewing head, and a curved pointed needle supported from the shaft in spaced relation to the node former, the improvement comprising first and second eccentric studs supporting the needle bar, each of said studs having a first cylindrical portion formed about a first axis and a second cylindrical portion formed about a second axis, said second axis being parallel to and displaced from said first axis, each of said first cylindrical portions being adjustably fixed in the sewing head, said needle bar being oscillatably mounted on said second portions of said first and second studs, each of said second cylindrical portions having first and second parallel planar segments whereby the rotation of said studs permits the position of said needle bar relative to the node former to be adjusted, the control of penetration of the needle to be adjusted, the amount of deflection of the needle to be adjusted, and the side-to-side location of the needle point to be adjusted.

4. A sewing machine as defined in claim **3** further comprising detachable means for simultaneously adjusting both eccentric studs so that the position adjustment of the needle bar and needle relative to said node former may be carried out without introducing cant, skewing or misalignment of the parts.

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RICHARD J. SCANLAN, JR., *Examiner.*