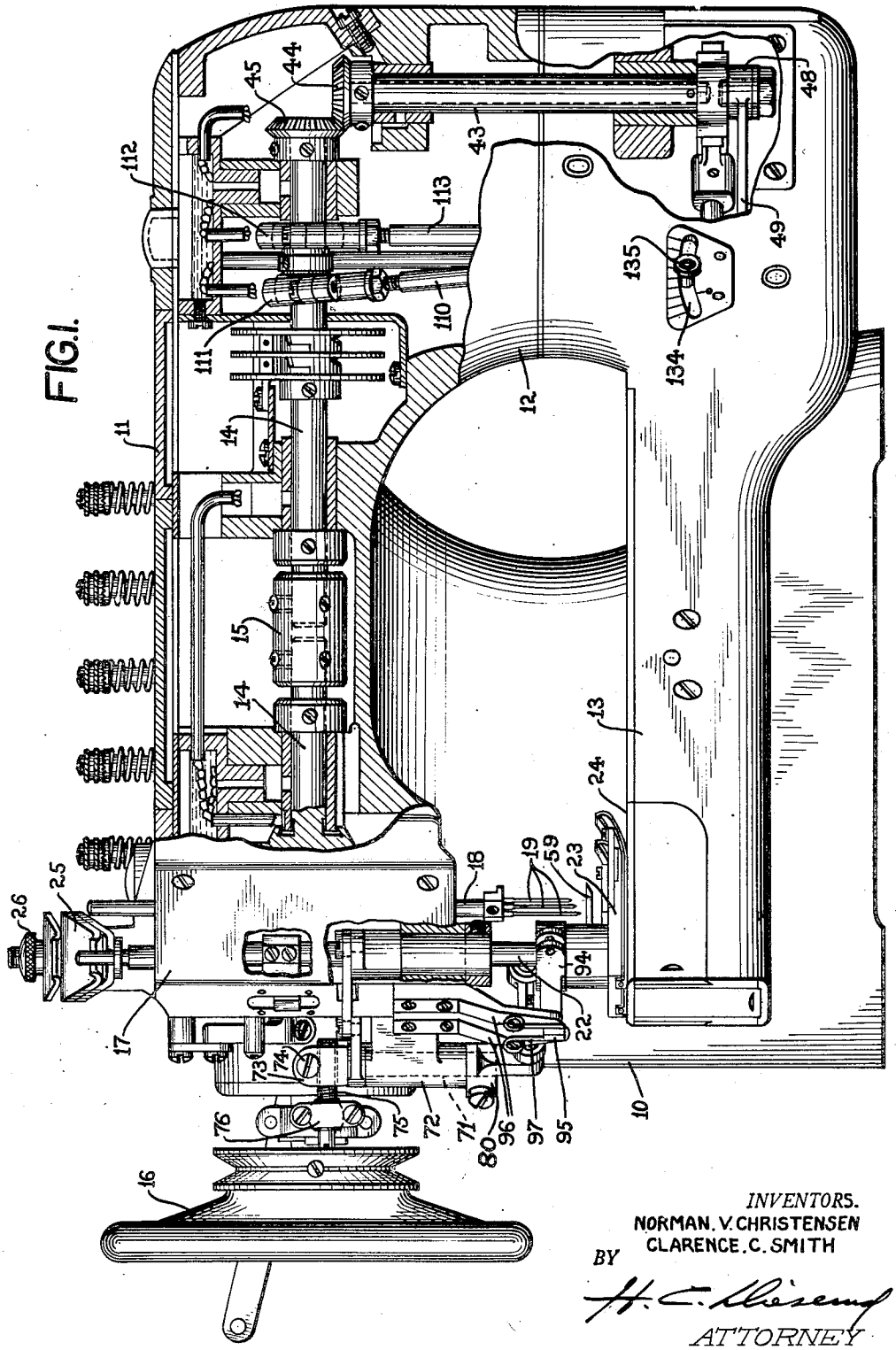
April 17, 1951 N. V. CHRISTENSEN ET AL 2,548,869

SEWING MACHINE

Filed March 27, 1947 6 Sheets-Sheet 1

FIG. 1.



INVENTORS.
NORMAN. V. CHRISTENSEN
CLARENCE. C. SMITH
BY
H. C. Weisenburg
ATTORNEY

April 17, 1951 N. V. CHRISTENSEN ET AL 2,548,869

SEWING MACHINE

Filed March 27, 1947 6 Sheets-Sheet 2

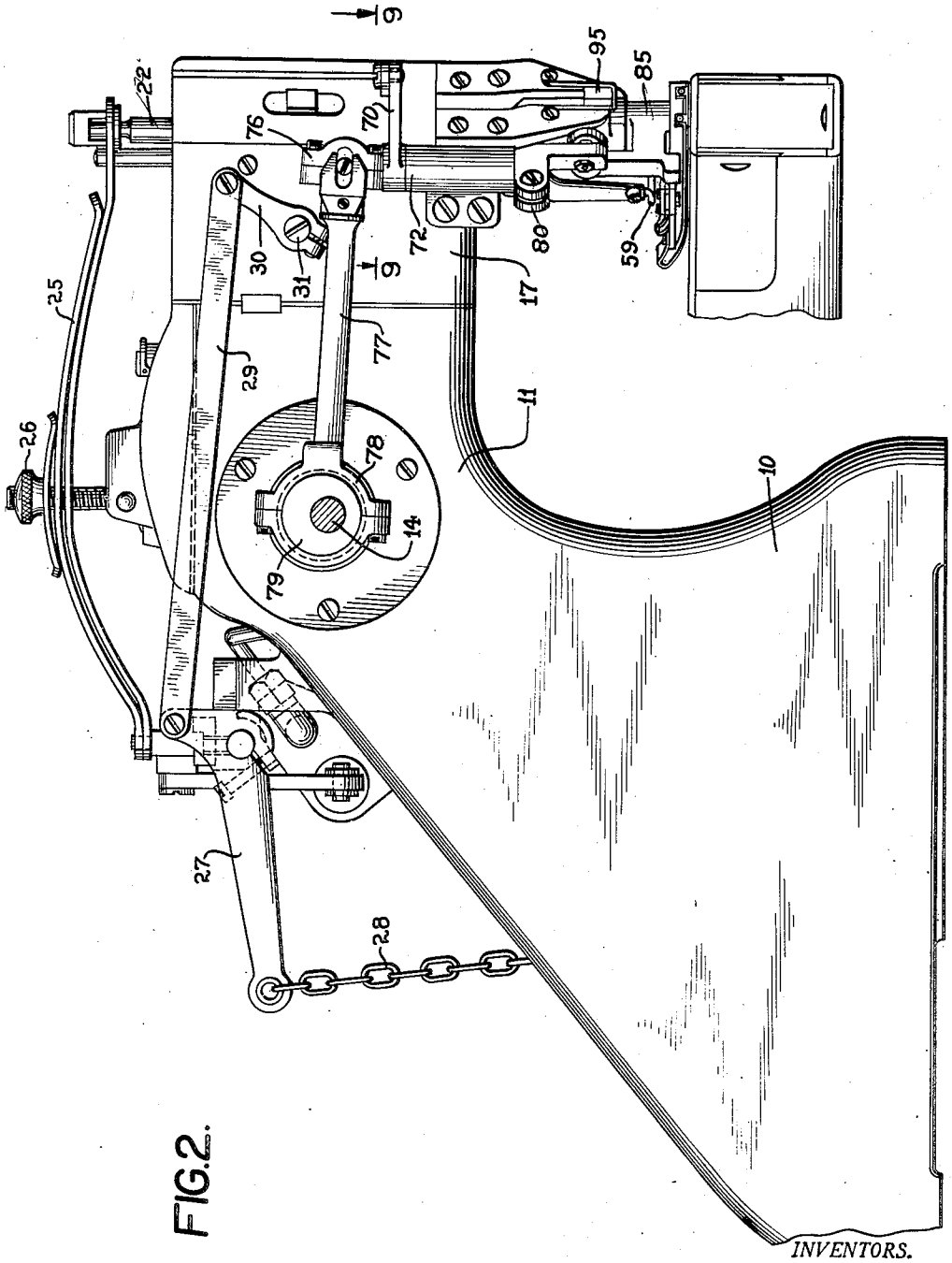


FIG.2.

INVENTORS.
NORMAN. V. CHRISTENSEN
BY CLARENCE. C. SMITH

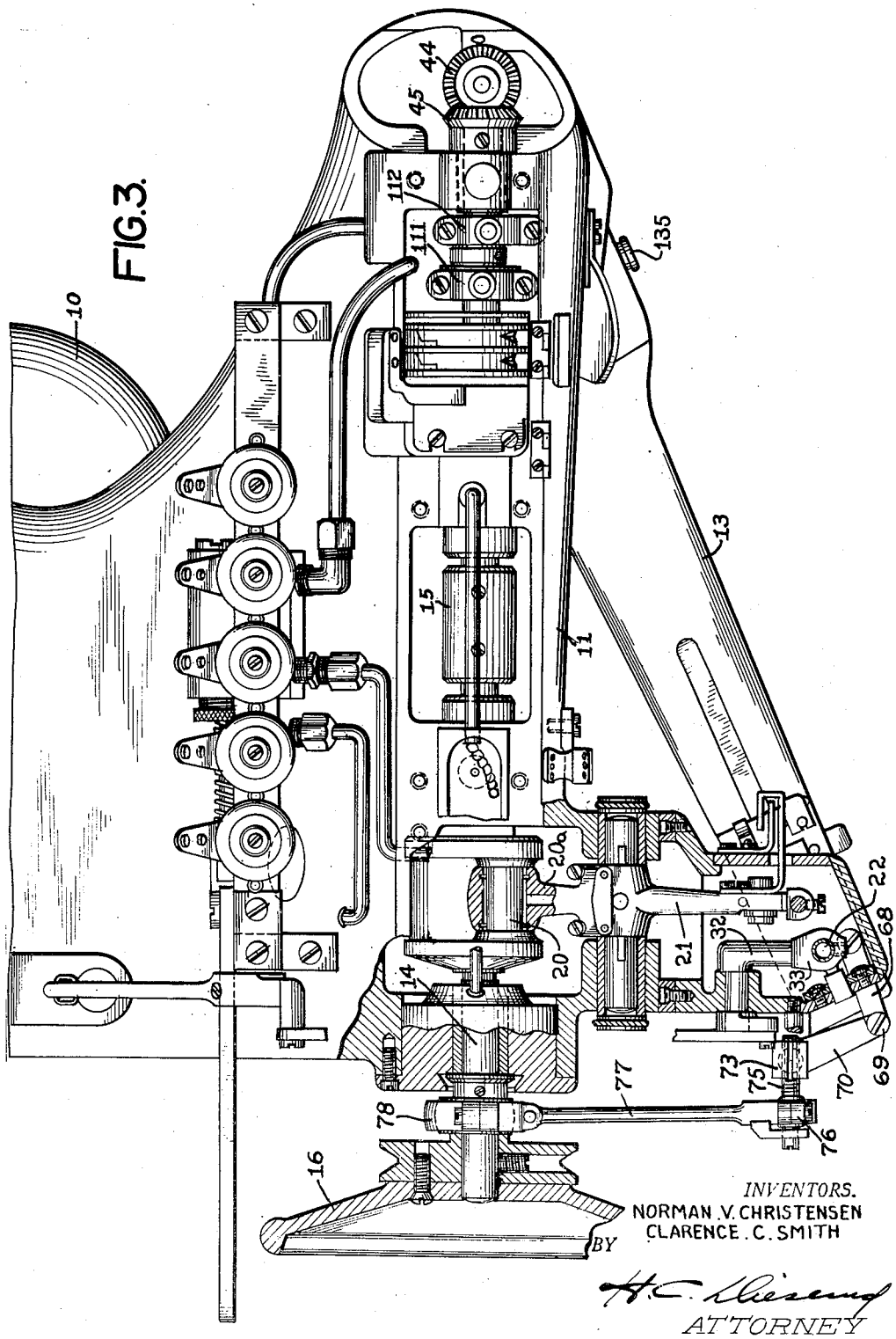
H. C. Thiemann
ATTORNEY

April 17, 1951 N. V. CHRISTENSEN ET AL 2,548,869

SEWING MACHINE

Filed March 27, 1947 6 Sheets-Sheet 3

FIG. 3.



INVENTORS.
NORMAN V. CHRISTENSEN
CLARENCE C. SMITH

H. C. Miessner
ATTORNEY

April 17, 1951 N. V. CHRISTENSEN ET AL 2,548,869

SEWING MACHINE

Filed March 27, 1947 6 Sheets-Sheet 4

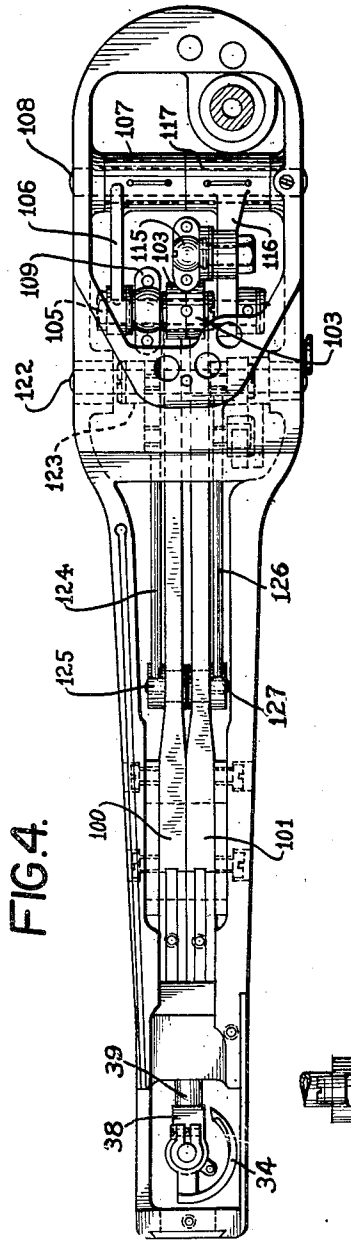


FIG. 4.

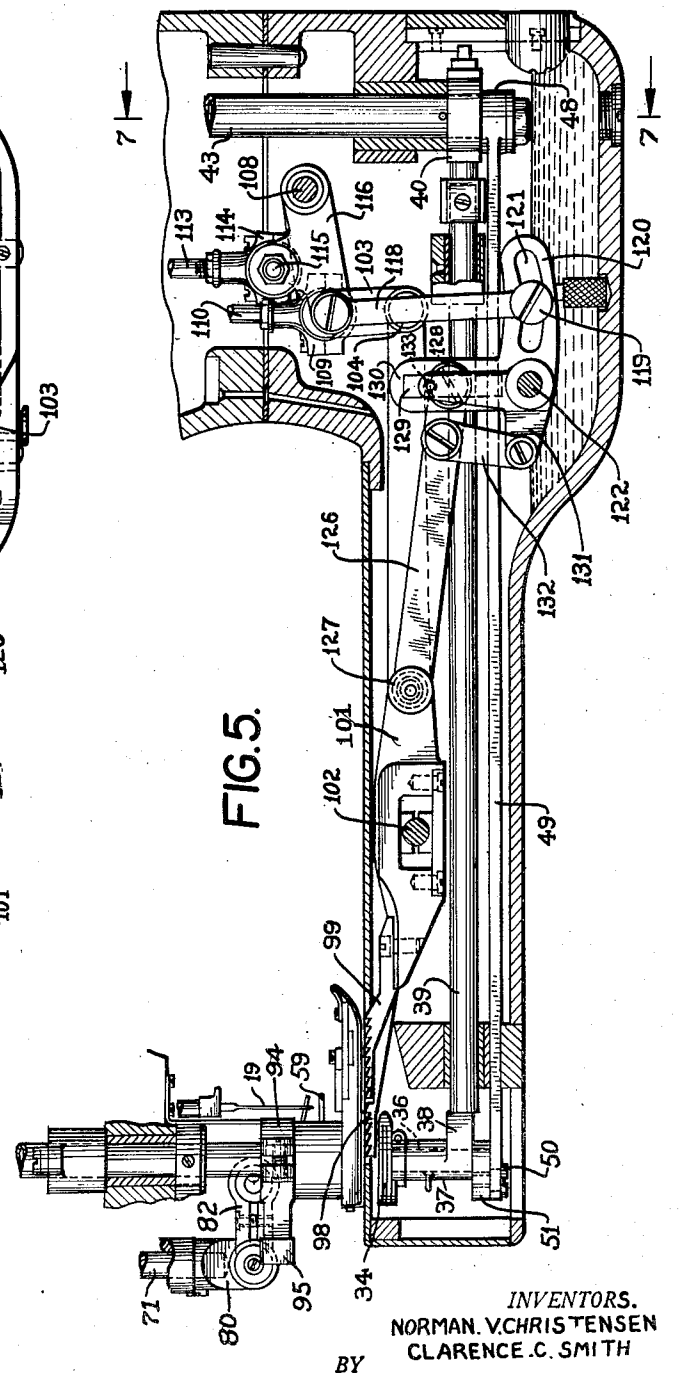


FIG. 5.

INVENTORS.
NORMAN. V. CHRISTENSEN
CLARENCE. C. SMITH
BY
H. C. Christensen
ATTORNEY

April 17, 1951 N. V. CHRISTENSEN ET AL 2,548,869

SEWING MACHINE

Filed March 27, 1947 6 Sheets-Sheet 5

FIG.6.

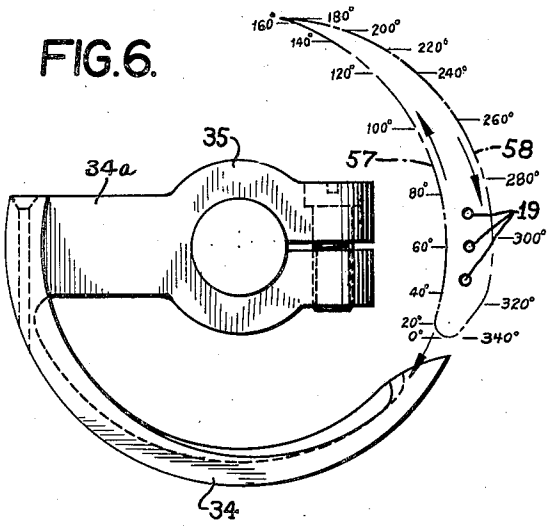


FIG.7.

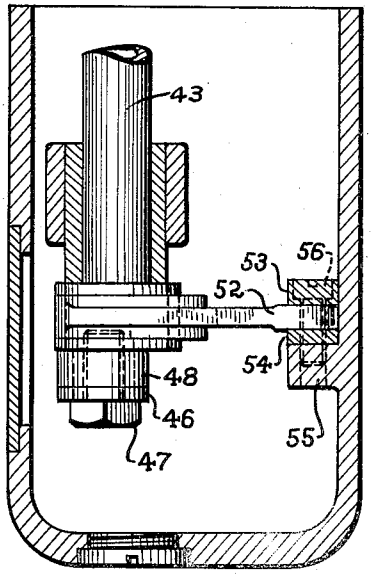


FIG.8.

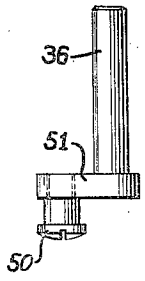


FIG.9.

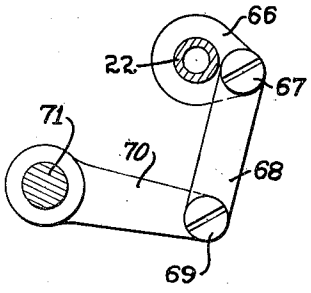


FIG.10.

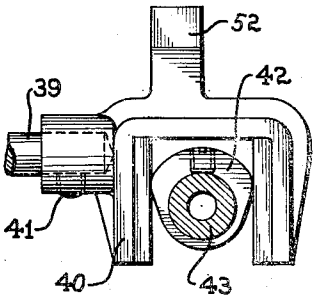
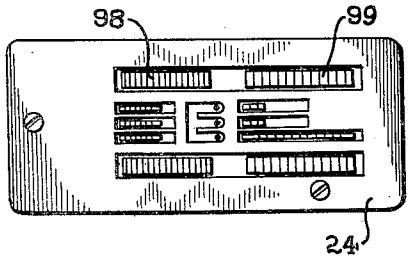


FIG.11.



INVENTORS.
NORMAN V. CHRISTENSEN
CLARENCE C. SMITH
BY
H. C. Rheinemund
ATTORNEY

April 17, 1951 N. V. CHRISTENSEN ET AL 2,548,869

SEWING MACHINE

Filed March 27, 1947 6 Sheets-Sheet 6

FIG.12.

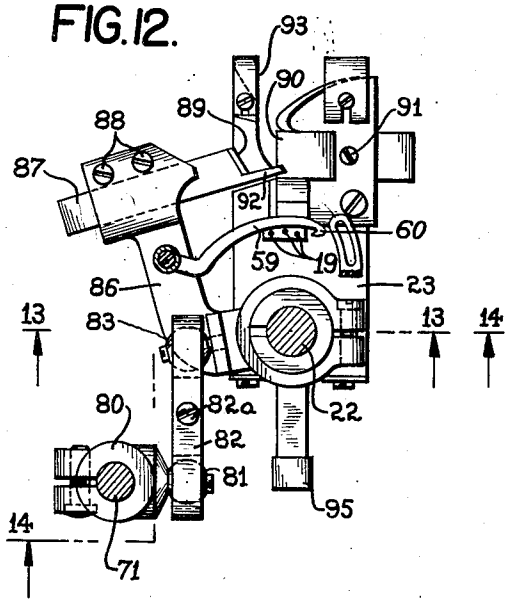


FIG.13.

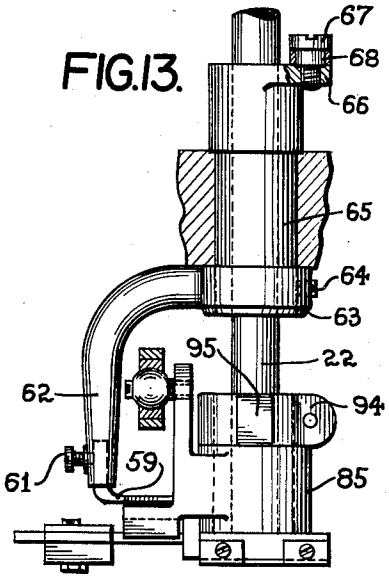


FIG.14.

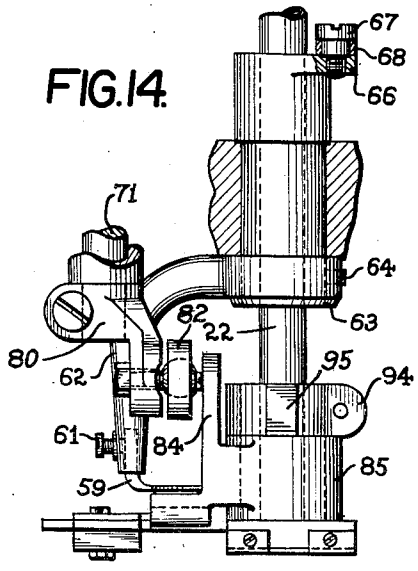
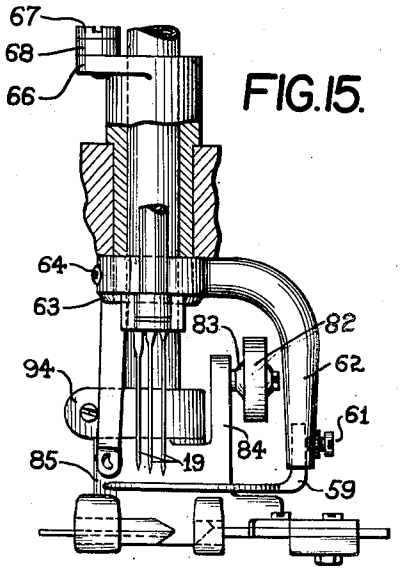


FIG.15.



INVENTORS.
NORMAN V. CHRISTENSEN
CLARENCE C. SMITH

BY

H. C. Klissendorf

ATTORNEY

Patented Apr. 17, 1951

2,548,869

UNITED STATES PATENT OFFICE

2,548,869

SEWING MACHINE

Norman V. Christensen and Clarence C. Smith, Chicago, Ill., assignors to Union Special Machine Company, Chicago, Ill., a corporation of Illinois

Application March 27, 1947, Serial No. 737,546

15 Claims. (Cl. 112—200)

1

This invention relates to sewing machines and more particularly to industrial sewing machines of the feed-off-the-arm type. It involves an improved construction in which the complemental stitch forming means that cooperates with a vertically reciprocatory needle or needles is in the form of a looper adapted to be oscillated within the work arm about a vertical axis which is, in turn, adapted to be shifted transversely to impart needle avoid movements to the looper.

The improved stitch forming means is particularly adapted for cooperation with an oscillatable finger which lays in a cover thread in interlocked relation with the needle thread above the work. The resulting stitch is particularly suited for the seaming of knit materials, such as used in underwear and the like, and the free ended work arm enables the production of seams of the character indicated in the tubular members of garments. Trimming mechanism may be provided in relation to the stitch forming devices so that a so-called flat seam may be produced. Moreover, the arrangement as a whole is such that a single machine is capable of performing a wide variety of seaming operations which have heretofore required a number of different machines.

A primary object of the invention has been to provide a simple, sturdy and reliable construction of the above indicated character adapted for rapid seaming operations.

Another object has been to provide a stitch forming mechanism of the foregoing character which has simple motions of a type that can be rapidly performed with a minimum of wear on the relatively moving parts.

A special feature of the stitch forming devices is the provision of a single curved looper to cooperate with a plurality of needles. Thus, in a machine provided with three needles an exceptionally desirable flat seam may be produced with five threads, in lieu of the greater number of threads heretofore employed in providing a corresponding seam.

A further feature of the invention is the provision of means for imparting a needle avoid movement to the looper which is of such character that a prolonged dwell is very simply and effectively produced at desired points in the cycle.

Another feature of the invention is the provision of a curved stitch forming element both above and below the work supporting surface to provide a thread which is interengaged or interlocked with a plurality of needle thread loops at each side of the work.

2

Other objects, features, and advantages of the invention will appear from the following detailed description of an illustrative embodiment shown in the accompanying drawings, in which:

Fig. 1 is a side elevational view of the illustrative machine with portions of the frame and other parts broken away and shown in section to disclose more clearly the interior construction;

Fig. 2 is an end elevational view of the machine with only a portion of the work supporting arm shown;

Fig. 3 is a top plan view of the machine with a top cover removed and with parts broken away and shown in section;

Fig. 4 is a plan view of the work supporting member of the machine with its cover removed;

Fig. 5 is a vertical sectional view through the work supporting member and a portion of the frame to which it is attached and shows a portion of the cooperating stitch-forming and work feeding devices which are in part carried by the needle head;

Fig. 6 is a detail view in plan of the looper and shows diagrammatically the path of the beak of the looper;

Fig. 7 is a vertical sectional view through the work supporting member taken along the line 7—7 of Fig. 5;

Fig. 8 is a detail view in elevation showing the looper supporting shaft and associated connections;

Fig. 9 is a detail view in section along the line 9—9 of Fig. 2, showing the operating means for the cover thread looper or spreader;

Fig. 10 is a detail view in plan showing a portion of the looper supporting and reciprocating rod and the operating means therefor;

Fig. 11 is a top plan view of the throat plate and feed dogs;

Fig. 12 is a detail view in horizontal section showing the cover thread laying means and the trimming mechanism;

Fig. 13 is a vertical sectional view of the parts shown in Fig. 12 as viewed along the line 13—13 of Fig. 12;

Fig. 14 is a view similar to Fig. 13 but is taken along the line 14—14 of Fig. 12; and

Fig. 15 is an elevational view of the parts shown in Fig. 14 as viewed from the opposite side, some of the supporting structure being broken away and shown in section.

Turning now to the drawings, the illustrative machine is of the feed-off-the-arm type, such as illustrated in the Christensen et al. Patent No. 1,741,095, granted December 24, 1929. The frame of the machine comprises a main supporting por-

tion 10 which is adapted to be supported by the top of a table and which extends upwardly and laterally into a horizontally disposed portion 11 having at one end a downward extension 12 to the lower end of which is secured a work supporting member 13. This projects laterally, in the manner shown, and has a free end which adapts the construction for the seaming of tubular work, such as the sleeves of garments and the like. By virtue of this free-ended work arm the machine is adapted for the performance of a variety of different kinds of work so that a single machine may perform seaming operations which heretofore have required a number of different machines.

Within the horizontally disposed portion 11 of the frame there is journalled, in suitable bearings, a main shaft 14 which, as shown in Fig. 1, may suitably be formed in two parts joined by a coupling 15. This shaft extends to a point exterior of the frame and carries at its outer end a combined handwheel and pulley 16 through which power may be supplied to the machine from an electric transmitter or any other suitable source.

Projecting laterally from the horizontal portion 11 of the frame, at the end thereof opposite to the downward extension 12, there is provided a needle head 17 which extends over the free end of the work supporting arm. A vertically disposed needle bar 18, carrying at its lower end a plurality of needles 19, is mounted for reciprocatory movement within the needle head. Such movement is imparted to the needle bar by a crank portion 20 (Fig. 3) of the shaft 14 which cooperates with a pitman or link 20*a* connected with a rock lever 21 journalled in suitable bearings in the frame. The outer end of the lever 21 is connected through a link with a block secured to the needle bar. Within the needle head there is also mounted a vertically slidable presser bar 22 carrying at its lower end a presser foot 23, of any suitable construction, arranged to cooperate with the upper surface of a throat plate 24. A leaf spring 25 cooperating with the upper end of the presser bar urges the presser foot against the throat plate or the work carried thereby. The tension of the spring 25 may be varied by an adjustable nut 26. Lifting of the presser foot to permit the introduction and removal of the work is brought about by a lever 27 pivotally mounted on the frame and connected at its free end, through a chain 28, with a treadle or other suitable control member, not shown. A second arm of the lever 27 is connected by a link 29 with an arm 30 secured to a rock shaft or stud 31 which carries an arm 32 within the needle head. The end of the arm 32 is arranged to engage the under surface of a lug 33 secured to the presser bar so that as the lever 27 and arm 30 are rocked in a counterclockwise direction (Fig. 2), the presser bar will be raised against the action of the spring 25.

Within the work supporting arm (Figs. 4 and 5) there is mounted a complemental stitch forming member, in the form of an arcuate or curved, oscillatable looper 34. This has an inwardly extending arm 34*a* formed integrally with a hub-like extension 35 (Fig. 6) which is split and arranged to be clamped about a vertically disposed looper shaft 36. The latter is journalled within a bearing sleeve 37 having a lateral extension 38 connected integrally or otherwise with a reciprocating rod 39. The rod 39 extends lengthwise within the work supporting arm and is slidably mounted in suitable bearings provided therein. At its end opposite to that carrying the looper it carries a forked cam-engaging member 40, the latter being secured to the rod 39 by means of a set screw 41 (see Fig. 10). The forked member 40 straddles and is acted upon by a substantially triangular cam 42 secured to the lower end of a shaft 43 which is journalled at its lower end in a bearing carried by the work support member and is journalled near its upper end in a bearing carried by the downward extension 12 of the frame. At its upper end the shaft 43 has secured thereto a bevel gear 44 (Fig. 1) which meshes with a bevel gear 45 secured to the shaft 14. These bevel gears are of the same size and the shaft 43 is, therefore, driven at the same angular speed as the shaft 14. Below the cam 42 there is secured to the shaft 43, in any suitable way, a bushing 46 having a sleeve-like portion which is eccentric with respect to the axis of the shaft 43. A screw or bolt 47 serves to secure this bushing to the lower end of the shaft. The sleeve-like portion of the bushing is surrounded by a strap or collar 48 which is connected with a pitman 49 that extends through the length of the work supporting arm and is connected at its forward end, by means of a screw 50, to an arm 51 (Figs. 5 and 8) extending laterally from the lower end of the shaft 36. To guide the member 40 in its reciprocating movements, it is provided with a lateral extension 52 (Figs. 7 and 10) having at its end top and bottom flat surfaces arranged to slide between guide bars 53 and 54 secured to a lug or projection 55 extending inwardly from the wall of the frame. One or more screws 56 may be provided for securing the guide bars to the lug. Any suitable means, such as thickened portions at the ends of the guide bars, may be provided for maintaining them in properly spaced relation.

By virtue of the foregoing construction, the looper carrying rod 39 is reciprocated upon each cycle of operation of the machine to impart needle-avoid movements to the looper. Because of the form of the cam 42 a substantial dwell is provided at each end of the reciprocating movement of the rod 39. At the same time, the eccentric element 46 serves to oscillate the looper upon each cycle of the machine. The path of the beak of the looper, as a result of its bodily movement and its oscillation about the axis of the supporting shaft 36, is indicated graphically by the broken line diagram and the arrows in Fig. 6. The loop-seizing movement of the looper is along the arc 57 which passes to the left of the needles 19, as shown in Fig. 6. The loop-shedding movement is along the path 58 which is to the right of the needles, as shown in Fig. 6.

Cooperating with the needles above the work, to introduce a cover thread beneath the needle thread stitches, is a looper or spreader 59 (Figs. 1, 2, 5, and 12 to 15). This preferably has a notched outer end 60 arranged to engage the cover thread and carry it across the path of the needles. It will be understood that suitable take-up mechanism (not shown) acting upon the cover thread will serve to hold the loop of this thread engaged with the notch 60 as the spreader is retracted. If desired, the spreader may be provided with a thread receiving eye. Spreader 59, which is of curved form, as illustrated most clearly in Fig. 12, is oscillated through a suitable arc, causing the end of the spreader to travel a distance of about 1 inch about the axis of the presser bar 22. For this purpose, the spreader is secured by means of a set screw 61 in a socket

provided in the lower end of an arm 62 which extends outwardly and downwardly from a collar portion 63 which is secured by a set screw 64 to the lower end of a rock sleeve 65 surrounding the presser bar. At its upper end the sleeve 65 has secured thereto, either integrally or otherwise, an enlarged collar portion having a laterally extending arm 66 (Fig. 9) to which is secured, by means of a screw 67, one end of a link 68. The opposite end of the link 68 is secured by a screw 69 to the outer end of an arm 70 secured to a rock shaft 71. The latter is disposed vertically within a bearing 72 secured, in any suitable way, to the needle head of the machine. Above the bearing 72 and the arm 70, the rock shaft 71 is provided with a forked extension 73 having a clamping screw 74 which serves to clamp a screw stud 75 in suitably adjusted position. Screw stud 75 has an enlarged spherical head at its outer end which cooperates with a strap 76 provided at one end of a pitman 77. The latter is provided with another strap 78 at its other end arranged to cooperate with an eccentric 79 secured to the shaft 14 between the frame of the machine and the handwheel 16.

It will be apparent that upon each revolution of the main shaft 14, the shaft 71 will be oscillated through an appropriate arc and, by means of the connections described, will rock the arm 62 about the axis of the presser bar to carry the looper or spreader 59 across the path of the needles 19 in the manner explained. The length of the arc through which the spreader is thus carried may be varied by appropriate adjustment of the screw stud 75. As the extent to which this projects from the clamp 73 is reduced, the length of the arc through which the shaft 71, and hence the carrier 62, is oscillated will be increased. It will be understood that the looper or spreader 59 is carried across the path of the needles, on the side thereof indicated in Fig. 12, while the needles are in the work. The needles are then raised and the work is advanced. When the needles are subsequently brought downwardly through the work again, while the looper or spreader still holds its thread across the path of the needles, the needles will be passed through the loop of the looper thread, so that the latter is interlocked with the needle threads. The resulting seam is similar to that disclosed in the Berger Patent No. 1,768,026, granted June 24, 1930.

Suitable trimming mechanism (Fig. 12) is preferably provided in conjunction with the stitching means so as to produce a uniform or regular lapped seam of the type illustrated in said Berger patent. This trimming mechanism comprises a yoke member 80 secured to the lower end of the shaft 71, beneath the bearing 72. Projecting laterally from the yoke member is a ball element 81 arranged to provide a universal connection with a link 82, the opposite end of which is connected with a similar ball member 83 secured to and extending laterally from an upwardly projecting arm 84 of a rock member 85 which is mounted for oscillation about the presser bar 22. The link 82 is divided longitudinally into upper and lower sections which are secured together by a screw 82*a*, to facilitate assembly of the link on the spherical elements at its ends. Member 85 is provided with an L-shaped arm 86, which extends laterally from a collar-like portion surrounding the presser bar and which carries at its outer end a split head or jaw adapted to receive a cutting blade 87. The latter may be clamped in the head by tightening a pair of screws 88. At its end, the cutter 87 is provided with an inclined cutting edge 89 arranged to cooperate with a stationary cutting edge on a cutting element 90 which is carried by the presser foot 23. Cutting element 90 may be adjusted to a suitable position on the presser foot and held as set by means of a set screw 91. A finger 92 extending longitudinally from the end of the cutter 87 is arranged to engage the top surface of the cutter 90 to insure maintenance of the proper relation between the cutting edges of the two cutters at all times. In the operation of the machine, the two edges of the fabric to be stitched together are turned upwardly and brought into abutting relation by suitable guides provided on the presser foot, in the manner disclosed in said Berger patent. As the work is advanced the upwardly projecting abutting edges are directed along a surface 93 on one branch of the presser foot. This surface serves to direct the material properly into the path of the cutters of the trimming means and then into the path of the guide surfaces which produce the lapped relation of the edges, as shown in the Berger patent, just in advance of the stitching point.

To prevent rotation or oscillation of the presser bar in response to the movements of the sleeve 65 or the collar 85, a split collar 94 (Figs. 1, 5, 12, and 13) is secured to the presser bar just above the collar 85. This split collar has a laterally projecting arm provided at its end with a flat sided portion 95 which is adapted to slide in a guide slot formed between two parallel guide members 96 secured to the needle head of the machine. This arrangement is such that the presser bar may be lifted and lowered in response to variations in the thickness of the work or in response to the operation of the presser foot lifting mechanism, hereinbefore described, but it will not rotate, thus insuring proper positioning of the presser foot at all times. A spring wire element 97, secured to the lower ends of the members 96, extends beneath the projection 95 and limits the downward movement of the presser bar in relation to the needle head.

Suitable means for advancing the work along the work supporting surface of the arm 13 may comprise a plurality of feed dogs 98 and 99 (Figs. 5 and 11) which are operated differentially in relation to each other. These feed dogs are adapted to extend through suitable openings in the throat plate 24 to engage the work and advance it in cooperation with the presser foot. Feed dog 98 is secured, by a screw or the like, to the forward end of a feed bar or lever 100, while feed dog 99 is similarly secured to the forward end of a feed bar or lever 101. These feed bars are mounted for both rocking and sliding movement on a transversely extending rod or shaft 102. Suitable bearings or fulcrum blocks are provided between the shaft and the upper and lower surfaces of elongated openings in the feed bars, as best shown in Fig. 5. The inner ends of the feed bars are connected with links 103 (Figs. 4 and 5) by means of screws 104. Links 103 depend from a stud 105 carried by an arm 106 extending from a hub or sleeve 107 rockably mounted on a fixed shaft or rod 108. Intermediate the arm 106 and the links 103 the stud 105 has a portion of spherical formation which constitutes part of a ball and socket connection, the other part being formed by a strap 109 carried by the lower end of a pitman 110. The lat-

ter at its upper end is connected by a strap 111 with an eccentric carried by the main shaft 14. It will be apparent that through the connections described, the arm 106 will be rocked to carry the links 103 downwardly and upwardly upon each cycle of operation of the machine, thereby imparting rising and falling movements to the feed dogs.

For the purpose of imparting feed stroke and return movements to the feed dogs, another eccentric carried by the shaft 14 cooperates with a strap 112 at the upper end of a pitman 113 which at its lower end is connected by a strap 114 with a ball at the inner end of a stud 115. The latter is secured to an upward extension of an arm 116 projecting from a sleeve or hub 117 rockably mounted on the shaft 108. A link 118, pivotally connected with the free end of the arm 116, depends from the latter and is connected by a bolt 119 with an arm 120.. The latter has an arcuate slot 121 which receives the bolt 119 and provides for adjustable connection between the link 118 and the arm 120. This arm is part of a rock frame and extends radially from a sleeve mounted on a fixed shaft 122. At the opposite end of the sleeve is an upwardly extending arm 123 with which is pivotally connected a link 124 having its other end pivotally connected at 125 with the feed bar 100. Feed bar 101 has pivotally connected with it at 127 a link 126, this link carrying a stud or roller 128 at its free end arranged to cooperate with an elongated slot 129 in another arm 130 which extends upwardly from the sleeve of the rock frame in the same plane as the arm 120. A bell crank 131 rockably mounted on the shaft 132 has one arm pivotally connected with a link 132, the opposite end of which is connected with an intermediate point on the link 126. The other arm of the bell crank is provided with a stud 133 which is arranged to extend through a slot 134 (Fig. 1) in the frame of the work supporting arm. At its outer end the stud 133 is screw threaded and carries a knurled and screw threaded nut element 135. The latter cooperating with the screw threads on the stud 133 serves to clamp the latter in any set position along the slot 134. By suitable adjustment of the stud 133, a corresponding adjustment is effected of the stud or roller 128 in the slot 129, thus varying the stroke of the feed dog 99 independently of the feed dog 98. The feed dog supporting and operating means as above described is similar to that disclosed in the Zeier Patent No. 1,950,337, granted March 6, 1934 and reference may be had to that patent for further details.

The illustrative machine is provided with various auxiliary means commonly provided in machines of this type. For example, appropriate thread handling and controlling means, including guides, takeup means, tensioning devices, and the like, are provided. So also, the machine is preferably provided with suitable means for insuring proper lubrication of all of the operating parts. Since these auxiliary means form no part of the present invention, except in so far as they enter into combination with the features above described, it is unnecessary to describe their construction.

The operation of the machine is, briefly, as follows: The work to be stitched, which may suitably be a tubular member of a knit garment, such as underwear, is advanced along the work support 13. It is initially brought into the zone of action of the feed dog 99 by the operator, the edges to be seamed being brought together in appropriate relation. From this point the work is advanced by the feed dogs 98 and 99 to and beyond the stitching point and in the course of its advance the adjacent edges of the work will be turned upwardly and then trimmed by the cutter 87 in cooperation with cutter 90. The trimmed edges are then flattened into overlapped relation to present them in the desired way to the stitch forming devices. The stitching is produced by the five threads carried by the three needles 19, the looper 34 and the looper or spreader 59. The thread of the looper 34 is passed through the loops of all of the needle threads at the under side of the work, while the thread carried by the cover thread looper or spreader 59 is laid in zig-zag fashion across the three lines of stitching formed by the needles and in interlocked relation with the several needle threads. The curved formation of the two looper elements 34 and 59 and their oscillation about vertical axes provides for a very simple and dependable stitch-forming operation. As explained in detail above, the looper 34 is shifted bodily at the ends of its oscillatory movements for needle avoid purposes. These bodily movements are imparted by a substantially triangular cam rather than by an eccentric; this permits a long dwell to be provided after each bodily movement.

While an illustrative form of the invention has 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. If desired, the machine may be supported from a column in the manner disclosed in the pending application of Norman V. Christensen and George Sauer, Serial No. 704,822, filed on October 22, 1946, now Patent No. 2,511,047, dated June 13, 1950.

We claim.

1. In a sewing machine having a frame carrying a needle head with a vertically reciprocable needle bar, said frame being also provided with a horizontally extending, free-ended work supporting arm, and having a main shaft above said arm for receiving power to operate the machine, the combination of an oscillatory looper, a vertically disposed shaft within said work supporting arm carrying said looper, a support in which said shaft is journalled, and connections from said main shaft for bodily reciprocating said support longitudinally of said arm and for oscillating said looper carrying shaft within said support.

2. In a sewing machine a frame having a horizontally extending member, a needle head projecting laterally at one end of said member with a vertically reciprocable needle bar therein carrying a plurality of needles, a downward extension at the opposite end of said member, a free-ended work supporting arm extending laterally from said downward extension to a point beneath said needle head, a main shaft journalled in said member and arranged to receive power for operating the machine, connections from said shaft for reciprocating said needle bar, an oscillatory looper arranged to cooperate with said needles in stitch formation, a vertically disposed shaft within said work supporting arm carrying said looper, a support in which said shaft is journalled, connections from said main shaft for bodily reciprocating said support longitudinally of said arm and for oscillating said looper carrying shaft within said support, an oscillatable thread finger

arranged to provide a cover thread in the path of said needles, and connections from said main shaft for oscillating said finger.

3. In a sewing machine having a frame carrying a needle head with a vertically reciprocable needle bar, said frame being also provided with a horizontally extending, free-ended work supporting arm, and having a main shaft above said arm for receiving power to operate the machine, the combination of an oscillatory looper, a vertically disposed shaft within said work supporting arm carrying said looper, a support in which said shaft is journalled, and connections from said main shaft including an intermediate shaft and a plurality of operating means thereon for bodily reciprocating said support longitudinally of said arm and for oscillating said looper carrying shaft within said support.

4. In a sewing machine a frame having a horizontally extending member, a needle head at one end of said member with a vertically reciprocable needle bar therein carrying at least one needle, a downward extension at the opposite end of said member, a free-ended work supporting arm extending laterally from said downward extension, a main shaft journalled in said member and arranged to receive power for operating the machine, connections from said shaft for reciprocating said needle bar, an oscillatory looper arranged to cooperate with said needle in stitch formation, a vertically disposed shaft within said work supporting arm carrying said looper, a support in which said shaft is journalled, and connections from said main shaft including an intermediate shaft vertically disposed in said downward extension and a plurality of operating means thereon for bodily reciprocating said support longitudinally of said arm and for oscillating said looper carrying shaft within said support.

5. In a sewing machine having a frame carrying a needle head with a vertically reciprocable needle bar, said frame being also provided with a horizontally extending, free-ended work supporting arm, and having a main shaft above said arm for receiving power to operate the machine, the combination of an oscillatory looper, a vertically disposed shaft within said work supporting arm carrying said looper, a support in which said shaft is journalled, and connections from said main shaft for bodily reciprocating said support longitudinally of said arm and for oscillating said looper carrying shaft within said support, said connections including a cam driven by said main shaft and arranged to provide a dwell at one end of the movement of said support.

6. In a sewing machine a frame having a horizontally extending member, a needle head at one end of said member with a vertically reciprocable needle bar therein carrying at least one needle, a downward extension at the opposite end of said member, a free-ended work supporting arm extending laterally from said downward extension, a main shaft journalled in said member and arranged to receive power for operating the machine, connections from said shaft for reciprocating said needle bar, an oscillatory looper arranged to cooperate with said needle in stitch formation, a vertically disposed shaft within said work supporting arm carrying said looper, a support in which said shaft is journalled, and connections from said main shaft including an intermediate shaft vertically disposed in said downward extension and a plurality of operating means thereon including a cam having a dwell for bodily reciprocating said support longitudinally of said arm and for oscillating said looper carrying shaft within said support.

7. In a sewing machine having a frame carrying a needle head with a vertically reciprocable needle bar, said frame being also provided with a horizontally extending, free-ended work supporting arm, and having a main shaft above said arm for receiving power to operate the machine, the combination of an oscillatory looper, a vertically disposed shaft within said work supporting arm carrying said looper, a support in which said shaft is journalled, an intermediate shaft driven by said main shaft, a cam on said intermediate shaft having a dwell and arranged to impart bodily movements to said support longitudinally of said arm for needle avoid movements of said looper, and an eccentric on said intermediate shaft for oscillating said looper carrying shaft in said support.

8. In a sewing machine a frame having a horizontally extending member, a needle head at one end of said member with a vertically reciprocable needle bar therein carrying at least one needle, a downward extension at the opposite end of said member, a free-ended work supporting arm extending laterally from said downward extension, a main shaft journalled in said member and arranged to receive power for operating the machine, connections from said shaft for reciprocating said needle bar, an oscillatory looper arranged to cooperate with said needle in stitch formation, a vertically disposed shaft within said work supporting arm carrying said looper, a support in which said shaft is journalled, an intermediate shaft disposed vertically in said downward extension, means for driving said intermediate shaft from said main shaft, a cam on said main shaft having a dwell and arranged to impart bodily movements to said support for needle avoid movements of said looper, and eccentric means on said intermediate shaft for oscillating said looper carrying shaft in said support.

9. In a sewing machine having a frame carrying a needle head with a vertically reciprocable needle bar, said frame being also provided with a horizontally extending, free-ended work supporting arm, and having a main shaft above said arm for receiving power to operate the machine, the combination of a curved looper, a vertically disposed shaft within said work supporting arm carrying said looper, a support in which said shaft is journalled, and connections from said main shaft for bodily reciprocating said support longitudinally of said arm and for oscillating said looper carrying shaft within said support.

10. In a sewing machine a frame having a work supporting member with a work supporting surface and a portion above said member carrying a needle head over said member, a vertically reciprocable needle bar in said needle head carrying a plurality of needles, a plurality of thread carrying members oscillatable about vertical axes arranged to carry thread transversely across the path of said needles and adjacent thereto, one of said thread carrying members being arranged beneath said work supporting surface and another above said surface, and means for synchronously operating said needles and thread carrying members to produce a seam having the threads carried by said thread carrying members inter-engaged with the threads carried by said needles above and below the work.

11. In a sewing machine a frame having a work supporting member with a work supporting surface and a portion above said member carrying a

needle head over said member, a vertically reciprocable needle bar in said needle head carrying a plurality of needles, a plurality of thread carrying members oscillatable about vertical axes arranged to carry thread transversely across the path of said needles and adjacent thereto, one of said thread carrying members being arranged beneath said work supporting surface and another above said surface, said thread carrying members being curved substantially about the centers of oscillation thereof, and means for synchronously operating said needles and thread carrying members to produce a seam having the threads carried by said thread carrying members interengaged with the threads carried by said needes above and below the work.

12. In a sewing machine a frame having a work supporting member with a work supporting surface and a portion above said member carrying a needle head over said member, a vertically reciprocable needle bar in said needle head carrying a plurality of needles, means for reciprocating said needle bar to carry said needles from a point above said work supporting surface through the work thereon to a point beneath said surface, a plurality of thread carrying members oscillatable about vertical axes arranged to carry thread transversely across the path of said needles and adjacent thereto, one of said thread carrying members being arranged beneath said work supporting surface and another above said surface, means for operating said thread carrying members in synchronism with said needle bar, and means for advancing the work while said needles are above the same, the construction and arrangement being such that the threads carried by said thread carrying members are interengaged with the threads carried by said needles on the under and upper sides of the work.

13. In a sewing machine a frame having a work supporting member with a work supporting surface and a portion above said member carrying a needle head over said member, a vertically reciprocable needle bar in said needle head carrying a plurality of needles, a plurality of thread carrying members oscillatable about vertical axes arranged to carry thread transversely across the path of said needles and adjacent thereto, one of said thread carrying members being arranged beneath said work supporting surface and another above said surface, means for synchronously operating said needles and thread carrying members to produce a seam having the threads carried by said thread carrying members interengaged with the threads carried by said needles above and below the work, means for advancing the work along said work supporting surface to form a continuous seam, and means cooperating with said work as it is advanced for trimming the edges thereof and assembling the same in lapped relation as said edges approach the region of stitch formation.

14. In a sewing machine a frame having a work supporting member with a work supporting surface and a portion above said member carrying a needle head over said member, a vertically reciprocable needle bar in said needle head carrying a plurality of needles, each of said needles carrying a thread and a plurality of thread carrying members oscillatable about vertical axes arranged to carry thread transversely across the path of said needles and adjacent thereto, one of said thread carrying members being arranged beneath said work supporting surface and another above said surface, each of said thread carrying members being arranged to carry a single thread into cooperative relation with the plurality of threads carried by said needles, and means for synchronously operating said needles and thread carrying members to produce a seam having the threads carried by said thread carrying members inter-engaged with the threads carried by said needles above and below the work.

15. In a sewing machine a frame having a work supporting member with a work supporting surface and a portion above said member carrying a needle head over said member, a vertically reciprocable needle bar in said needle head carrying a plurality of needles, a plurality of thread carrying members oscillatable about vertical axes arranged to carry thread transversely across the path of said needles and adjacent thereto, one of said thread carrying members being arranged beneath said work supporting surface and another above said surface, means for synchronously operating said needles and thread carrying members to produce a seam having the threads carried by said thread carrying members interengaged with the threads carried by said needles above and below the work, means for advancing the work along said work supporting surface to form a continuous seam, said work advancing means comprising a plurality of feed dogs operable differentially in relation to each other, and means cooperating with said work as it is advanced for trimming the edges thereof and assembling the same in lapped relation as said edges approach the region of stitch formation.

NORMAN V. CHRISTENSEN.
CLARENCE C. SMITH.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
525,227	Murphy	Aug. 28, 1894
556,710	Beardslee	Mar. 17, 1896
999,718	Hawes	Aug. 1, 1911
1,741,095	Christensen et al.	Dec. 24, 1929
1,768,026	Berger	June 24, 1930
1,827,613	Riviere et al.	Oct. 13, 1931