

Jan. 17, 1956

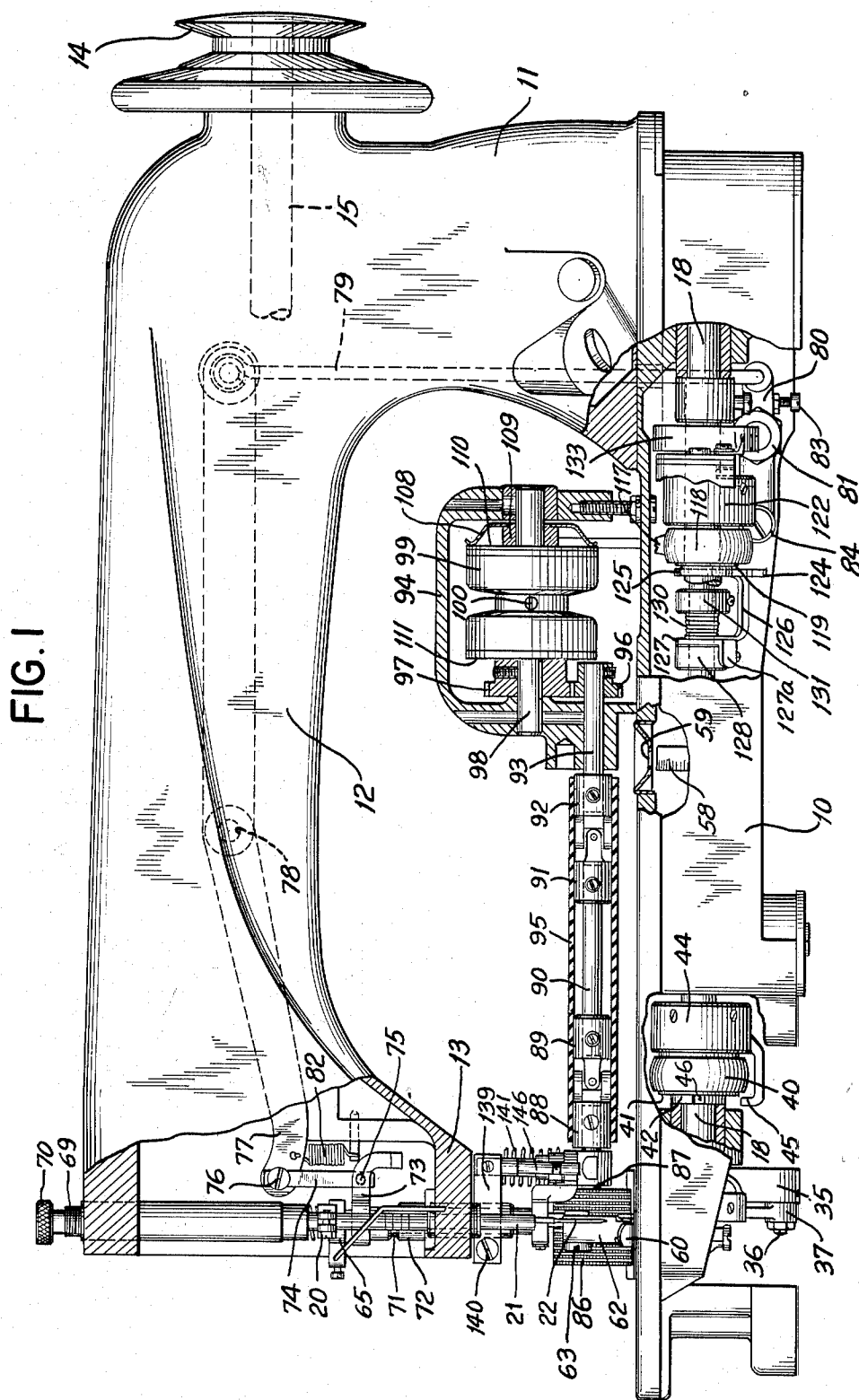
R. A. HAYES ET AL

2,730,977

FEED MECHANISM FOR SEWING MACHINES

Filed July 31, 1953

7 Sheets-Sheet 1



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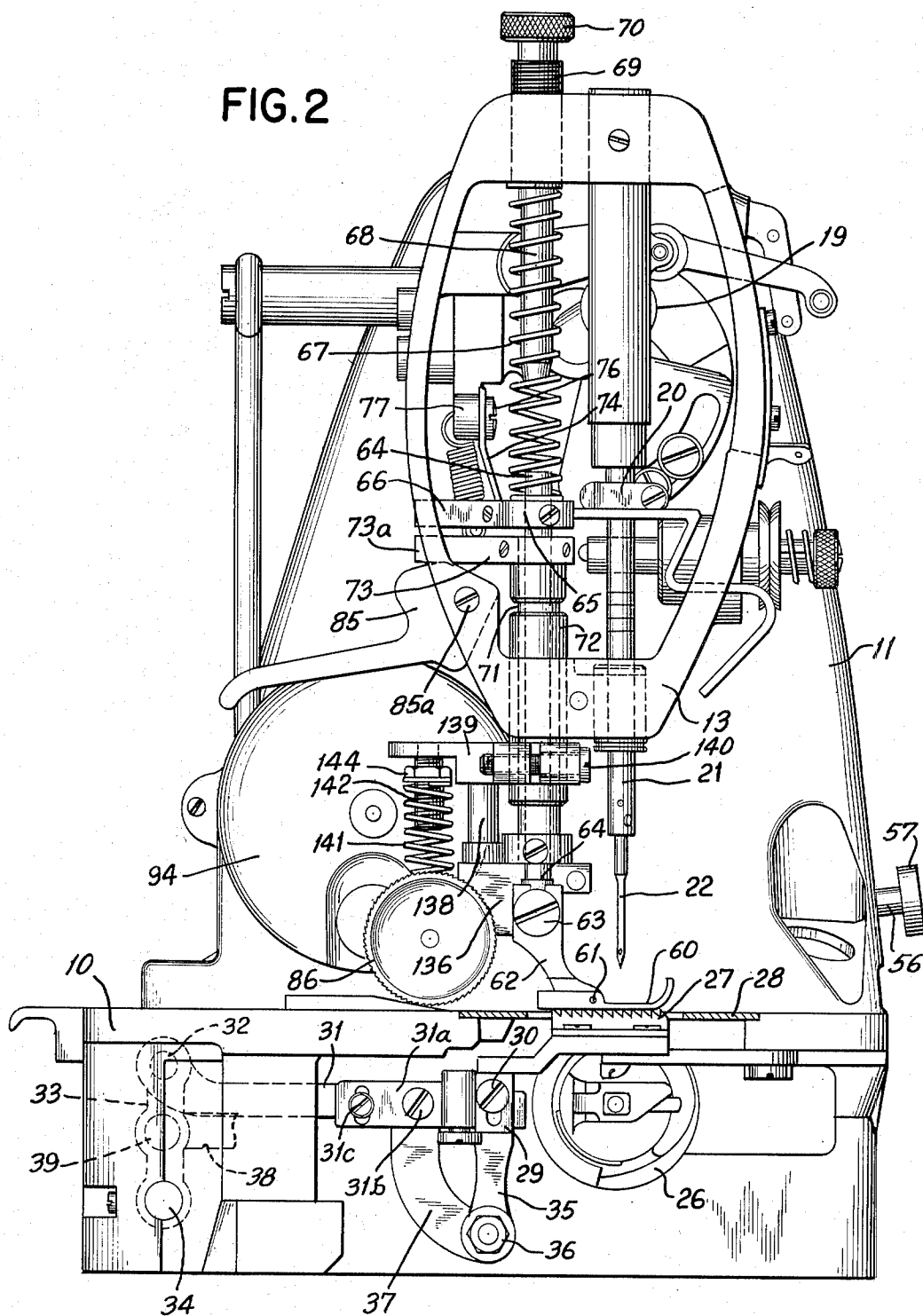
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FEED MECHANISM FOR SEWING MACHINES

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FIG. 2



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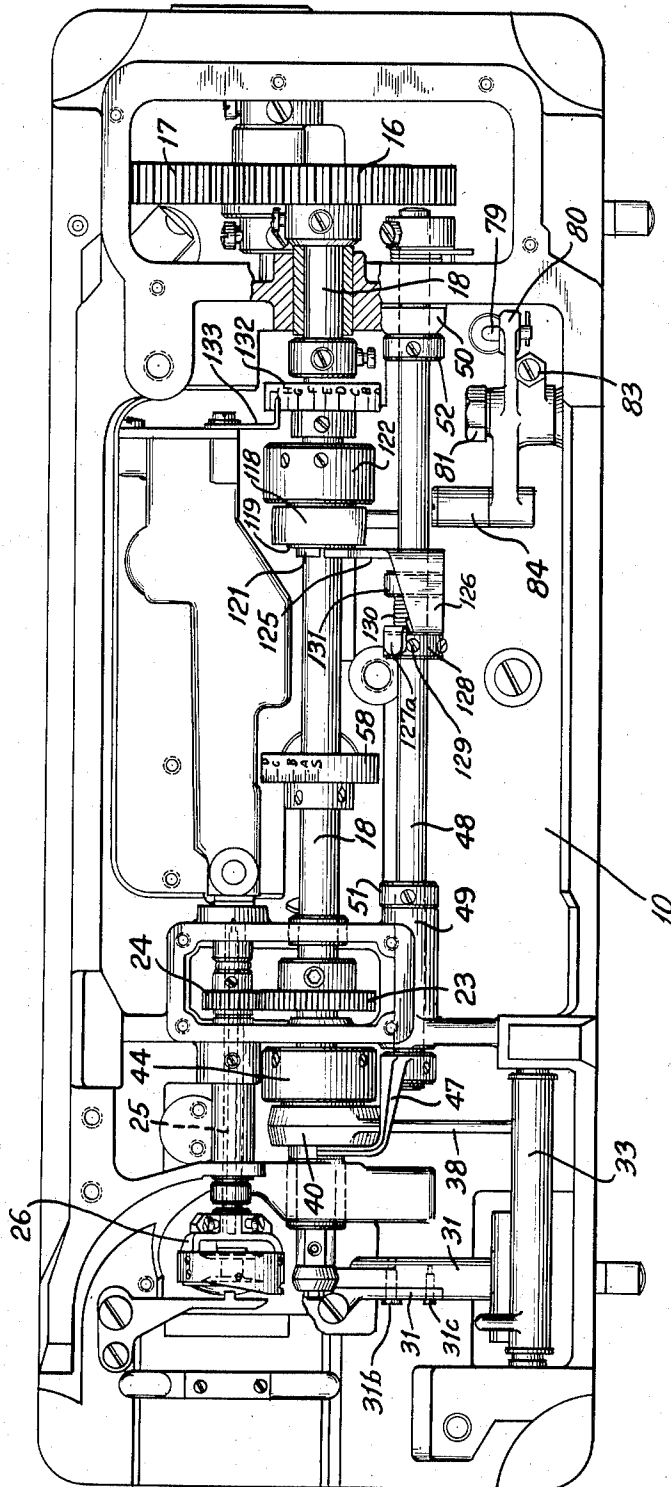
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FIG. 3



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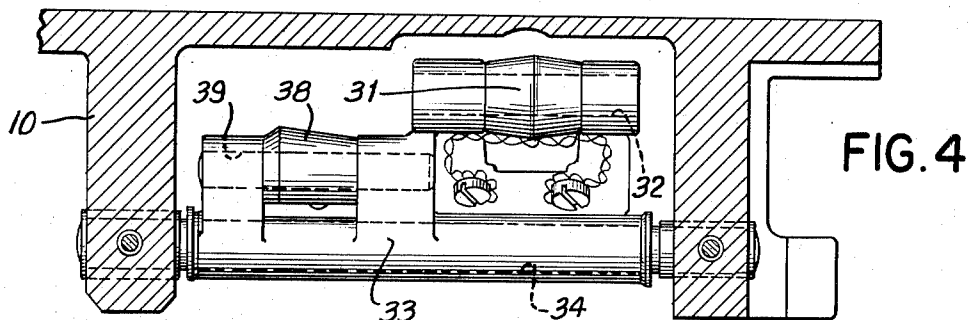
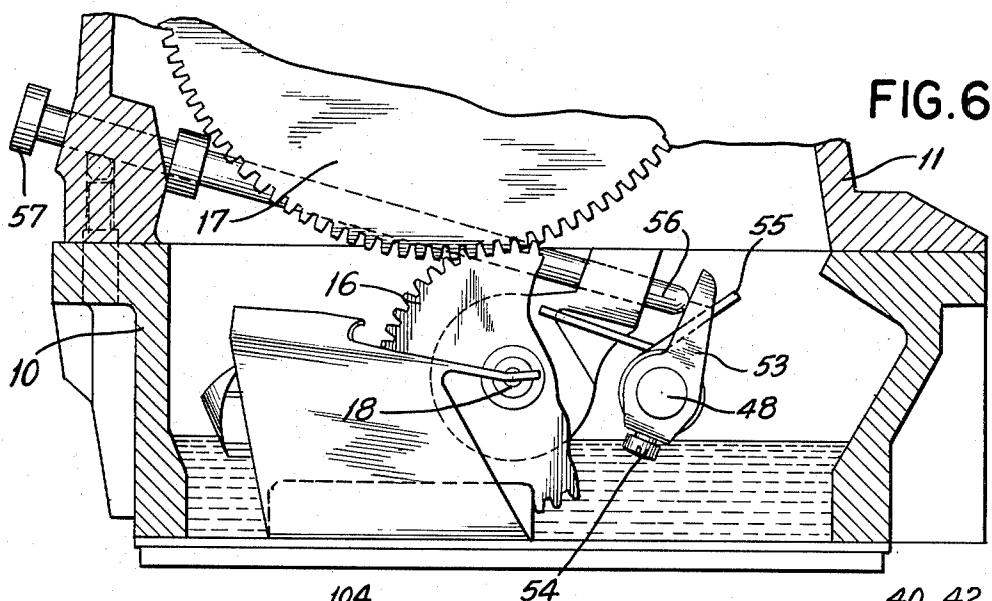
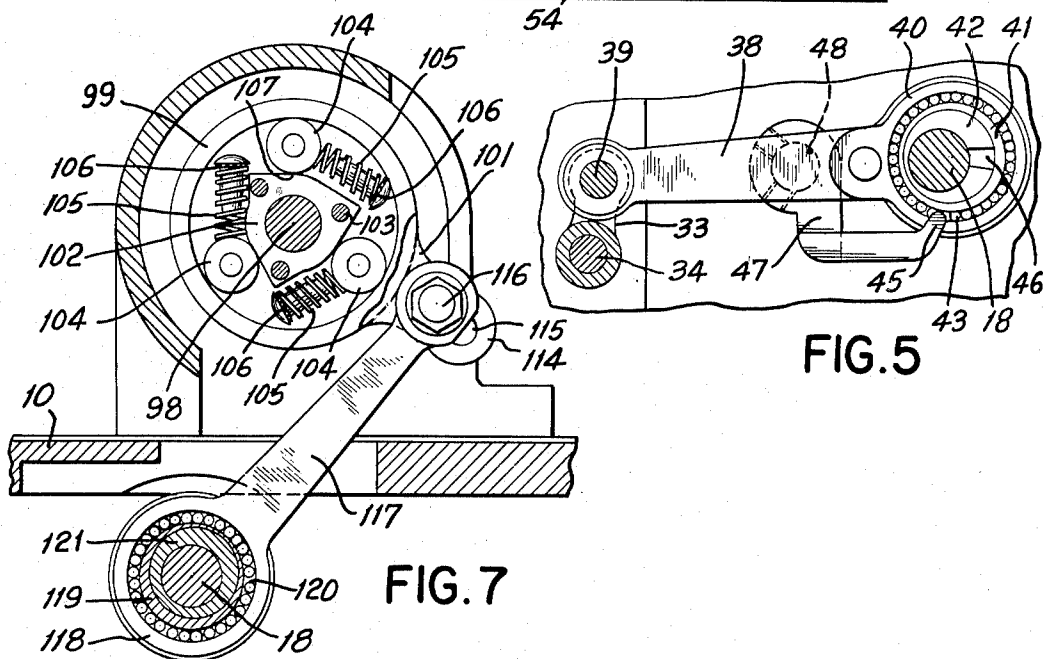
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FIG. 8

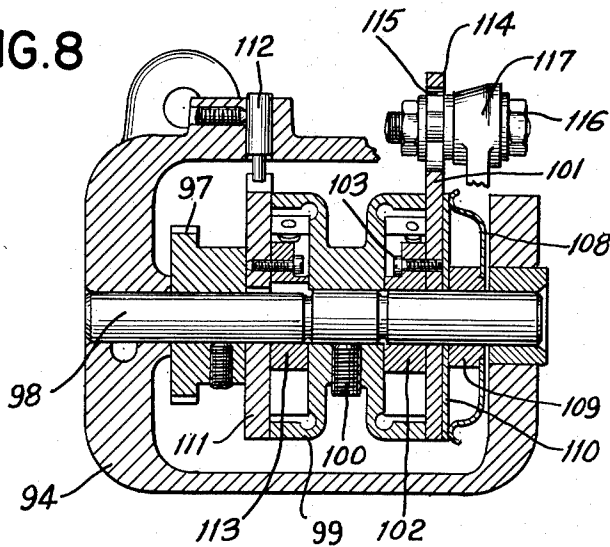


FIG. 9

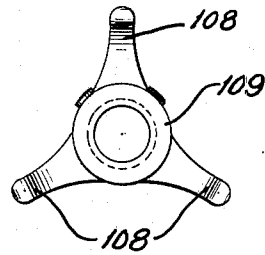


FIG. 10

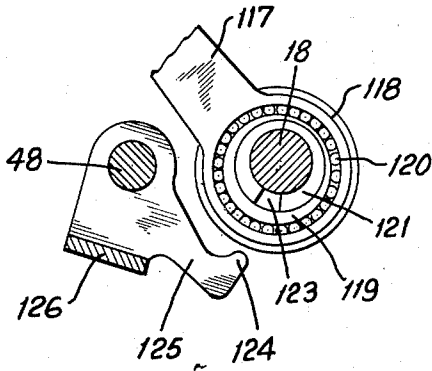


FIG. 11

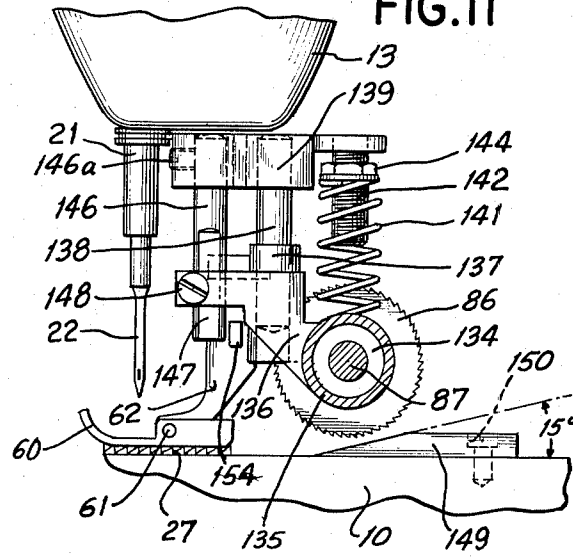


FIG. 12

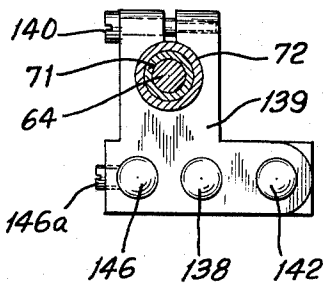


FIG. 13

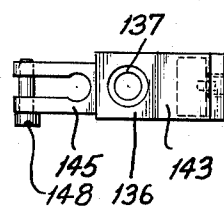
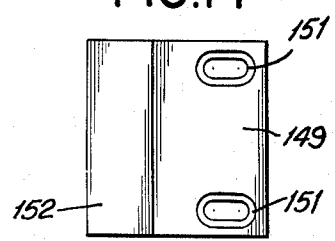


FIG. 14



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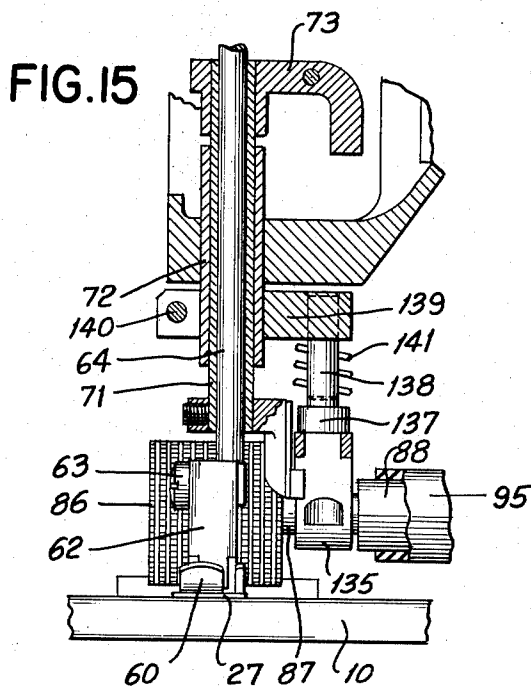


FIG. 16

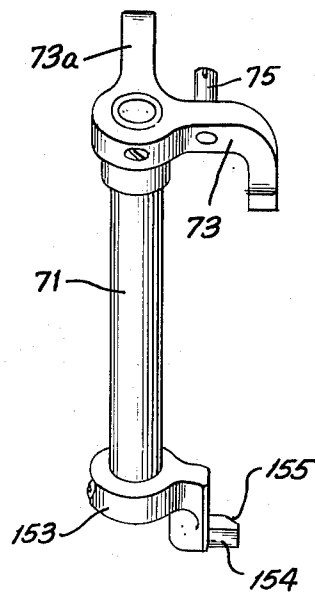


FIG. 17

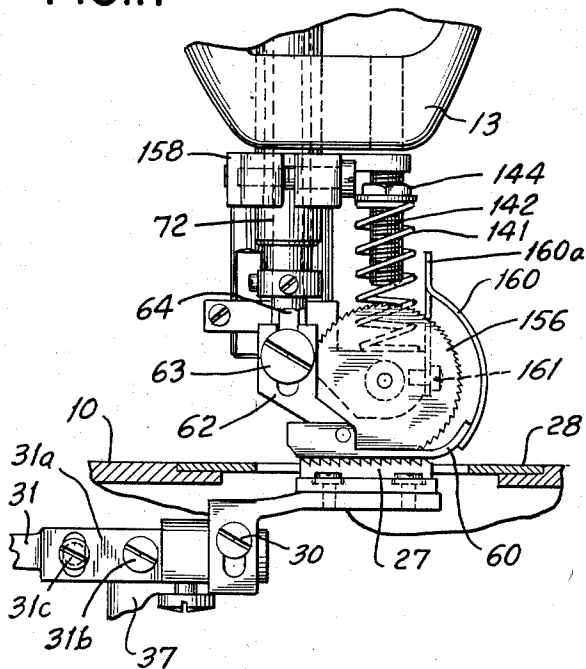
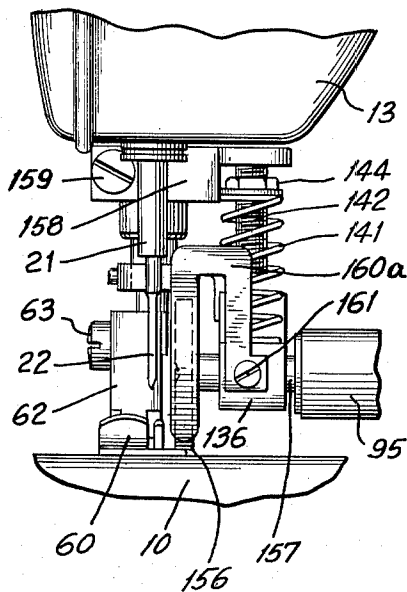


FIG. 18



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FIG. 20

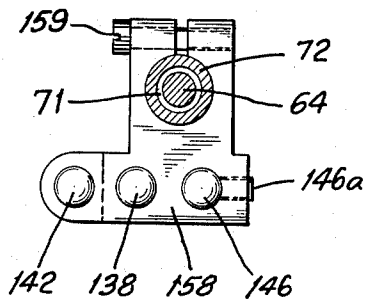


FIG. 19

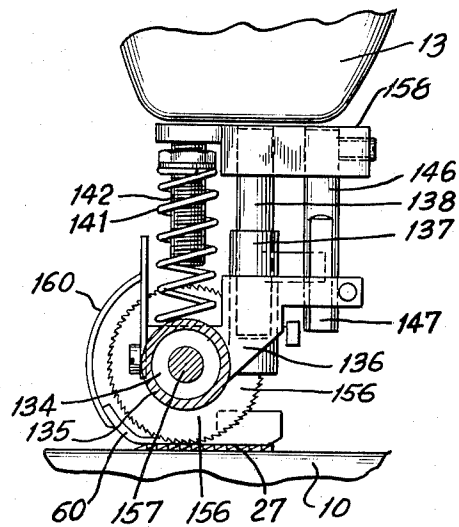
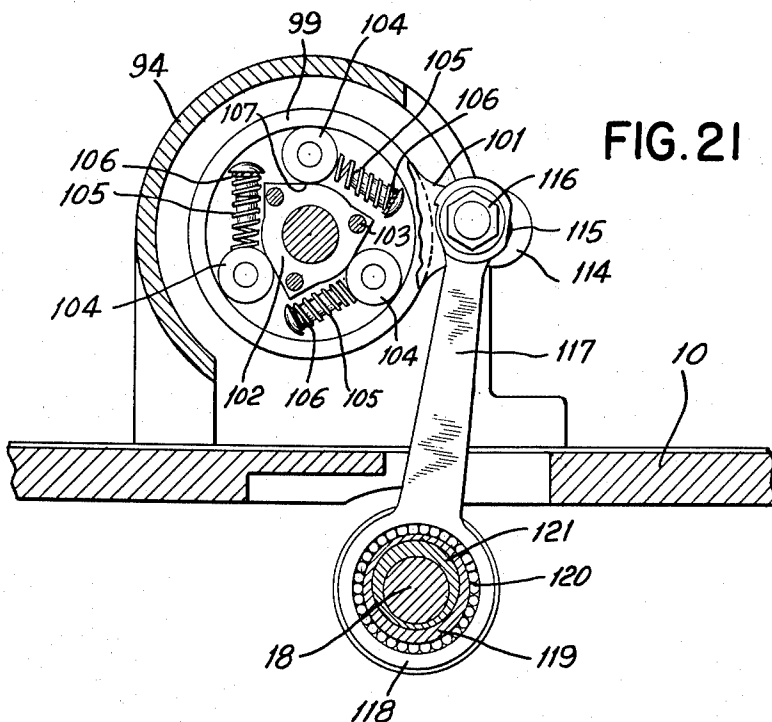


FIG. 21



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FEED MECHANISM FOR SEWING MACHINES

Robert A. Hayes, Franklin Park, and George M. Reimer, Elmwood Park, Ill., assignors to Union Special Machine Company, Chicago, Ill., a corporation of Illinois

Application July 31, 1953, Serial No. 371,475

20 Claims. (Cl. 112—214)

This invention relates to sewing machines and more particularly to improved work feeding mechanisms for such machines, arranged to provide a work feeding action to the work both from above and from below a work supporting surface.

In accordance with the invention a four motion feed dog is provided beneath the work support for intermittently engaging the under surface of the work to advance the same in the region of stitch formation, suitable presser means being provided to urge the work downwardly against the feed dog. A roller is provided above the work support and is urged downwardly against the work to assist in advancing the latter. This roller may be disposed adjacent the line of reciprocation of the needle and at one side of the same, or it may be disposed at some distance in the rear of the needle and arranged to provide a puller action upon the work. The roller is arranged to be driven intermittently in coordination with the feed dog.

A primary object of the invention has been to provide simple, compact and efficient driving connections from a rotary shaft beneath the work support for operating the feed dog and the roller in suitably timed relation and enabling the stroke or length of each intermittent feeding action of the two feed members to be varied readily and independently, thus making it possible to impart different increments of feed by the two members when desired.

An important feature of the invention is the provision of separate adjustable eccentrics on the same rotary shaft for operating the two feed members of the character indicated in properly timed relation, with the ability to adjust readily the extent of eccentricity of each of the eccentrics by a force applied to the handwheel of the machine.

A further important feature is the provision of adjusting means for the two adjustable eccentrics which comprises a pair of detent arms mounted upon a single shaft in a manner enabling independent effective action of the detents. The detents are provided with readily accessible operating means and the arrangement is such that one of the detents may be operated to exert its control without operation of the other detent. While both detents may be operated by one of the operating means, only one of them is rendered effective upon such operation. Adjustment of either eccentric may be effected by turning the handwheel as the related detent is active.

Another feature of the invention is the provision of means for cooperation with the roller feed member to assist its operation. This means is stationary and eliminates the necessity of providing an idler roller or a driven roller to cooperate with the top feed roller in advancing the work. The arrangement is such that cross seams in the work are caused to pass readily and smoothly beneath the feed roller and there is no tendency to cut into or otherwise damage the cross seams or to produce bunching of the work.

A still further feature of the invention is the provision of simple but effective means for lifting the feed roller and also a presser bar which cooperates with the feed dog

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in advancing the work. This means may be operated manually or by a knee press or treadle, and includes a sleeve surrounding the presser bar adapted, after a limited idle movement, to lift the presser bar and the feed roller. The arrangement is such that the presser bar and feed roller may be lifted independently of each other in the normal course of movement of the work beneath them.

Still another feature of the invention is the provision of a novel arrangement for supporting, guiding and applying spring pressure to the top feed roller of the machine. This arrangement is such that by the substitution of only a few parts and the rearrangement of other parts the construction may be adapted for use with a roller arranged to provide a feeding action alongside of the presser foot and needle or for use with a puller roller in rear of the presser foot and needle.

Other objects, features and advantages of the invention will appear from the detailed description which will now be given in conjunction with the accompanying drawings, in which:

Fig. 1 is a view partly in front elevation and partly in vertical section through a sewing machine embodying the invention;

Fig. 2 is an end elevational view of the machine, as seen from the left in Fig. 1, the needle head cover plate being removed;

Fig. 3 is a bottom plan view of the machine with certain cover plates removed;

Fig. 4 is a longitudinal sectional view through a portion of the frame showing the feed rocker as seen from the back of the machine;

Fig. 5 is a detail view, partly in elevation and partly in section, showing the eccentric and related connections for operating the feed rocker;

Fig. 6 is a transverse, vertical section through the lower portion of the vertical standard and base of the machine;

Fig. 7 is a detail view, partly in elevation and partly in section, showing the eccentric and a one-way clutch forming part of the connections for driving the feed roller;

Fig. 8 is a horizontal sectional view through the one-way clutch and related means forming part of the connections for driving the feed roller;

Fig. 9 is a face view of a spring member embodied in the one-way clutch unit;

Fig. 10 is a vertical section through the eccentric for operating the feed roller and the detent means provided for adjusting the eccentric;

Fig. 11 is a detail view, partly in front elevation and partly in section, showing the mounting of the feed roller on the needle head of the machine;

Fig. 12 shows a bracket forming part of the mounting means for the feed roller, certain related parts being shown in section;

Fig. 13 is a detail view in plan of a supporting member for the feed roller;

Fig. 14 is a plan view of a block carried by the work support to cooperate with the feed roller in advancing the work;

Fig. 15 is a view partly in front elevation and partly in vertical section through the roller mounting means;

Fig. 16 is a perspective view of a presser bar and feed roller lifting member;

Fig. 17 is a view, partly in end elevation and partly in section, of a portion of a modified machine and shows mounting means for a different form and arrangement of the feed roller;

Fig. 18 is a front elevational view of the modified construction of Fig. 17;

Fig. 19 is a view, partly in elevation and partly in vertical section, of the mounting means of Fig. 17 as viewed from the opposite side;

Fig. 20 is a plan view of a modified bracket member

employed in the mounting of Figs. 17 to 19 inclusive, certain related parts being shown in section; and

Fig. 21 is a view similar to Fig. 7, showing the relationship of the one-way clutch and the roller driving eccentric for the modified construction.

Referring now to the drawings, the invention has been illustrated as applied to a lockstitch sewing machine of the general character disclosed in the patent to Beck et al. No. 2,544,549, granted March 6, 1951. It comprises a main frame having a work supporting base 10 (Fig. 1), a vertical standard 11 and an overhanging arm 12 terminating in a needle head 13 positioned over the work supporting base in the region of stitch formation. Power is supplied to the machine through a combined handwheel and pulley 4 secured to a shaft 15 journaled in suitable bearings in the upper portion of the vertical standard and in the overhanging arm. This shaft extends longitudinally of the arm and into the needle head. Within the vertical standard suitable gearing, including gears 16 and 17 (Figs. 3 and 6), serves to connect the shaft 15 with a shaft 18 in the base. The shaft 18 extends longitudinally of the base and is driven in synchronism with the shaft 15.

Within the needle head the shaft 15 carries a needle bar driving crank 19 which is connected by a link or pitman (not shown) with a collar 20 secured to a needle bar 21. The latter is mounted in suitable bearings for vertical reciprocation in the needle head and carries at its lower end a needle 22. In the base of the frame a gear 23 secured to the shaft 18 meshes with a pinion 24 secured to a shaft 25 which carries at its outer end a rotary hook 26. Gearing 23, 24 is such that shaft 25 is given two revolutions for each revolution of shaft 18. As will be understood, the rotary hook embodies a rotary component having a needle thread seizing beak or point which, upon alternate revolutions of the hook, seizes the loop of needle thread as the needle 22 starts to rise from its lowermost position in which its thread carrying eye is below the work supporting surface.

A four motion feed dog 27 is provided in the region of stitch formation for intermittently advancing the work. This feed dog is arranged to be elevated and lowered through a suitable opening in a throat plate 28 and is given feed and return movements in said opening in properly timed relation to the stitch forming devices. The feed dog 27 is carried by a member 29 having a vertically elongated opening which receives a screw 30 for adjustably mounting the feed dog on the forward portion 31a of a two part feed bar 31. Portion 31a of the feed bar is pivoted upon a screw stud 31b carried by the rear portion of the feed bar and is adapted to be retained in adjusted position by means of a screw 31c. This pivotal connection of the two parts of the feed bar enables tilting of the feed dog to a limited extent in either direction from the horizontal. Feed bar 31 is pivotally mounted at 32 upon a feed rocker 33 rockably mounted on a fixed shaft 34. Lifting and lowering movements are imparted to the feed dog by means of an eccentric (not shown) at the left end, Fig. 1, of the shaft 18 which cooperates with a strap at the upper end of a pitman 35, the lower end of which is connected by a bolt 36 to a downwardly extending arm 37 of the feed bar 31.

Feed and return movements are imparted to the feed rocker by means of an adjustable eccentric which may suitably be of the type disclosed in the pending application of George M. Reimer, Ser. No. 150,843, filed March 21, 1950, now Patent No. 2,643,625 granted June 30, 1953. This is in part illustrated in Figs. 1, 3, and 5, of the present drawings. A pitman 38 is pivotally connected with the feed rocker by means of a pin 39 and carries a strap 40 at its opposite end which surrounds a pair of telescoping eccentrics 41 and 42 carried by the shaft 18. Between the strap 40 and the outer surface of eccentric 41 there is preferably provided needle bearing means 43. The outer eccentric 41 is connected, through suitable key means of the character shown in said Reimer application, with a housing 44 se-

cured to the shaft 18. This arrangement is such that the eccentric 41 will rotate at all times with the shaft 18, but it may be shifted transversely of the shaft upon adjustment of the eccentric in the manner to be explained. Inner eccentric 42 is capable of being turned relative to the shaft 18 and to the eccentric 41 by engaging a finger 45 with a notch 46 provided in a portion of the inner eccentric which extends beyond the outer eccentric. Finger 45 is carried by an arm 47 secured to a rock shaft 48 suitably journaled in a pair of bearing bosses 49 and 50 formed on the base of the machine frame. Collars 51 and 52 secured to the shaft 48 prevent axial movement of the latter. Within that portion of the base beneath the vertical standard an arm 53 is secured to the shaft 48 by means of a set screw 54. A spring 55 coacting between a portion of the frame and a lateral extension of the arm 53 normally urges the latter in a counterclockwise direction, Fig. 6, against the inner end of a rod 56. The latter carries at its outer end, at the front of the vertical standard, an operating button or knob 57. When the latter is pressed inwardly by the thumb of the operator it rocks the shaft 48 to carry the finger 45 against the outer periphery of the cam 42. If the handwheel 14 is now turned, the notch 46 in the eccentric may be brought opposite the finger and the latter may be forced into the notch by further pressure on the knob. At this time the handwheel may be turned to a limited extent in either direction to bring about relative angular adjustment of the two eccentrics. It will be understood that the inner eccentric is now held against turning while the outer eccentric turns with the shaft 18. The relative positions of the two eccentrics may be indicated by a wheel 58 secured to the shaft 18 which carries indicia that may be viewed through an opening 59 in the work supporting surface of the base. The indicia on the wheel 58 may be of a character to indicate stitch length. After the proper adjustment has been effected, pressure on the knob 57 may be released and the spring 55 will then retract the detent finger 45 from the notch 46. Subsequent turning of the shaft 18 will cause the two eccentrics to rotate together. The friction between the cooperating surfaces of the eccentrics, and between the inner eccentric and the shaft, may be adequate to insure this, but preferably additional friction means, such as that disclosed in said Reimer application, should be provided.

Cooperating with the feed dog in advancing the work is a presser foot 60 pivoted at 61 upon a shank member 62 secured by a screw 63 to the lower end of a presser bar 64. The latter, as best shown in Fig. 2, carries a collar 65 adjacent its upper end, this collar being provided with a laterally extending finger 66 which cooperates with a slot in the needle head to prevent turning of the presser bar. A spring 67 surrounding the upper end of the presser bar and acting against the upper surface of the collar 65 serves to urge the presser bar downwardly to engage the presser foot with the feed dog or the interposed work. Spring 67 is held in place by a pin 68 extending downwardly from the top of the needle head as a part of a screw threaded sleeve 69 which may be turned in a threaded opening in the top of the needle head by means of a knob 70, to adjust the vertical position of the sleeve. Spring 67 cooperates with the lower end of the sleeve and hence adjustment of the latter serves to vary the pressure exerted by the spring.

Referring now to Fig. 15, it will be seen that the presser bar 64 is surrounded by a sleeve 71 which in turn is surrounded by a sleeve 72. The latter is fixedly mounted in the bottom of the needle head while the sleeve 71 is capable of vertical sliding movement within the sleeve 72, and the presser bar 64 is capable of vertical sliding movement within the sleeve 71. At its upper end the sleeve 71 carries a member 73 (Fig. 16) having a laterally extending finger 73a arranged to cooperate with a slot in the needle head to prevent turning of the sleeve

71. The lower end of a link 74 (Figs. 1 and 2) is con-

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ected with the member 73 by means of a pin 75. At its upper end the link 74 is connected by a screw stud 76 with the end of a presser bar lifting lever 77 pivoted at 78 in the overhanging arm. The opposite end of the lever 77 is connected by means of a rod or link 79 with an arm 80 of a rock member carried by a bolt 81 extending inwardly from the base portion of the machine frame. A spring 82 in the needle head, connected at one end with the lever 77 and at its other end with a pin carried by the needle head, serves to rock the lever 77 in a counterclockwise direction (Fig. 1) to the extent permitted by a suitable stop, such as provided by a set screw 83 carried by the arm 80 arranged to cooperate with a fixed shoulder on the frame. This set screw determines the normal position of the parts including the sleeve 71. Rocking of the lever 77 to lift the sleeve 71 may be accomplished through suitable connections from a knee press or treadle acting upon a pin 84 extending laterally from the rock member which carries the arm 80. A suitable knee press control for this purpose is shown, for example, in the patent to Rubel, No. 2,373,418, granted April 10, 1945. Manual means may be provided in addition to, or in lieu of, the knee press or treadle control. For this purpose a cam lever 85 (Fig. 2) may be pivotally mounted on the needle head by means of a screw stud 85a. The cam forming part of this lever is arranged to cooperate with the extension 73a of the member 73 secured to the upper end of the sleeve 71. Lifting of the lever 85 will thus cause the cam portion thereof to lift the sleeve 71. As the sleeve 71 is lifted by any of the means described, the member 73 will be brought into engagement with the collar 65 and further upward movement of the sleeve will thereby lift the presser bar and its connected presser foot.

Cooperating with the work in rear of the presser foot and extending across the line of stitch formation is a feed roller 86 adapted to apply a puller action to the work. This feed roller is mounted on and connected for rotation with a shaft 87 to which is secured one member 88 of a universal coupling. The other member 89 of this coupling is secured to a shaft 90 which at its opposite end carries a member 91 of a second universal coupling having its other member 92 secured to a shaft 93 journaled in a housing 94 of a one way clutch unit. The members 88 and 92 and the intervening connections may suitably be enclosed within a sleeve 95 formed of any suitable flexible material or otherwise arranged to provide the necessary freedom of movement of the parts. Secured to the shaft 93 within the housing 94 is a pinion 96 which meshes with a gear 97 secured to a shaft 98 also journaled in the housing. A double cup-shaped member or barrel 99, forming part of the one way clutch unit, is secured by means of a screw 100 to an eccentric portion of the shaft 98. The one way clutch unit may suitably be of the construction illustrated and described in the patent to Schoij, No. 2,494,006, granted January 10, 1950. As explained in said patent, the construction and arrangement of the parts is such as to bring about variation in the wear receiving surfaces of the unit. Furthermore by turning the clutch barrel from time to time in relation to the eccentric portion of the shaft, the regions of the several wear receiving surfaces which are active in the course of operation of the machine may be further varied.

A plate 101 is mounted for oscillatory movement on the shaft 98 through an arc related to the feed stroke to be imparted to the feed roller. Secured to the plate 101 is a block 102 having the configuration shown in Fig. 7, this block being secured to the plate by means of three screws 103. Coacting between the outer peripheral surfaces of the block 102 and the inner cylindrical surface of the adjacent cup of the barrel 99 are three rollers 104, which are urged by springs 105 in a counterclockwise direction (Fig. 7). Springs 105 are carried by pins extending from lugs 106 integral with,

or otherwise secured to, the plate 101. The arrangement is such that as the block 102 is rocked in a clockwise direction (Fig. 7) by means of the plate 101, the rollers 104 will become wedged and will impart this movement to the barrel 99. As the block 102 is rocked in the opposite direction, the wedging action upon the rollers will be released and no appreciable turning force will be imparted to the barrel. This is due to the configuration of the portions 107 of the outer peripheral surfaces of the block, as is more fully explained in said Schoij patent. To prevent overthrow of the barrel 99 and connected shaft 98, as the latter are driven by the block 102, a spider-like spring element having three arms 108 is provided. These arms are secured to a hub 109 which in turn is secured to the shaft 98. The ends of the spring arms bear upon a friction face 110 carried by the adjacent face of the plate 101.

To prevent movement of the barrel 99 and shaft 98 in the reverse direction, as the plate 101 is given its return movement, a plate 111 is provided adjacent the outer end of the other cup of the barrel 99. Plate 111 is freely mounted on the shaft 98 and is held against rotation with the latter by means of a pin 112 carried by the housing 94. A block 113, similar to block 102, is secured to the plate 111, and rollers and springs similar to those designated 104 and 105 in Fig. 7 are provided to coact with the block 113 and the adjacent cup of the barrel 99.

For oscillating the plate 101 the latter is provided with an arm 114 having an elongated slot 115 which receives a bolt 116 by means of which the upper end of a pitman 117 is pivotally connected with the arm. The arrangement is such that a slight adjustment is permitted in the location of the bolt 116 along the slot 115 to vary the extent of movement imparted to the plate 101 upon longitudinal movement of the pitman 117. At its lower end the pitman 117 is provided with a strap 118 surrounding an eccentric 119 carried by the shaft 18. Needle bearing elements 120 are preferably provided between the strap and the periphery of the eccentric. Eccentric 119 is one of a pair of telescopically arranged eccentrics, the other eccentric 121 of the pair being mounted directly on the shaft 18. The construction and arrangement of these eccentrics may be the same as for the eccentrics 41 and 42. Eccentric 119 is keyed to a housing 122 for rotation therewith but in a manner permitting relative transverse movement. Housing 122 is secured to the shaft 18 and thereby causes rotation of eccentric 119 at all times with the shaft 18. Eccentric 121, however, may be turned relative to the shaft 18 and to the eccentric 119 to a limited extent. Normally the two eccentrics turn together with the shaft 18 due to the friction between the parts, as explained in relation to the eccentrics 41 and 42. However, when it is desired to effect a relative adjustment between the eccentrics 119 and 121, a notch 123 in a portion of eccentric 121 which extends axially beyond eccentric 119 may be engaged by a finger 124 to prevent turning of the inner eccentric as the shaft 18 and the outer eccentric are turned by manual turning of the hand-wheel 14. Finger 124 is carried by an arm 125 (Figs. 1, 3 and 10) of a bracket member rockably mounted on the rock shaft 48. This bracket member has a connecting bar 126 extending from the arm 125, the bar having its other end integrally connected with another radially extending arm 127 rockable on the shaft 48. Arm 127 has an overturned portion or finger 127a extending over a collar 128 secured to the shaft 48. The portion or finger 127a is normally urged against a stop 129, carried by the collar 128, by means of a spring 130 surrounding the shaft 48. One end of this spring is held by a collar 131 secured to the shaft and the other end coacts with the bar 126 to urge the bracket member in the direction indicated, i. e. clockwise in Fig. 10.

The foregoing arrangement is such that upon the rocking of the shaft 48 by inward pressure on the knob or button 57, the finger 45 may be engaged with the notch

43 of eccentric 42 while the finger 124 will still be held spaced slightly from the surface of eccentric 121 and will not become engaged with notch 123. By way of example, the normal distance between finger 45 and the periphery of eccentric 42 may be about $\frac{1}{8}$ in., while the normal distance between finger 124 and the periphery of eccentric 121 may be between $\frac{1}{4}$ " and $\frac{5}{16}$ ".

When it is desired to adjust the eccentrics 119 and 121, the finger 124 may be engaged with notch 123 by simply rocking the arm 125 through manual pressure applied directly to this arm or to the connecting bar 126. Such movement of the arm is permitted by its mounting on the shaft 48, and when proper adjustment of the eccentric has been accomplished, the arm will be restored to its normal position by the spring 130. It will be understood that the knob 57 is not pushed inwardly at this time, so that the shaft 48 remains in its normal position and the finger 45 is out of engagement with the eccentric 42.

To indicate the relative adjustment of the eccentrics 119 and 121, an indicator wheel, 132 is secured to the shaft 18, adjacent the housing 122, and cooperates with an index 133 secured to the frame. The indicia on the wheel 132 may be correlated to stitch length. As will be seen, the feed actions of the feed dog and feed roller are capable of independent adjustment and may be made to coincide or to differ in their extents, as desired, for any particular operation.

Feed roller 86 is mounted for vertical movement toward and from the work supporting base. For this purpose the shaft 87 connected with the roller is journaled in a bearing sleeve 134 (Fig. 11) carried by a cylindrical portion 135 of a support member 136. The latter has adjacent its center a vertically extending opening in which is fitted a sleeve 137. This sleeve is mounted for vertical sliding movement on a pin 138 carried by and extending downwardly from a bracket 139. The latter, as best shown in Fig. 12, has a split portion providing a cylindrical opening adapted to be fitted over the lower end of the fixed sleeve 72 carried by the needle head. A clamping screw 140 is provided to clamp the bracket 139 to the sleeve 72. For urging the feed roller downwardly toward the work there is a spring 141, retained at its upper end by a screw threaded stud 142 and bearing at its lower end against the support 136. The latter is provided with a flat surface 143 directly over the shaft 87 so that the pressure of the spring is exerted downwardly on the feed roller support in vertical alinement with the axis of the roller. A nut 144 adjustably mounted on the stud 142, and against which the upper end of the spring 141 bears, may be turned to vary the pressure of the spring 141. Support member 136 has a forked extension 145 arranged to straddle a guide pin 146 extending downwardly from the bracket 139. This pin, which serves to prevent turning of the support member 136 about the pin 138, is provided with flat faces 147 at its opposite sides for cooperation with the inner faces of the forked extension 145. A clamping screw 148 may be adjusted to provide the desired sliding clearance between the forked extension 145 and the pin 146. To retain the pin 146 firmly in the bracket 139 in a position to present the flat surfaces 147 for proper cooperation with the forked extension 145, a set screw 146a is preferably provided.

Beneath the feed roller there is secured to the work supporting surface of the base a block 149, best shown in Figs. 11 and 14. This block is secured to the base of the frame by means of screws 150 cooperating with elongated openings 151 in the block, which permit adjustable positioning of the latter. The forward end of the block 149 is of knife-like or wedge-like form and is provided with an upwardly inclined surface 152 arranged for cooperation with the feed roller as the latter is urged downwardly by the spring 141. The surface 152 is preferably at an angle of about 15° to the horizontal, although this angle may be varied somewhat, as for example between 10° and 20° to

the horizontal. It has been found that the provision of this inclined surface, which extends from a vertical plane slightly forward of the shaft 87 to a plane some distance rearwardly of said shaft, assists materially in the feeding action of the feed roller and prevents the tendency of the latter to cut into or cause bunching of the work as cross seams are encountered. It eliminates the necessity of an idler roller beneath the feed roller for cooperation therewith in advancing the work.

If desired, a stop (not shown) may be provided to coast between the sleeve 137 and pin 138, or between forked extension 145 and pin 146, for limiting the extent of downward movement of the feed roller support. This may be so arranged that the feed roller will be held spaced slightly from the inclined surface 152 in the absence of work between these parts, but the spacing should not be greater than the minimum thickness of the work to be passed through the machine.

Provision is made for lifting the feed roller whenever desired under manual or knee press or treadle control, to facilitate introduction and removal of work. For this purpose the sleeve 71, Fig. 16, is provided with a collar 153 at its lower end having a downwardly extending portion carrying a laterally extending projection 154. The latter fits into the space between the pin 146 and the central portion of the support 136 which carries the sleeve 137. Preferably the end of the projection 154 is tapered to provide an inclined face 155 thus permitting the end of the projection to fit into the relatively narrow space indicated, while providing adequate thickness of the projection at its point of connection with the downward extension of collar 153 to afford strength. It will be apparent that upon lifting of the sleeve 71 through the operation of the knee press controlled arm 80, or the manual lever 85, the projection 154, after a limited upward movement, will engage the under surface of forked extension 145 of the feed roller support and will lift the latter vertically along the pin 138 for the purpose indicated. This may occur simultaneously with the lifting of the presser bar or may be somewhat more delayed so that the presser bar may be lifted slightly without lifting the feed roller.

Referring now to Figs. 17 to 20 inclusive, a modified arrangement is illustrated in which the feed roller is positioned at one side of the presser foot and feed dog. This feed roller is relatively narrow. It is provided with a supporting shaft 157 arranged to be connected with the one way clutch unit in the same manner as the shaft 87 of the first described embodiment. Only slight change is required in the supporting means for the modified roller. The same support member 136 may be employed as in the first embodiment, but the position of this is reversed so that the bearing for the shaft 157 is forward of the presser bar while the guide pin 146 is rearward of the presser bar. A bracket 158 similar to bracket 139 but of reverse form is secured to the lower end of the fixed sleeve 72 by means of a clamping screw 159. Except for the reversal of the position of the screw threaded stud 142 and guide pin 146, the mounting means is the same as for the first embodiment.

To prevent accidental movement of one of the fingers of the operator into the zone of operation of the feed roller 156 as work is fed and guided toward the point of stitch formation, a guard finger 160 is provided in front of the feed roller. This guard finger has an arcuate part spaced slightly from the periphery of the roller and has a shank portion 160a attached by means of a screw 161 to the forward end of the support member 136.

It will be understood that the modified machine may be of the same construction as the machine illustrated in Figs. 1 to 16 inclusive, apart from the differences noted above. Feed roller 156 cooperates with the work at one side of the point of stitch formation and feeds the work along a smooth, flat portion of the top of the throat plate. The wedge block 149 of the first embodiment is omitted.

In the modified construction, the one-way clutch unit

is mounted on the work supporting arm in a more forward position than for the wide roller construction. This is to bring the axis of roller 156 into substantial alignment with the axis of the shaft 93 of the clutch unit. As a result, the pitman 117 is inclined somewhat less to the vertical, as shown in Fig. 21, and the arm 114 of the operating plate of the clutch extends more nearly horizontally.

The two eccentric units 41, 42 and 119, 121 are preferably displaced angularly about the shaft 18 in relation to each other. This is to place the point of maximum eccentricity of the first unit along the axis of pitman 33 at the same time that the point of maximum eccentricity of the second unit is along the axis of pitman 117. For this purpose the extent of angular displacement will differ somewhat as between the embodiment of Figs. 1 to 16 and that of Figs. 17 to 21. The relative angular positions of the two units should, preferably, be such as to cause feed movements to be imparted substantially simultaneously to the feed dog and the feed roller. For the puller roller embodiment the angular displacement of the units is between 120° and 150°, whereas for the second embodiment, having the roller adjacent the presser foot, the displacement is between 90° and 110°.

While an illustrative embodiment of the invention and a modification thereof have been disclosed in considerable detail, it will be understood that various changes may be made in the construction and arrangement of the several parts, without departing from the general principles and scope of the invention. The novel features may be applied to machines of other types than that illustrated.

What is claimed is:

1. In a sewing machine having a frame including a work supporting base and an overhanging arm carrying a needle head over said base, and a rotary shaft extending longitudinally of said base, the combination of a four motion feed dog in said base, connections from said shaft to said feed dog for imparting work advancing and return movements and lifting and lowering movements to said feed dog, said connections including a first pair of telescopically arranged and relatively angularly adjustable eccentrics on said shaft by which the feed stroke of said feed dog may be varied, a feed roller above said base yieldingly urged toward the work supporting surface thereof, and connections from said shaft to said roller for imparting intermittent rotation thereto, said last mentioned connections including a second pair of telescopically arranged and relatively angularly adjustable eccentrics on said shaft by which the extent of intermittent movements of said roller may be varied, said eccentrics of said second pair being displaced angularly about said shaft in relation to the eccentrics of said first pair.

2. In a sewing machine having a frame including a work supporting base and an overhanging arm carrying a needle head over said base, and a rotary shaft extending longitudinally of said base, the combination of a four motion feed dog in said base, connections from said shaft to said feed dog for imparting work advancing and return movements and lifting and lowering movements to said feed dog, said connections including a pair of telescopically arranged and relatively angularly adjustable eccentrics on said shaft by which the feed stroke of said feed dog may be varied, a feed roller above said base yieldingly urged toward the work supporting surface thereof, connections from said shaft to said roller for imparting intermittent rotation thereto, said last mentioned connections including a pair of telescopically arranged and relatively angularly adjustable eccentrics on said shaft by which the extent of intermittent movements of said roller may be varied, and detent means associated with each of said pairs of eccentrics arranged to enable relative angular adjustment of the eccentrics of each pair upon turning of said shaft, said detent means associated with one of said pairs of eccentrics being operable independently of the other of said detent means.

3. In a sewing machine having a frame including a

work supporting base and an overhanging arm carrying a needle head over said base, and a rotary shaft extending longitudinally of said base, the combination of a four motion feed dog in said base, connections from said shaft to said feed dog for imparting work advancing and return movements and lifting and lowering movements to said feed dog, said connections including a pair of telescopically arranged and relatively angularly adjustable eccentrics on said shaft by which the feed stroke of said feed dog may be varied, a feed roller above said base yieldingly urged toward the work supporting surface thereof, connections from said shaft to said roller for imparting intermittent rotation thereto, said last mentioned connections including a pair of telescopically arranged and relatively angularly adjustable eccentrics on said shaft by which the extent of intermittent movements of said roller may be varied, detent means associated with each of said pairs of eccentrics arranged to enable relative angular adjustment of the eccentrics of each pair upon turning of said shaft, said detent means associated with one of said pairs of eccentrics being operable independently of the other of said detent means, each of said detent means comprising a detaining arm, and a common shaft parallel with said rotary shaft for carrying said detaining arms.

4. In a sewing machine having a frame including a work supporting base and an overhanging arm carrying a needle head over said base, and a rotary shaft extending longitudinally of said base, the combination of a four motion feed dog in said base, connections from said shaft to said feed dog for imparting work advancing and return movements and lifting and lowering movements to said feed dog, said connections including a pair of telescopically arranged and relatively angularly adjustable eccentrics on said shaft by which the feed stroke of said feed dog may be varied, a feed roller above said base yieldingly urged toward the work supporting surface thereof, connections from said shaft to said roller for imparting intermittent rotation thereto, said last mentioned connections including a pair of telescopically arranged and relatively angularly adjustable eccentrics on said shaft by which the extent of intermittent movements of said roller may be varied, a rock shaft parallel with said rotary shaft, a pair of detent arms carried by said rock shaft, each of said detent arms being disposed adjacent one of the eccentrics of said pairs of eccentrics and being arranged to be engaged with a part connected with its related eccentric to retain the same against rotation with said rotary shaft, and manually operable means for rocking said rock shaft to cause engagement of one of said detent arms with said part connected with its related eccentric, the second of said detent arms being rockable relative to said rock shaft into engagement with said part connected with its related eccentric, the arrangement being such that when one of said detent arms is engaged with the part connected with its related eccentric the eccentrics of the related pair may be shifted angularly in relation to each other to vary their combined eccentricity by turning of said rotary shaft.

5. In a sewing machine having a frame including a work supporting base and an overhanging arm carrying a needle head over said base, and a rotary shaft extending longitudinally of said base, the combination of a four motion feed dog in said base, connections from said shaft to said feed dog for imparting work advancing and return movements and lifting and lowering movements to said feed dog, said connections including a pair of telescopically arranged and relatively angularly adjustable eccentrics on said shaft by which the feed stroke of said feed dog may be varied, a feed roller above said base yieldingly urged toward the work supporting surface thereof, connections from said shaft to said roller for imparting intermittent rotation thereto, said last mentioned connections including a pair of telescopically arranged and relatively angularly adjustable eccentrics on said shaft by

which the extent of intermittent movements of said roller may be varied, a rock shaft parallel with said rotary shaft, a pair of detent arms carried by said rock shaft, each of said detent arms being disposed adjacent one of the eccentrics of said pairs of eccentrics and being arranged to be engaged with a part connected with its related eccentric to retain the same against rotation with said rotary shaft, manually operable means for rocking said rock shaft to cause engagement of one of said detent arms with said part connected with its related eccentric, the second of said detent arms being rockable relative to said rock shaft into engagement with said part connected with its related eccentric, and spring means urging said second detent arm angularly in relation to said rock shaft in a direction opposite to the movement of said rock shaft in response to said manually operable means, the arrangement being such that when one of said detent arms is engaged with the part connected with its related eccentric the eccentrics of the related pair may be shifted angularly in relation to each other to vary their combined eccentricity by turning of said rotary shaft.

6. In a sewing machine having a frame including a work supporting base and an overhanging arm carrying a needle head over said base, and a rotary shaft extending longitudinally of said base, the combination of a four motion feed dog in said base, connections from said shaft to said feed dog for imparting work advancing and return movements and lifting and lowering movements to said feed dog, said connections including a pair of telescopically arranged and relatively angularly adjustable eccentrics on said shaft by which the feed stroke of said feed dog may be varied, a feed roller above said base yieldingly urged toward the work supporting surface thereof, connections from said shaft to said roller for imparting intermittent rotation thereto, said last mentioned connections including a pair of telescopically arranged and relatively angularly adjustable eccentrics on said shaft by which the extent of intermittent movements of said roller may be varied, a rock shaft parallel with said rotary shaft, a pair of detent arms carried by said rock shaft, each of said detent arms being disposed adjacent one of the eccentrics of said pairs of eccentrics and being arranged to be engaged with a part connected with its related eccentric to retain the same against rotation with said rotary shaft, manually operable means for rocking said rock shaft to cause engagement of one of said detent arms with said part connected with its related eccentric, the second of said detent arms being rockable relative to said rock shaft into engagement with said part connected with its related eccentric, spring means urging said second detent arm angularly in relation to said rock shaft in a direction opposite to the movement of said rock shaft in response to said manually operable means, and means on said rock shaft for limiting the relative movement of said second detent arm thereon in response to said spring means, the arrangement being such that when one of said detent arms is engaged with the part connected with its related eccentric the eccentrics of the related pair may be shifted angularly in relation to each other to vary their combined eccentricity by turning of said rotary shaft.

7. In a sewing machine having a frame including a work supporting base and an overhanging arm carrying a needle head over said base, and a rotary shaft extending longitudinally of said base, the combination of a four motion feed dog in said base, connections from said shaft to said feed dog for imparting work advancing and return movements and lifting and lowering movements to said feed dog, said connections including a pair of telescopically arranged and relatively angularly adjustable eccentrics on said shaft by which the feed stroke of said feed dog may be varied, a feed roller above said base yieldingly urged toward the work supporting surface thereof, connections from said shaft to said roller for imparting intermittent rotation thereto, said last mentioned connections including a pair of telescopically arranged and rela-

tively angularly adjustable eccentrics on said shaft by which the extent of intermittent movements of said roller may be varied, a rock shaft parallel with said rotary shaft, a pair of detent arms carried by said rock shaft, each of said detent arms being disposed adjacent one of the eccentrics of said pairs of eccentrics and being arranged to be engaged with a part connected with its related eccentric to retain the same against rotation with said rotary shaft, manually operable means for rocking said rock shaft to cause engagement of one of said detent arms with said part connected with its related eccentric, the second of said detent arms being rockable relative to said rock shaft into engagement with said part connected with its related eccentric, spring means urging said second detent arm angularly in relation to said rock shaft in a direction opposite to the movement of said rock shaft in response to said manually operable means, and means on said rock shaft for limiting the relative movement of said second detent arm thereon in response to said spring means, said second detent arm being retained by said spring a sufficient distance from the part connected with its related eccentric not to engage the same upon rocking of said rock shaft by said manual means, the arrangement being such that when one of said detent arms is engaged with the part connected with its related eccentric the eccentrics of the related pair may be shifted angularly in relation to each other to vary their combined eccentricity by turning of said rotary shaft.

8. In a sewing machine having a frame including a work supporting base and an overhanging arm carrying a needle head over said base, and a rotary shaft extending longitudinally of said base, the combination of a four motion feed dog in said base, connections from said shaft to said feed dog for imparting work advancing and return movements and lifting and lowering movements to said feed dog, said connections including a pair of telescopically arranged and relatively angularly adjustable eccentrics on said shaft by which the feed stroke of said feed dog may be varied, a feed roller above said base yieldingly urged toward the work supporting surface thereof, and connections from said shaft to said roller for imparting intermittent rotation thereto, said last mentioned connections including a pair of telescopically arranged and relatively angularly adjustable eccentrics on said shaft by which the extent of intermittent movements of said roller may be varied, a plane passing through the axis of said rotary shaft and through the center of curvature of the outer eccentric surface of one of said pairs of eccentrics being disposed at an angle of approximately 90° to a similar plane related to the other of said pairs of eccentrics.

9. In a sewing machine having a frame including a work supporting base and an overhanging arm carrying a needle head over said base, and a rotary shaft extending longitudinally of said base, the combination of a four motion feed dog in said base, connections from said shaft to said feed dog for imparting work advancing and return movements and lifting and lowering movements to said feed dog, said connections including a pair of telescopically arranged and relatively angularly adjustable eccentrics on said shaft by which the feed stroke of said feed dog may be varied, a feed roller above said base yieldingly urged toward the work supporting surface thereof, and connections from said shaft to said roller for imparting intermittent rotation thereto, said last mentioned connections including a pair of telescopically arranged and relatively angularly adjustable eccentrics on said shaft by which the extent of intermittent movements of said roller may be varied, a plane passing through the axis of said rotary shaft and through the center of curvature of the outer eccentric surface of one of said pairs of eccentrics being disposed at an angle of between 90° and 150° to a similar plane related to the other of said pairs of eccentrics.

10. In a sewing machine having a frame including a work supporting base and an overhanging arm carrying a

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needle head over said base, and a rotary shaft extending longitudinally of said base, the combination of a four motion feed dog in said base, connections from said shaft to said feed dog for imparting work advancing and return movements and lifting and lowering movements to said feed dog, said connections including a pair of telescopically arranged and relatively angularly adjustable eccentrics on said shaft by which the feed stroke of said feed dog may be varied, a feed roller above said base yieldingly urged toward the work supporting surface thereof, connections from said shaft to said roller for imparting intermittent rotation thereto, said last mentioned connections including a pair of telescopically arranged and relatively angularly adjustable eccentrics on said shaft by which the extent of intermittent movements of said roller may be varied, a plane passing through the axis of said rotary shaft and through the center of curvature of the outer eccentric surface of one of said pairs of eccentrics being disposed at an angle of between 90° and 150° to a similar plane related to the other of said pairs of eccentrics, and detent means associated with each of said pairs of eccentrics arranged to enable relative angular adjustment of the eccentrics of each pair upon turning of said shaft, said detent means associated with one of said pairs of eccentrics being operable independently of the other of said detent means.

11. In a sewing machine having a frame including a work supporting base and an overhanging arm carrying a needle head over said base, and a rotary shaft extending longitudinally of said base, the combination of a four motion feed dog in said base, connections from said shaft to said feed dog for imparting work advancing and return movements and lifting and lowering movements to said feed dog, a presser bar carrying a presser foot at its lower end mounted for vertical movement in said needle head and yieldingly urged downwardly into cooperation with said feed dog, a feed roller above said work supporting base yieldingly urged toward the latter, connections from said shaft for imparting intermittent rotation to said feed roller, a sleeve surrounding said presser bar and arranged for axial movement in said needle head, means operable at will for lifting said sleeve, and means on said sleeve arranged to lift said presser bar and said feed roller upon lifting of said sleeve, said presser bar and feed roller being arranged for independent upward movement in response to different thicknesses of the work passing beneath them.

12. In a sewing machine having a frame including a work supporting base and an overhanging arm carrying a needle head over said base, and a rotary shaft extending longitudinally of said base, the combination of a four motion feed dog in said base, connections from said shaft to said feed dog for imparting work advancing and return movements and lifting and lowering movements to said feed dog, a presser bar carrying a presser foot at its lower end mounted for vertical movement in said needle head and yieldingly urged downwardly into cooperation with said feed dog, a feed roller above said work supporting base yieldingly urged toward the latter, connections from said shaft for imparting intermittent rotation to said feed roller, a sleeve surrounding said presser bar and arranged for axial movement in said needle head, means for yieldingly urging said sleeve downwardly and retaining the same in a predetermined position as work of varying thickness is advanced by said feed dog and feed roller, said sleeve and said means enabling upward movement of said presser bar and said feed roller relative thereto, means operable at will for lifting said sleeve, and means on said sleeve arranged to lift said presser bar and said feed roller upon lifting of said sleeve, said presser bar and feed roller being arranged for independent upward movement in response to different thicknesses of the work passing beneath them.

13. In a sewing machine having a frame including a work supporting base and an overhanging arm carrying

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a needle head over said base, and a rotary shaft extending longitudinally of said base, the combination of a four motion feed dog in said base, connections from said shaft to said feed dog for imparting work advancing and return movements and lifting and lowering movements to said feed dog, a vertically disposed sleeve mounted for axial movement in the lower portion of said needle head, spring means for urging said sleeve downwardly to a predetermined position, a presser bar extending through said sleeve and carrying a presser foot at its lower end, spring means for urging said presser bar downwardly and causing said presser foot to cooperate with said feed dog, a feed roller arranged to cooperate with the upper surface of work on said work supporting base, a support for said feed roller mounted on said needle head independently of said sleeve and arranged to enable vertical movements of said feed roller, spring means normally urging said feed roller into engagement with the work, means for lifting said sleeve at will, and cooperating means on said sleeve and said presser bar and said support arranged to lift said presser bar and said support upon lifting of said sleeve beyond a limited independent upward movement thereof.

14. In a sewing machine having a frame including a work supporting base and an overhanging arm carrying a needle head over said base, and a rotary shaft extending longitudinally of said base, the combination of a four motion feed dog in said base, connections from said shaft to said feed dog for imparting work advancing and return movements and lifting and lowering movements to said feed dog, a vertically disposed sleeve mounted for axial movement in the lower portion of said needle head, spring means for urging said sleeve downwardly to a predetermined position, a presser bar extending through said sleeve and carrying a presser foot at its lower end, spring means for urging said presser bar downwardly and causing said presser foot to cooperate with said feed dog, a feed roller arranged to cooperate with the upper surface of work on said work supporting base, a bracket secured to said needle head, a support for said feed roller slidably mounted for vertical movement on said bracket, spring means coacting between said bracket and said support for urging said feed roller against the work, means for lifting said sleeve at will, and cooperating means on said sleeve and said presser bar and said support arranged to lift said presser bar and said support upon lifting of said sleeve beyond a limited independent upward movement thereof.

15. In a sewing machine having a frame including a work supporting base and an overhanging arm carrying a needle head over said base, and a rotary shaft extending longitudinally of said base, the combination of a four motion feed dog in said base, connections from said shaft to said feed dog for imparting work advancing and return movements and lifting and lowering movements to said feed dog, a vertically disposed sleeve mounted for axial movement in the lower portion of said needle head, spring means for urging said sleeve downwardly to a predetermined position, a presser bar extending through said sleeve and carrying a presser foot at its lower end, spring means for urging said presser bar downwardly and causing said presser foot to cooperate with said feed dog, a feed roller arranged to cooperate with the upper surface of work on said work supporting base, said feed roller being positioned adjacent and at one side of said presser foot, a bracket secured to said needle head, a support for said feed roller slidably mounted for vertical movement on said bracket, spring means coacting between said bracket and said support for urging said feed roller against the work, means for lifting said sleeve at will and cooperating means on said sleeve and said presser bar and said support arranged to lift said presser bar and said support upon lifting of said sleeve beyond a limited independent upward movement thereof.

16. In a sewing machine having a frame including a work supporting base and an overhanging arm carrying a

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needle head over said base, and a rotary shaft extending longitudinally of said base, the combination of a four motion feed dog in said base, connections from said shaft to said feed dog for imparting work advancing and return movements and lifting and lowering movements to said feed dog, a vertically disposed sleeve mounted for axial movement in the lower portion of said needle head, spring means for urging said sleeve downwardly to a predetermined position, a presser bar extending through said sleeve and carrying a presser foot at its lower end, spring means for urging said presser bar downwardly and causing said presser foot to cooperate with said feed dog, a feed roller arranged to cooperate with the upper surface of work on said work supporting base, said feed roller being positioned rearwardly of said presser foot and being arranged to exert a puller action upon the work advanced by said feed dog, a bracket secured to said needle head, a support for said feed roller slidably mounted for vertical movement on said bracket, spring means coacting between said bracket and said support for urging said feed roller against the work, means for lifting said sleeve at will, and cooperating means on said sleeve and said presser bar and said support arranged to lift said presser bar and said support upon lifting of said sleeve beyond a limited independent upward movement thereof.

17. In a sewing machine having a frame including a work supporting base and an overhanging arm carrying a needle head over said base, and a rotary shaft extending longitudinally of said base, the combination of a four motion feed dog in said base, connections from said shaft to said feed dog for imparting work advancing and return movements and lifting and lowering movements to said feed dog, a vertically disposed sleeve mounted for axial movement in the lower portion of said needle head, spring means for urging said sleeve downwardly to a predetermined position, a presser bar extending through said sleeve and carrying a presser foot at its lower end, spring means for urging said presser bar downwardly and causing said presser foot to cooperate with said feed dog, a feed roller arranged to cooperate with the upper surface of work on said work supporting base, said feed roller being positioned rearwardly of said presser foot and being arranged to exert a puller action upon the work advanced by said feed dog, a bracket secured to said needle head, a support for said feed roller slidably mounted for vertical movement on said bracket, spring means coacting between said bracket and said support for urging said feed roller against the work, means on said work supporting base providing a surface inclined upwardly at a small angle in the direction of feed of the work in the region in which the work is engaged by said feed roller, means for lifting said sleeve at will, and cooperating means on said sleeve and said presser bar and said support arranged to lift said presser bar and said support upon lifting of said sleeve beyond a limited independent upward movement thereof.

18. In a sewing machine having a frame including a work supporting base, and an overhanging arm carrying a needle head at its end over said base, and a main drive shaft, the combination of means including a reciprocable needle bar in said head carrying a needle at its lower end and complementary stitch forming devices in said base

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for forming stitches in work advanced over the upper surface of said base, connections from said drive shaft for operating said needle bar and said complementary stitch forming devices, means adjacent the point of stitch formation for advancing the work, connections from said drive shaft for operating said work advancing means, a feed roller disposed above the work supporting base, means for yieldingly urging said roller downwardly against the work on said work supporting base, connections from said drive shaft for operating said feed roller, and means on said base providing a surface for cooperation with the work beneath said feed roller, said surface being inclined upwardly at a small angle in the direction of feed of the work by said roller.

19. In a sewing machine having a frame including a work supporting base and an overhanging arm carrying a needle head at its end over said base, and a main drive shaft, the combination of means including a reciprocable needle bar in said head carrying a needle at its lower end and complementary stitch forming devices in said base for forming stitches in work advanced over the upper surface of said base, connections from said drive shaft for operating said needle bar and said complementary stitch forming devices, means adjacent the point of stitch formation for advancing the work, connections from said drive shaft for operating said work advancing means, a feed roller disposed above the work supporting base, means for yieldingly urging said roller downwardly against the work on said work supporting base, connections from said drive shaft for operating said feed roller, and means on said base providing a surface for cooperation with the work beneath said feed roller, said surface being inclined upwardly at an angle of approximately 15° to the horizontal in the direction of feed of the work by said roller.

20. In a sewing machine having a frame including a work supporting base and an overhanging arm carrying a needle head at its end over said base, and a main drive shaft, the combination of means including a reciprocable needle bar in said head carrying a needle at its lower end and complementary stitch forming devices in said base for forming stitches in work advanced over the upper surface of said base, connections from said drive shaft for operating said needle bar and said complementary stitch forming devices, means adjacent the point of stitch formation for advancing the work, connections from said drive shaft for operating said work advancing means, a feed roller disposed above the work supporting base, means for yieldingly urging said roller downwardly against the work on said work supporting base, connections from said drive shaft for operating said feed roller, and means on said base providing a surface for cooperation with the work beneath said feed roller, said surface being inclined upwardly at between 10° and 20° in the direction of feed of the work by said roller.

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