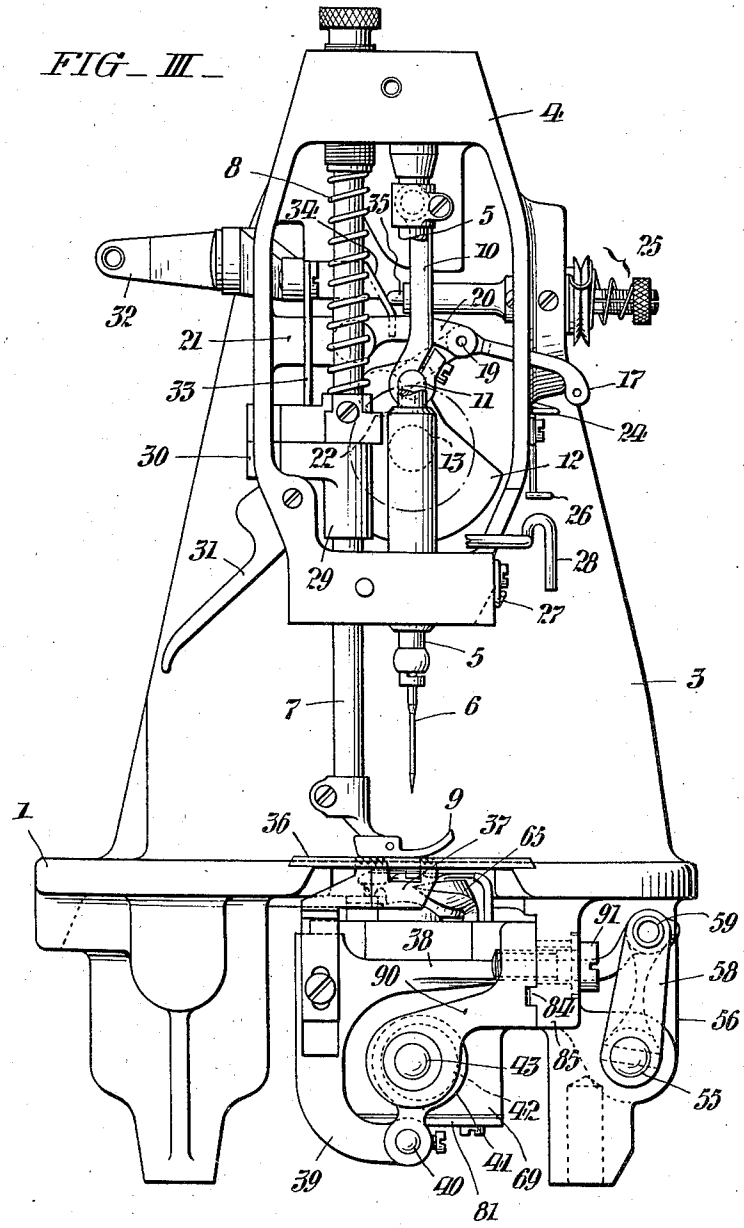
Oct. 25, 1938. N. V. CHRISTENSEN ET AL 2,134,652

LOCKSTITCH SEWING MACHINE

Filed Dec. 9, 1935 7 Sheets-Sheet 2

FIG. III.



WITNESSES:

John C. Bergner.

Hubert Fuchs

INVENTORS:

Norman V. Christensen &

Oscar Quist,

BY Fraser & Paul

ATTORNEYS.

Oct. 25, 1938. N. V. CHRISTENSEN ET AL 2,134,652

LOCKSTITCH SEWING MACHINE

Filed Dec. 9, 1935 7 Sheets-Sheet 1

FIG. I.

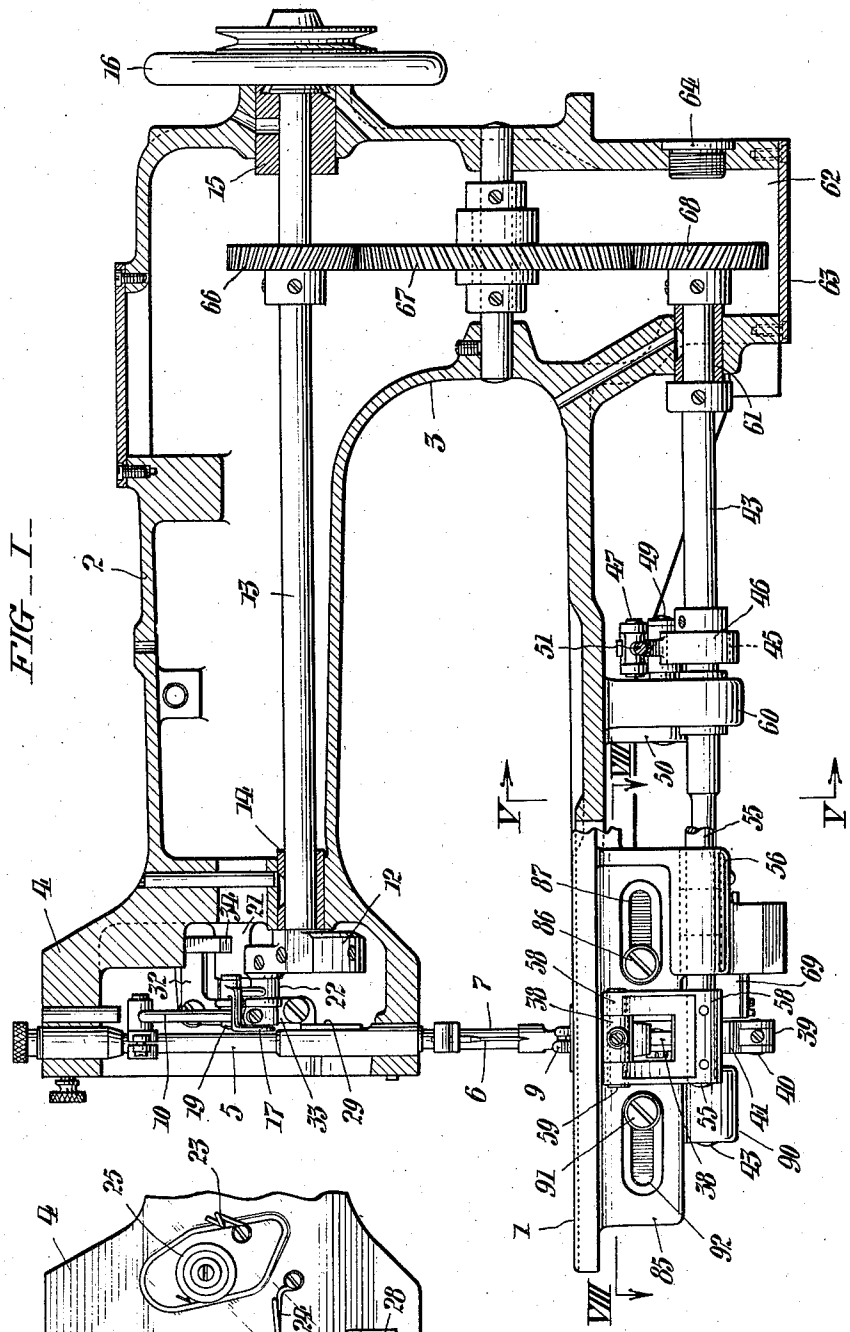


FIG. II.

INVENTORS:
Norman V. Christensen &
Oscar Quist,
BY
Fraley & Paul
ATTORNEYS.

Oct. 25, 1938. N. V. CHRISTENSEN ET AL 2,134,652

LOCKSTITCH SEWING MACHINE

Filed Dec. 9, 1935 7 Sheets-Sheet 3

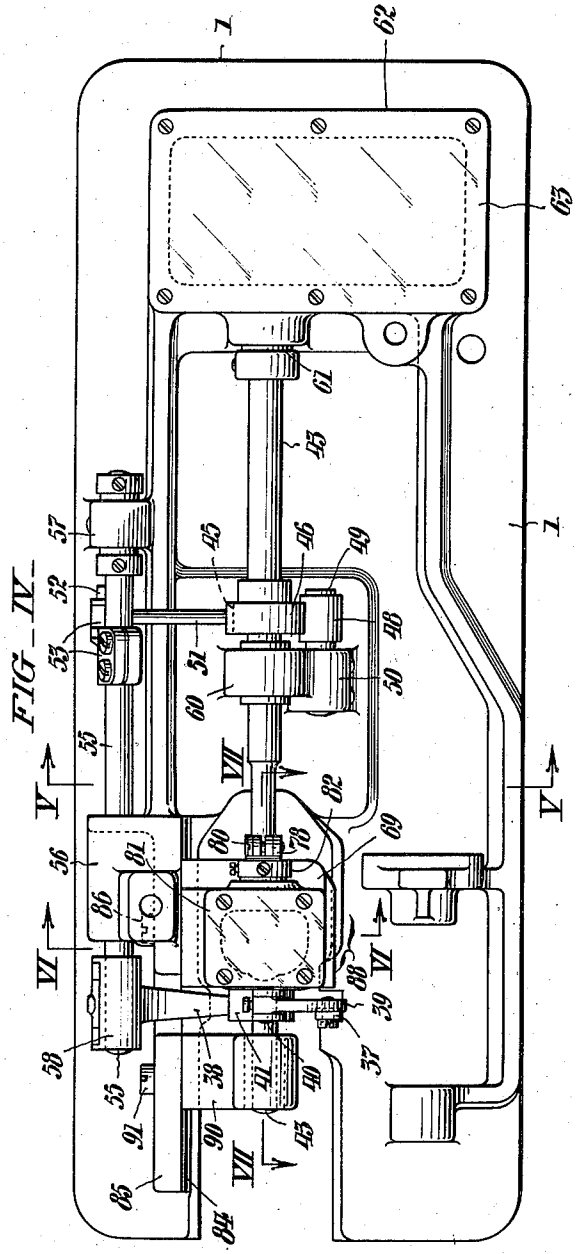


FIG. IV.

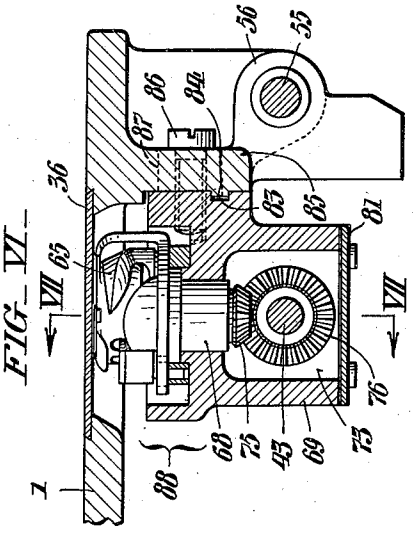


FIG. VI.

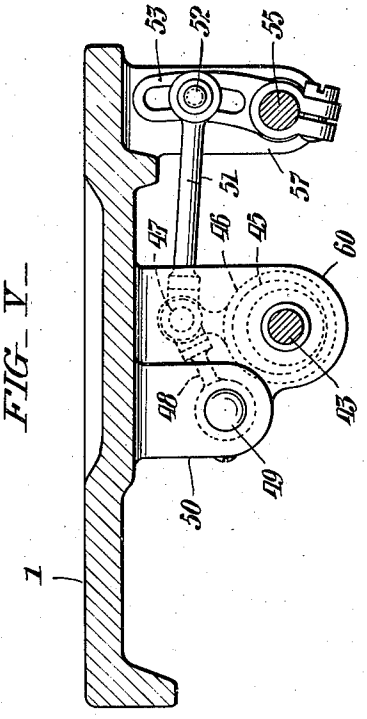


FIG. V.

WITNESSES:
John C. Bergner.
Hubert Fuchs

INVENTORS:
Norman V. Christensen &
Oscar Quist,
BY Fraley & Paul
ATTORNEYS.

Oct. 25, 1938. N. V. CHRISTENSEN ET AL 2,134,652

LOCKSTITCH SEWING MACHINE

Filed Dec. 9, 1935 7 Sheets-Sheet 4

FIG. VII

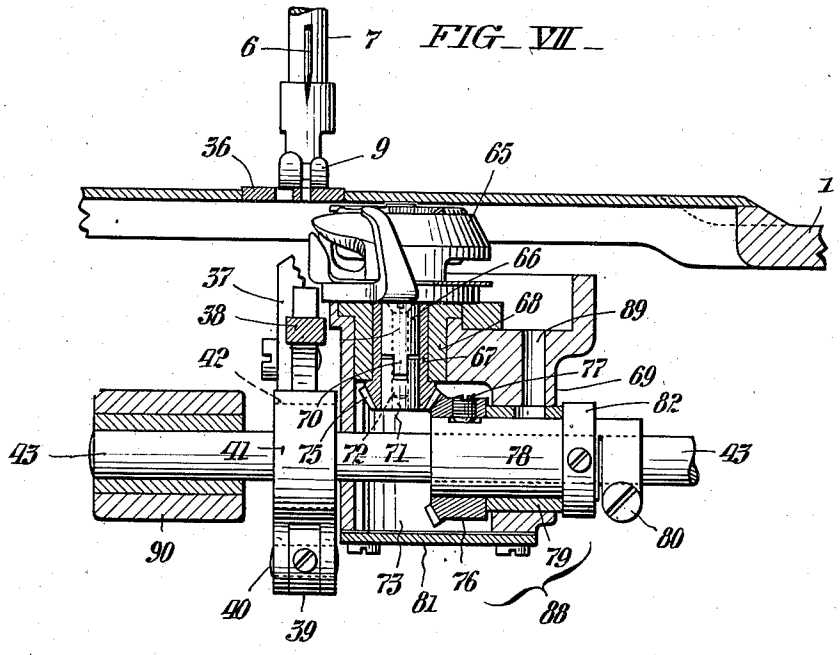
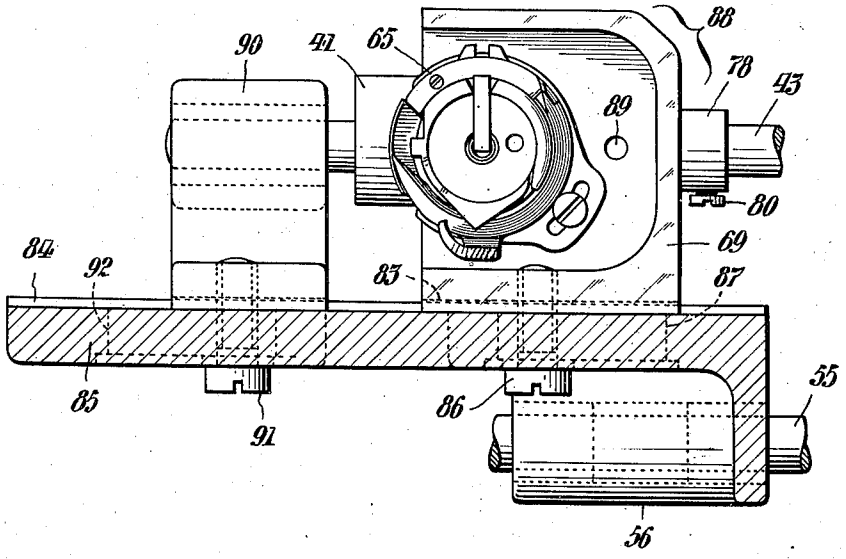


FIG. VIII



WITNESSES:
John C. Bergner
Hubert Fuchs

INVENTORS:
Norman V. Christensen &
Oscar Quist,
BY Fraley & Paul
ATTORNEYS.

Oct. 25, 1938. N. V. CHRISTENSEN ET AL 2,134,652

LOCKSTITCH SEWING MACHINE

Filed Dec. 9, 1935 7 Sheets-Sheet 5

FIG. IX.

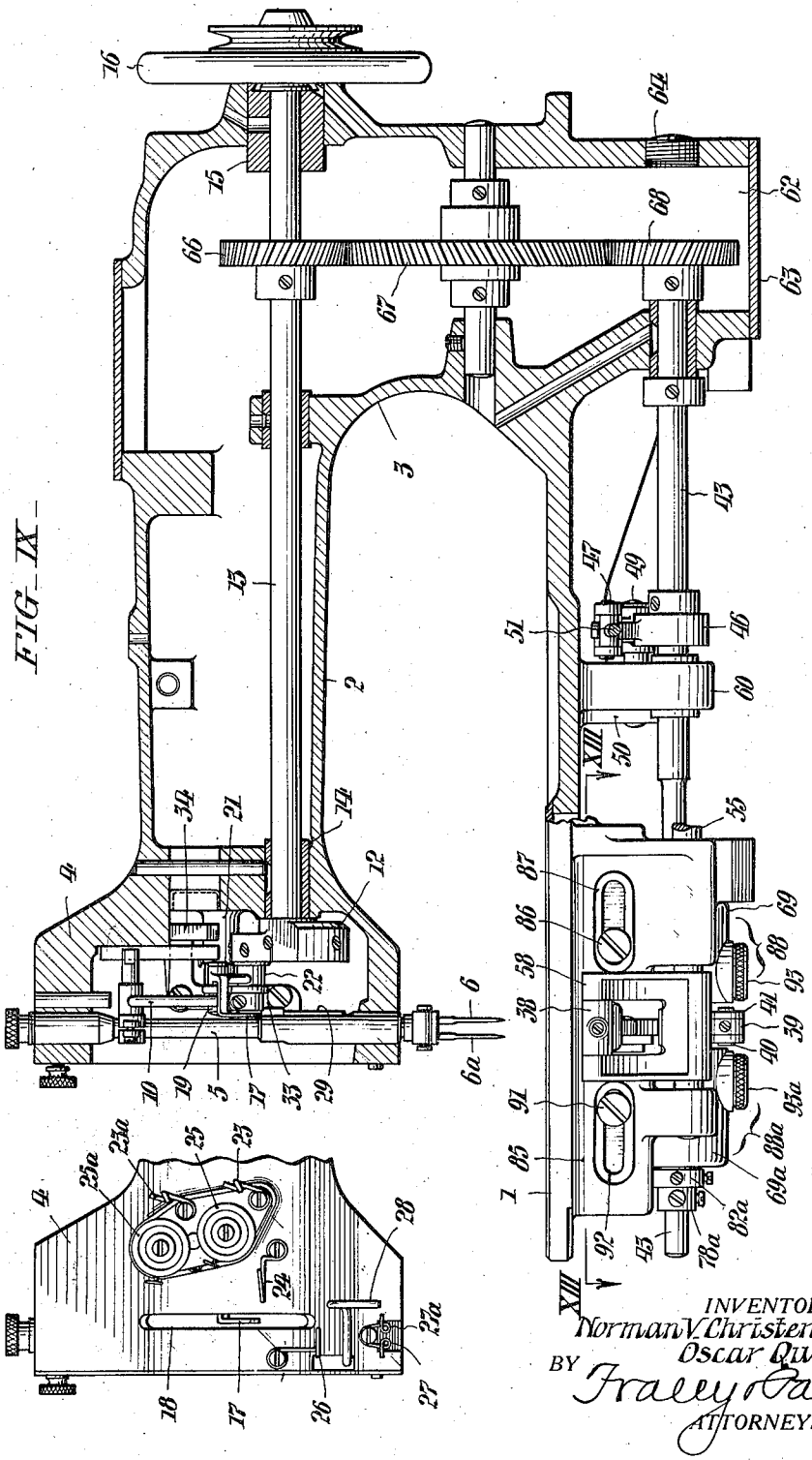


FIG. X.

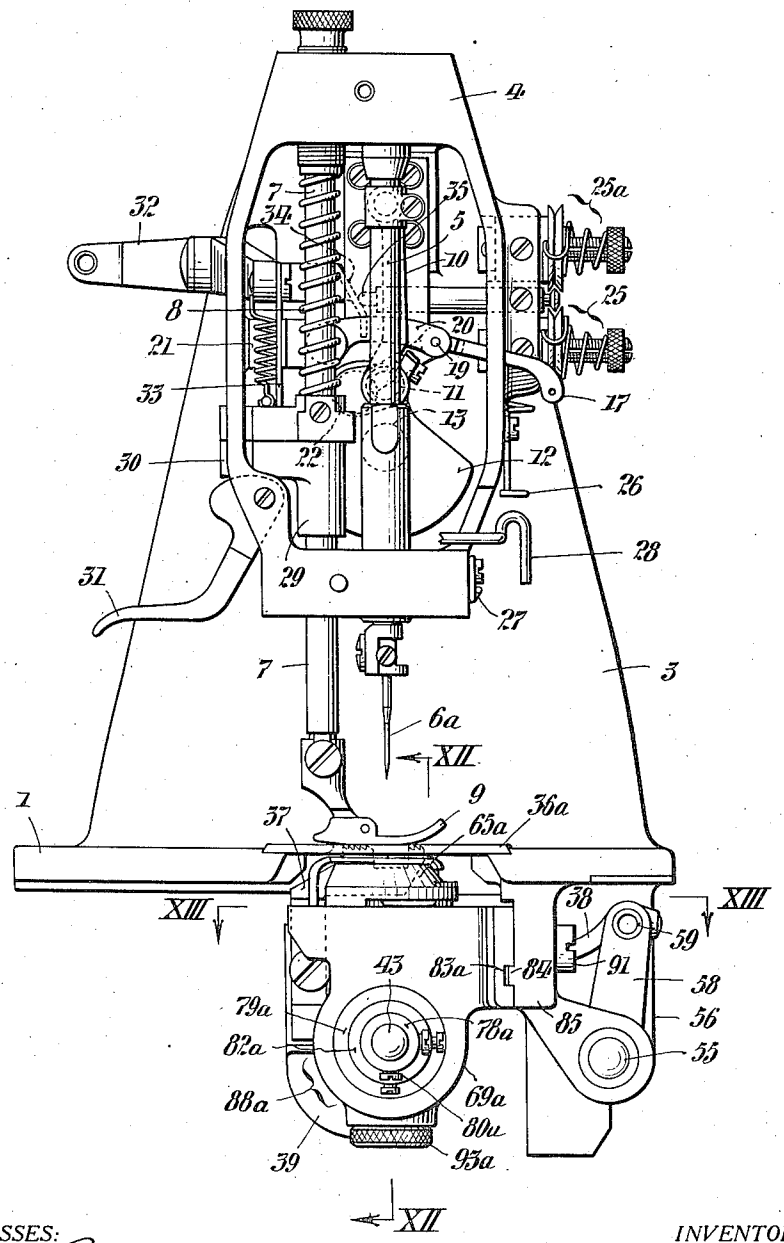
INVENTORS:
Norman V. Christensen &
Oscar Quist,
BY Fraley & Paul
ATTORNEYS.

Oct. 25, 1938. N. V. CHRISTENSEN ET AL 2,134,652

LOCKSTITCH SEWING MACHINE

Filed Dec. 9, 1935 7 Sheets-Sheet 6

FIG. XI.



WITNESSES:
John C. Bergner.
Herbert Fuchs

INVENTORS:
Norman V. Christensen &
Oscar Quist,
BY Fraley & Paul
ATTORNEYS.

Oct. 25, 1938. N. V. CHRISTENSEN ET AL 2,134,652

LOCKSTITCH SEWING MACHINE

Filed Dec. 9, 1935 7 Sheets-Sheet 7

FIG. XII.

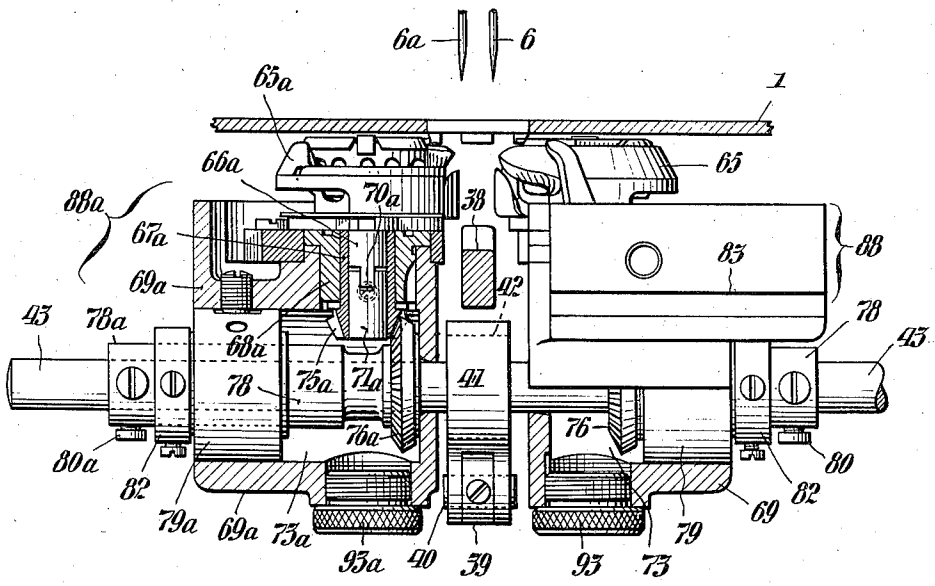
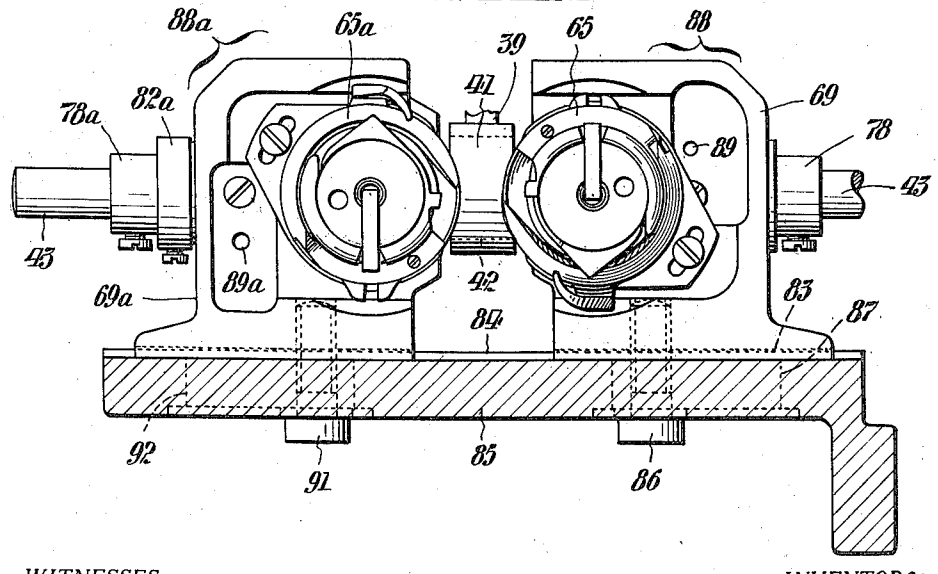


FIG. XIII.



WITNESSES:
John C. Bergner.
Hubert Fuchs

INVENTORS:
Norman V. Christensen &
Oscar Quist,
BY Frally & Paul
ATTORNEYS.

Patented Oct. 25, 1938 2,134,652

UNITED STATES PATENT OFFICE

2,134,652

LOCKSTITCH SEWING MACHINE

Norman V. Christensen and Oscar Quist, Chicago, Ill., assignors to Union Special Machine Company, Chicago, Ill., a corporation of Illinois

Application December 9, 1935, Serial No. 53,552

18 Claims. (Cl. 112—184)

This invention relates to lock stitch sewing machines; and it is concerned with both single and multiple needle lock stitch sewing machines wherein the rotary loop takers or hooks are arranged vertically with their axis parallel to the needles.

In connection with machines of the above referred to type, we aim, through simplified construction, to facilitate assembling of the machines initially, and to enable adjustment of the rotary hooks relative to the needles for precise cooperation with the latter.

A further object of our invention is to make it possible to effect the adjustments of the rotary hooks easily and quickly without necessitating disconnection of the means by which they are directly driven and without disturbing the timing of said hooks in respect to the needles.

Other objects and attendant advantages of this invention will appear from the following detailed description of the attached drawings, wherein

Fig. I is a view partly in longitudinal section and partly in side elevation of a single needle lock stitch machine conveniently embodying the present improvements.

Fig. II is a fragmentary view in side elevation of the head of the sewing machine.

Fig. III shows the front end elevation of the machine.

Fig. IV is an inverted plan view of the machine.

Fig. V is a transverse sectional view taken as indicated by the arrows V—V in Figs. I and IV.

Fig. VI is a fragmentary detail sectional view taken as indicated by the arrows VI—VI in Fig. IV.

Fig. VII is a fragmentary longitudinal sectional view taken as indicated by the arrows VII—VII in Figs. IV and VI.

Fig. VIII is a fragmentary detail plan sectional view taken as indicated by the arrows VIII—VIII in Fig. I.

Fig. IX is a view corresponding to Fig. I of a two-needle lock stitch sewing machine embodying our invention.

Fig. X is a fragmentary view showing the head of the machine in side elevation.

Fig. XI is an elevation of the front end of the two-needle machine.

Fig. XII is a fragmentary detail sectional view taken as indicated by the arrows XII—XII in Fig. XI; and

Fig. XIII is a detail plan sectional view taken as indicated by the arrows XIII—XIII in Figs. IX and XI.

With more detailed reference first to Figs. I–VIII of these illustrations, the sewing machine therein delineated for the purposes of exemplifying our invention has a frame with a horizontal bed plate or work support 1 which is overhung by a hollow horizontal arm 2 that reaches forwardly from an integral hollow standard 3 upstanding from the work support at the right hand end as viewed in Fig. I. Guided for vertical movement in the head 4 at the free end of the arm 2 is a needle bar 5 carrying a needle 6, and a presser bar 7 which is subject to a regulatable compression spring 8 (Fig. III) and to the lower end of which is secured a presser foot 9. The needle bar 5 is reciprocated by virtue of coordination, through a link 10 with a crank pin 11 on a counterweighted crank arm 12 at the forward end of the main shaft 13 of the machine within the head 4, said shaft extending longitudinally through the hollow of the arm 2 and being journaled in bearing bushings 14 and 15 set into the machine frame. As shown in Fig. I the main shaft 13 extends outward through the bearing bushing 15, and to its protruding end is secured a combined hand and belt wheel 16 so that it can be rotated either manually or by power. The needle thread takeup 17 operates through a vertical slot 18 (Fig. II) in the front side of the head 4, and within the latter, it is pivotally connected medially at 19 to a lazy bar 20 fulcrumed on a fixed lug 21, while its inner end is connected to another crank pin 22 on the crank arm 12. Enroute to the needle 6, the needle thread (not shown) is directed by guides 23 and 24 to pass between the disks of a tensioning device 25, thence through the eye of the takeup 17, thence through another pair of fixed guides 26 and 27 in the interval between which it is engaged by a hook 28 reaching outward from a collar 29 fixed on the presser bar 7. A lateral projection 30 on the collar 29 engages a vertical slot in the head 4 to prevent the presser bar 7 from rotating incident to up and down movement thereof as different thicknesses of fabric pass beneath the presser foot 9. The presser bar 7 is lockable in elevated position by means of a lifting cam finger 31; and in order that it may be raised and lowered during sewing, there is provided a knee or pedal operated control arm 32 which is coupled by a link 33 with the collar 29. When the control arm 32 is actuated, a cam projection 34 thereon pushes the stem 35 of the tension device 25 forward to relieve the tension on the needle thread. The features thus far described are all well known in the art.

Operating beneath the work support 1 within the openings of the throat plate 36 (Fig. VII) of the machine and opposing the presser foot 9 is a feed dog 37 which is secured, with capacity for vertical adjustment, to a feed bar 38. As shown in Fig. III, the feed bar 38 has a downwardly and forwardly curved arm 39, which, at 40, has pivotal connection with the strap 41 of an eccentric 42 at the front end of a transmission shaft 43 extending longitudinally of the bottom of the work plate 1 and so receives its rising and falling movements. As shown in Fig. VII, the feed bar 38 and the feed lift strap 41 and eccentric 42 lie, one above the other in the vertical plane of the needle 6. The feed movements are imparted to the feed bar 38 from another eccentric 45 (Figs. I, IV and V) on the transmission shaft 43, the strap 46 of said eccentric having pivotal connection at 47 with a lazy bar 48 fulcrumed at 49 on a pendant lug 50 of the work support 1, as well as with one end of a link 51, which, at its other end, has an adjustable pivotal connection at 52 with a curved slotted arm 53 on a rock shaft 55. This rock shaft 55 is journaled in pendant lugs 56 and 57 of the work plate 1, and to its forward end (Figs. III and IV) is secured an upstanding bifurcated arm 58, which has a pivotal connection 59 with the outer end of the feed bar 38. The transmission shaft 43, see Figs. I and IV, is journaled at an intermediate point in a fixed bearing 60 and has its rear end extending through a bearing bushing 61 into a lubricant reservoir 62 below the work plate 1, which reservoir communicates directly with the hollow of the standard 3, and which has a removable bottom plate 63 as well as a removable filling hole plug 64. By means of a train of intermeshing gears 66, 67 and 68 within the standard 3 and the communicating lubricant reservoir 62, rotary motion is imparted at unison speed from the main shaft 13 to the transmission shaft 43. The feed mechanism just briefly described, per se, constitutes the subject matter of a separate application Ser. No. 54,805 filed on December 17, 1935 in the name of George Sauer.

Having now generally indicated a type of sewing machine suitable to the embodiment of our invention, we will proceed to those features and improvements which are deemed to be new. Cooperating with the needle 6 below the work support 1 is a rotary loop taker or hook 65 having its axis or shaft 66 vertical and parallel with said needle and above the shaft 43. As shown in Fig. VII, the rotary hook shaft 66 fits downwardly into a sleeve 67 which is journaled in a bearing bushing 68 set into a journal member 69. At its lower end, the hook shaft 66 is formed with a tongue 70 that engages a transverse slot in a plug 71 fixed within the bottom of the sleeve 67. The rotary hook 65 is held in position by a headed axial screw 72 whereof the shank passes down through the hook shaft 66 and engages the plug 71. Obviously, upon removing the screw 72, the rotary hook 65 can be lifted out of the machine from above when required, and replaced without changing its timing with relation to the needle or feed movements. The sleeve 67, it will be noted, extends downward into a lubricant chamber 73 afforded by the journal member 69, and at its bottom end within said chamber terminates in a bevel gear pinion 75 which meshes with the top of a driving bevel gear 76 on the transmission shaft 43. Due to this arrangement of the drive for the rotary hook 65, it is possible to afford the shaft 43 journal support outward of said hook, i. e., to the left in Figs. IV and VII as later on described. The ratio of the gears 75 and 76 in the present instance is such that the rotary hook 65 is revolved twice for each reciprocation of the needle 6. The gear wheel 76 is not directly attached to the transmission shaft 43, but secured, by a set screw 77 to a sleeve 78 which extends outward through a bearing bushing 79 in one of the side walls of the lubricant chamber 73. This sleeve 78 is split at its projecting end as shown in Fig. VII and provided with a screw 80 by which it is clamped fast to the transmission shaft 43. As a consequence of this construction it is possible to adjust the gear wheel 76 circumferentially of the shaft 43 to change the timing of the rotary hook 65 without the necessity for removing the bottom cover 81 of the lubricant chamber 73 which latter serves as a housing for the two bevel gears. Axial displacement of the sleeve 78 is prevented by engagement of the hub of the gear wheel 76 with the inner end of the bushing 79 fast in the wall of the housing 69, and by engagement of a collar 82 on the projecting end of said sleeve with the outer end of said bushing. As shown in Fig. VI, the journal member 69 is formed with a groove 83 which engages a lateral horizontal tongue 84 at one side of a longitudinally-extending pendant flange 85 of the work support 1 and is secured by a headed clamp screw 86 whereof the shank passes through a horizontal slot 87 in said flange, see Figs. I, VI and VIII. By virtue of this arrangement, the whole rotary hook unit comprehensively designated by the numeral 88 in Figs. I, IV, VI, VII and VIII can, upon loosening of the clamp screw 80 of the sleeve 78 and thereby freeing the latter on the shaft 43, be shifted along said shaft and the flange 85 of the bed plate 1 to adjust the rotary hook 65 laterally in respect to the needle 6, such adjustment being accomplished without disengagement between the hook driving bevel gears 75 and 76 since these are both carried by the housing 73, and without changing the timing of said hook in respect to the needle 6. As shown, the side of the housing 73 contiguous to the needle 6 is flat and vertical with the periphery of the rotary hook 65 overhanging it and extending over the feed bar 38 and the feed lift strap 41 and eccentric 42. This construction and arrangement is advantageous in that it permits close adjustment of the rotary hook 65 relative to the needle 6 incident to positional shifting of the unit 88 along the shaft 43. The sleeve 78 is lubricated by oil introduced through a vertical duct 89 in the journal member 69, see Fig. VII. The transmission shaft 43 is afforded journal support at its forward end by a bearing bracket 90 which also has a tongue and groove connection with the flange and is secured by a releasable clamp screw 91 passing through another horizontal slot 92 in said flange so that it too can be positionally adjusted when required. Aside from the consideration of ready adjustment, the manner of mounting the rotary hook unit 88 and the end bearing bracket 90 for the transmission shaft 43 obviously facilitates assembling of the machine initially at the factory, and, moreover, makes possible easy and quick removal of said unit and bracket in the event that their replacement is necessitated by reason of derangement or wear. Moreover, by providing the journal bearings 60 and 90 for the shaft 43 at opposite sides of the driving connection for the rotary hook 65, said shaft is effectively steadied in its rotation at

high speeds with attendant absence of vibration.

In Figs. IX–XIII we have shown a sewing machine which is generally like the machine of Figs. I–VIII but has two needles 6, 6a, and accordingly we provide it with two vertical hook units 88, 88a whereof the rotary hooks are designated 65 and 65a. The rotary hook unit 88 associated with the needle 6 is like the unit 88 of the single needle machine, part for part, except in that a plug 93 is utilized as a closure for the bottom of the gear housing instead of a plate as before, said unit being shiftable along the flange 85 for adjustment of the hook relative to said needle, and fixable in adjusted positions by the clamp screw 86. The rotary hook unit 88a, associated with the needle 6a, it will be observed from Fig. XII, is a reverse or left hand duplicate of the unit 88 with corresponding parts identified by the same reference numerals heretofore employed except for addition in each instance of the letter "a" for the purposes of distinction. The unit 88a is independently shiftable along the flange 85 for adjustment of its rotary hook 65a relative to the corresponding needle 6a. In the two-needle machine, the unit 88a takes the place of the bearing bracket 90 of the single needle machine in affording journal support to the front end of the transmission shaft 43. The thread for the additional needle 6a in the machine of Figs. IX–XIII is tensioned by a tensioning device 25a like the tensioning device 25 and directed to a definite course by suitably positioned additional guides 23a, 27a on the head 4. It will be especially noted from Figs. XII and XIII that the feed bar 38 and the feed lift eccentric 42 and strap 41 in this instance lie, one above the other, in a vertical plane centrally between the two needles 6, 6a with the peripheries of the two cooperating rotary hooks 65, 65a overhanging the contiguous flat vertical sides of the housings 73, 73a which enclose the gear sets 75, 76, and 75a, 76a. This construction and arrangement not only favors close spacing of the needles 6, 6a, but makes possible close adjustment of the rotary hooks 65, 65a relative to each other and to said needles upon positional shifting of the units 88, 88a along the shaft 43. In view of the general similarity between the two machines, all corresponding parts other than those particularly referred to, have been identified by the same reference characters previously employed to preclude the necessity for duplicate description.

Having thus described our invention, we claim:

1. In a lock stitch sewing machine, a frame; a needle; a transmission shaft; a rotary hook having its shaft parallel with the needle and at right angles to the transmission shaft; a journal member affording a lubricant chamber into which both the transmission and rotary hook shafts extend; a gear wheel on the rotary hook shaft within the lubricant chamber, an intermeshing gear wheel also within the lubricant chamber; a sleeve whereon the last mentioned gear wheel is mounted surrounding the transmission shaft and extending to the exterior of said chamber; securing means externally of the lubricant chamber whereby the sleeve is secured to the transmission shaft with capacity for circumferential adjustment to change the timing of the rotary hook.

2. In a lock stitch sewing machine, a frame; a needle; a transmission shaft; a rotary hook unit including a rotary hook having its shaft parallel with the needle and at right angles to the transmission shaft, a journal member affording a lubricant chamber into which both the transmission and rotary hook shafts extend, a gear wheel on the rotary hook shaft within the lubricant chamber, an intermeshing gear wheel on a sleeve surrounding the transmission shaft and extending to the exterior of the lubricant chamber, means externally of said chamber whereby the sleeve is secured to the transmission shaft with capacity for circumferential adjustment to change the timing of the rotary hook; and means for securing the rotary hook unit to the frame of the machine with capacity for being shifted along the transmission shaft to adjust the rotary hook laterally relative to the needle.

3. In a lock stitch sewing machine, a work support with a pendant flange; a transmission shaft below the work support parallel with the flange; a rotary hook unit including a vertical rotary hook, a shaft for the rotary hook, a journal member affording a lubricant chamber into which the transmission shaft and the rotary hook shaft extend, and a pair of gears within the lubricant chamber interconnecting said shafts; and means for securing the rotary hook unit to the flange of the work support with capacity to be shifted along the transmission shaft to adjust the rotary hook laterally relative to the needle.

4. In a lock stitch sewing machine, a plurality of needles; cooperating rotary hooks having their shafts parallel with the respective needles; a transmission shaft at right angles to the rotary hook shafts; individual drive means interconnecting the rotary hook shafts with the transmission shaft; and means whereby the rotary hooks can be independently adjusted laterally relative to the respective needles without change in their timing and without disconnection of said drive means.

5. In a lock stitch sewing machine, a needle, and complemental stitch-forming mechanism including a rotary hook with its axis parallel to the needle, a drive shaft at right angles to the rotary hook axis, gearing interconnecting said rotary hook, and the shaft within a housing, and means exteriorly of the housing whereby said rotary hook can be adjusted laterally of the needle as well as circumferentially about its own axis.

6. In a lock stitch sewing machine, a needle; and complemental stitch forming mechanism including a vertical rotary hook, a horizontal drive shaft, gearing interconnecting said rotary hook and said shaft enclosed within a housing, and means exteriorly of the housing whereby said rotary hook can be adjusted laterally of the needle as well as circumferentially about its own axis.

7. In a lock stitch sewing machine, a frame; a plurality of needles; cooperating rotary hooks having their shafts parallel with the respective needles; a transmission shaft at right angles to the rotary hook shafts; journal members for the respective rotary hook shafts independently slidable along the transmission shaft to permit independent adjustment of the hooks laterally relative to the respective needles; and means for securing the journal members in adjusted positions to the machine frame.

8. In a lock stitch sewing machine, a plurality of needles; cooperative rotary hooks having their shafts parallel with the respective needles; a transmission shaft at right angles to the rotary hook shafts; gear wheels on the respective hook shafts; gear wheels on the transmission shaft respectively in mesh with the gear

wheels on the hook shafts; journal members for the several rotary hook shafts slidable independently along the transmission shaft together with the coupled gears to permit independent adjustment of the rotary hooks relative to the respective needles; and means for securing the journal members in adjusted positions.

9. In a lock stitch sewing machine, a frame; a transmission shaft; a plurality of needles; and rotary hook units, including rotary hooks having their shafts parallel with the respective needles and at right angles to the transmission shaft, journal members affording lubricant chambers into which the transmission shaft and the corresponding rotary hook shafts extend, pairs of intermeshing bevel gears interconnecting said transmission shaft and the rotary hook shafts within the lubricating chambers; and means for securing the rotary hook units to the frame of the machine with capacity for being independently shifted along the transmission shaft to adjust the rotary hooks laterally relative to the respective needles.

10. In a lock stitch sewing machine, a frame; a plurality of needles; a transmission shaft; cooperating rotary hooks having their shafts parallel with the respective needles and at right angles to the transmission shaft; journal members affording lubricant chambers into which the transmission shaft and the respective rotary hook shafts extend; gear wheels on the rotary hook shafts within the lubricant chambers; corresponding intermeshing gear wheels also within the respective lubricant chambers; individual sleeves whereon the last mentioned gear wheels are mounted surrounding the transmission shaft and extending respectively to the exteriors of said chambers; and securing means externally of the lubricant chambers whereby the sleeves are secured to the transmission shaft with capacity for independent circumferential adjustment to change the timing of the corresponding rotary hooks.

11. In a lock stitch sewing machine, a frame; a plurality of needles; a transmission shaft; rotary hook units including rotary hooks having their shafts parallel with the respective needles and at right angles to the transmission shaft, journal members affording lubricant chambers into which the transmission shaft and the respective rotary hook shafts extend, individual gear wheels on the rotary hook shafts within the respective lubricant chambers, intermeshing gear wheels respectively on independent sleeves surrounding the transmission shaft and extending to the exteriors of the lubricant chambers, and means externally of said chambers whereby the sleeves are secured to the transmission shaft with capacity for independent circumferential adjustment to change the timing of the rotary hooks; and means for securing the rotary hook units to th frame of the machine with capacity for being independently shifted along the transmission shaft to adjust the rotary hooks laterally relative to the respective needles.

12. In a lock stitch sewing machine, a work support with a pendant flange; a plurality of needles; rotary hook units including vertical rotary hooks to cooperate respectively with said needles; and journal members for the shafts of said rotary hooks having tongue and groove connections with the work support to enable independent adjustment of the rotary hooks laterally relative to the respective needles; means for securing the rotary hook units in adjusted positions to the flange aforesaid; and means for driving the rotary hooks.

13. In a lock stitch sewing machine, a work support with a pendant flange; a transmission shaft below the work support parallel with the flange; a plurality of needles; rotary hook units including vertical rotary hooks to cooperate with the respective needles, journal members affording lubricant chambers into which the transmission shaft and the individual rotary hook shafts extend, and pairs of intermeshing gears within the lubricant chambers interconnecting the transmission shaft with the corresponding hook shafts; and means for securing the rotary hook units to the flange of the work support with capacity for independent shifting along the transmission shaft to adjust the rotary hooks laterally relative to the respective needles.

14. In a lock stitch sewing machine, a plurality of needles; and complemental stitch forming mechanism including vertical rotary hooks to cooperate with the respective needles, a horizontal drive shaft, gearing interconnecting said rotary hooks and said shaft within separate housings, and means exteriorly of said housings whereby said hooks can be independently adjusted laterally of the respective needles as well as circumferentially about their own axes.

15. In a lock stitch sewing machine, a plurality of needles; and complemental stitch forming mechanism including rotary hooks with axes parallel to the respective needles, a drive shaft at right angles to the rotary hook axes, gearing interconnecting said rotary hooks and the drive shaft within separate housings, and means exteriorly of said housings whereby said hooks can be independently adjusted laterally of the respective needles as well as circumferentially about their own axes.

16. In a lockstitch sewing machine, a needle; a horizontal shaft effecting reciprocation of the needle; a vertical shaft carrying at its upper end a rotary hook to cooperate with the needle; a bevel gear at the lower end of the vertical hook shaft; a shaft extending parallel with the needle shaft carrying a bevel gear which at the top meshes with the bevel gear on the vertical hook shaft; and a train of spur gears interconnecting said needle and parallel shafts.

17. In a lock stitch sewing machine, a work support; a needle operative above the work support; a longitudinally extending rotary shaft beneath the work support; feeding means below the work support including a feed bar and a feed lift eccentric on the shaft, one above the other in the vertical plane of the needle; a rotary hook having its axis parallel with the needle; a gear set coordinating the rotary hook with the shaft; and a housing positionally shiftable along the shaft and enclosing the gear set, the side of the housing contiguous to the needle being flat and vertical with the periphery of the hook overhanging it and extending over the feed bar and the feed lift eccentric to enable close adjustment of said hook in respect to the needle.

18. In a lock stitch sewing machine, a work support; a pair of laterally spaced needles operative above the work support; a longitudinally-extending rotary shaft beneath the work support; feeding means below the work support including a feed bar and a feed lift eccentric on the shaft, one above the other in a vertical plane centrally of the needles; a pair of cooperative rotary hooks having their axes parallel with the

needles; gear sets respectively coordinating the rotary hooks with the shaft; and housings separately positionally shiftable along the shaft and enclosing the gear sets, the contiguous sides of the housings being flat and vertical with the peripheries of the rotary hooks overhanging them and extending over the feed bar and the feed lift eccentric, thereby permitting close spacing of the needles and close adjustment of said hooks relative to each other and to the needles.

NORMAN V. CHRISTENSEN.
OSCAR QUIST.