

Feb. 23, 1926.

1,574,270

A. H. WEIS

MULTIPLE NEEDLE SEWING MACHINE

Filed June 27, 1923

3 Sheets-Sheet 1

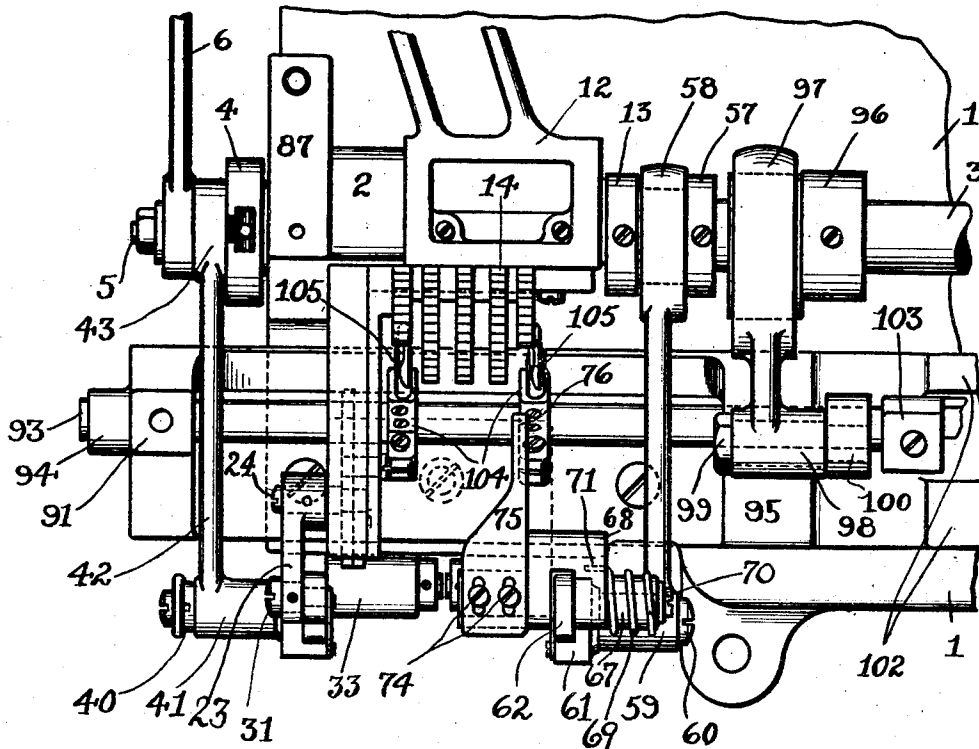


Fig. 1

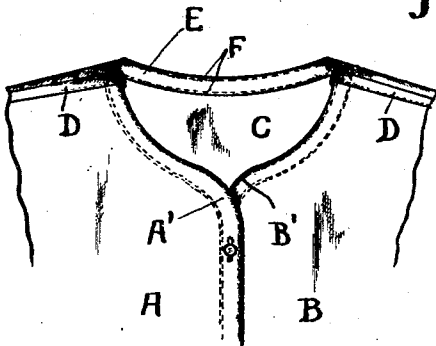


Fig. 2

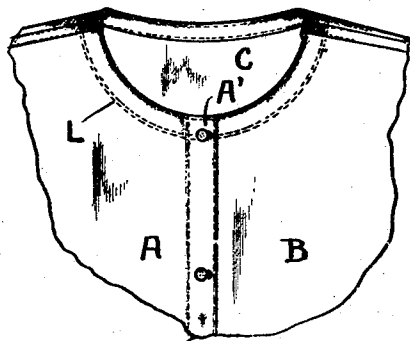


Fig. 3

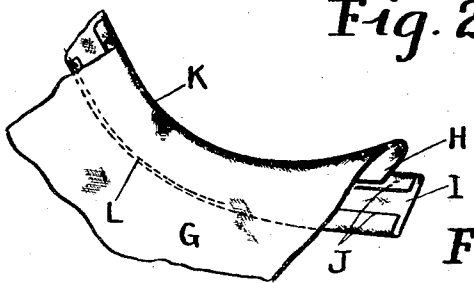


Fig. 4

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3 Sheets-Sheet 2

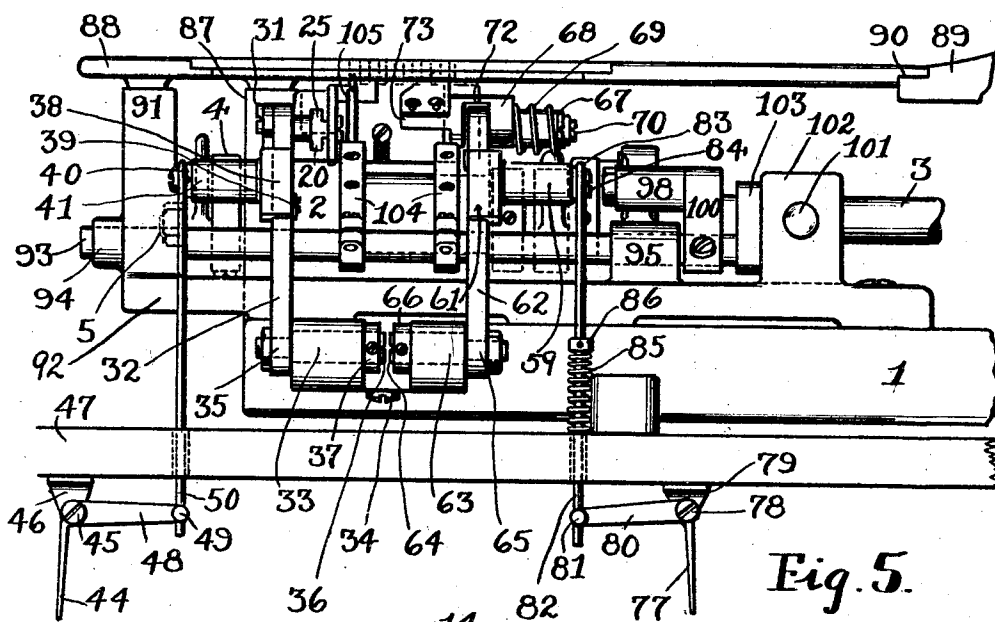


Fig. 5.

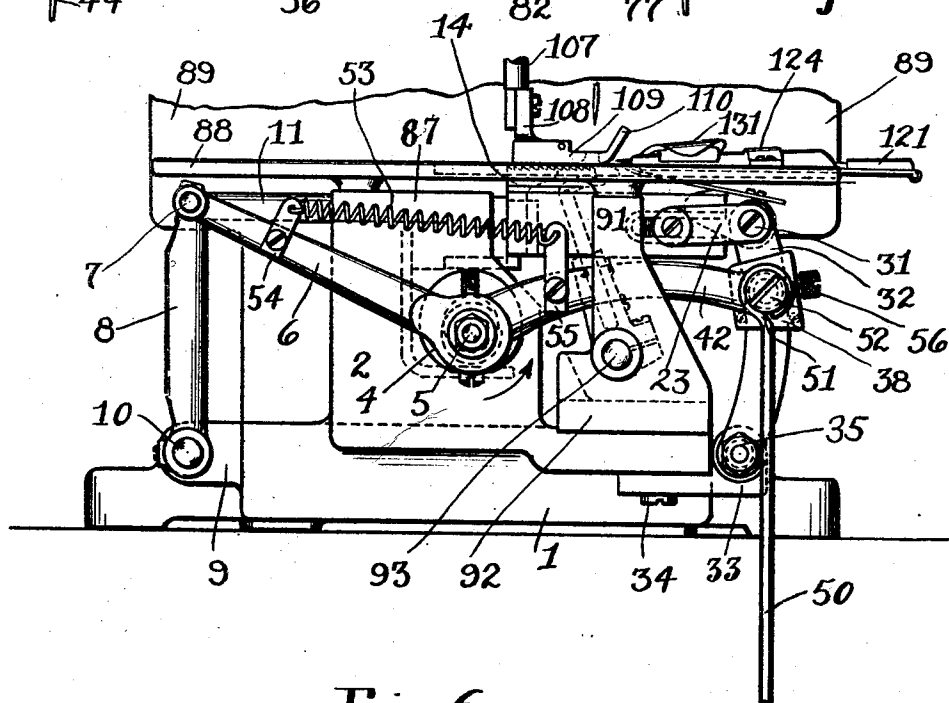


Fig. 6.

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3 Sheets-Sheet 3

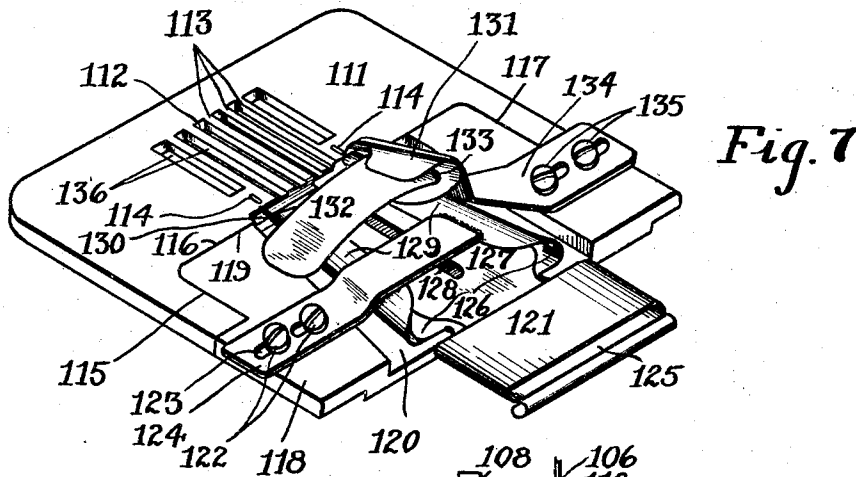


Fig. 7

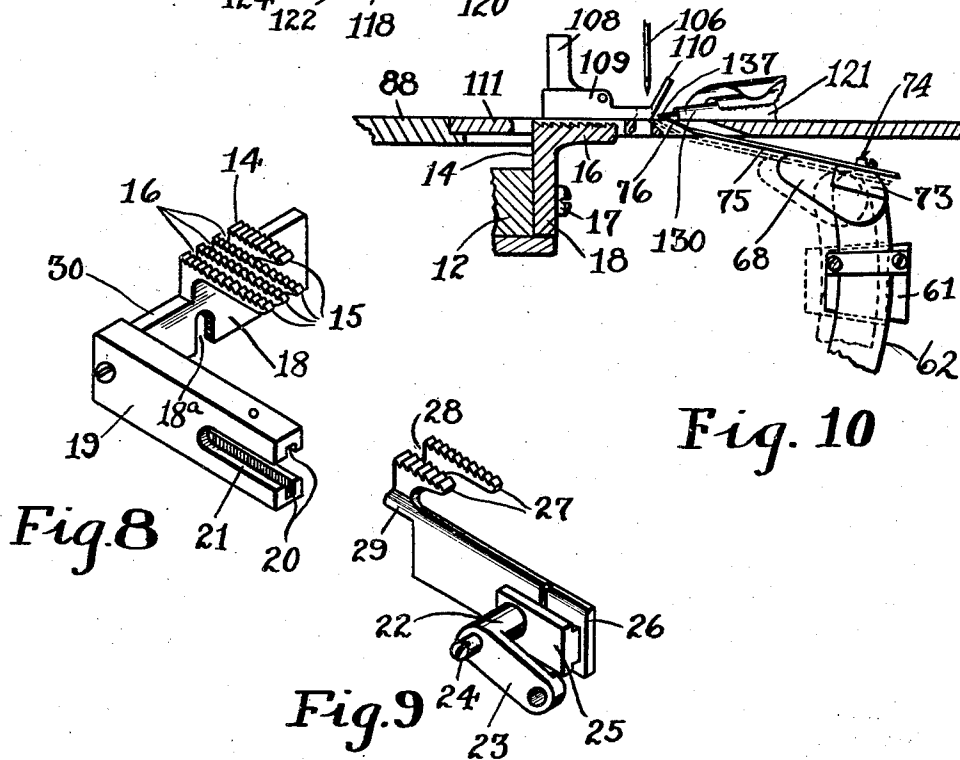


Fig. 10

Fig. 8

Fig. 9

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UNITED STATES PATENT OFFICE.

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MULTIPLE-NEEDLE SEWING MACHINE.

Application filed June 27, 1923. Serial No. 647,972.

To all whom it may concern:

Be it known that I, ALBERT H. WEIS, a citizen of the United States, residing at Nyack, in the county of Rockland and State of New York, have invented certain new and useful Improvements in Multiple-Needle Sewing Machines, of which the following is a specification.

This invention relates to sewing machines, and more particularly to multiple needle sewing machines especially adapted for use in factories for high speed manufacturing purposes, an object of the invention being to provide an improved sewing machine for applying a folded strip to the neck opening, as well as the front of garments such as underwear, night-shirts, house-dresses, shirt waists, children's rompers, etc., which machine will reduce the amount of labor necessary, simplify the operation, enable uniform highclass work to be turned out in large quantities with a minimum of labor, skill, and experience, thereby reducing materially the cost of production.

A further object of this invention is to provide an improved sewing machine for finishing the necks and fronts of garments, and by means of which a folded strip may be applied to the folded edge of a garment, the organization being such that the work of folding and hemming the garment, folding the edges of the strip and stitching the same to the folded edge of the garment, may be accomplished in a single operation, the operations of feeding, folding and stitching being accomplished automatically by the present mechanism, thus reducing the duties of the operator to merely guiding the garment to the machine and to effecting the control of the mechanism.

A further object of this invention is to provide an improved sewing machine having means for feeding the neck portions of garments in a curved or circular path and having means for simultaneously stitching a folded strip to the edge of the neck portion.

A further object is to provide a machine having means for applying a finishing strip to the neck portion of a garment and at the same time for feeding such neck portion in a curved or circular path, and means for adjusting said feeding means so that the facing strip and neck edges may be fed in circles or curves of different sizes.

A further object is to provide means for feeding the finishing strip and the edges of the garment to the stitching mechanism, and means under the control of the operator for adjusting such feeding means so that the direction of feed may be changed or modified to such an extent that the lines of stitching may follow straight or curved paths or reverse curves. As a result it is possible for the machine to stitch the button strip or button hole facing strip up the front or one edge of the garment, then by changing the direction of feed stitch around one corner of the neck opening, then by reversing the feeding action stitch in an oppositely curving path across the back portion of the neck of the garment, then around the front of the neck and around the other front corner of the neck portion, and down the opposite front edge of the front opening.

A further object of this invention is to provide improved mechanism for folding and guiding the raw edge of the neck opening of the garment and simultaneously folding and guiding the opposite edges of the facing strip to the stitching mechanism, and multiple needle stitching mechanism for simultaneously stitching together the inner folded edge of the facing strip and the folded edge of the neck opening and also for stitching the outer folded edge of the facing strip to the body of the garment.

A further object of this invention is to provide a sewing machine having means for stitching both folded edges of a woven fabric strip to the folded edge of a woven fabric garment, and means for feeding the edges in curved as well as straight paths.

Other objects of this invention will appear in the following description and the appended claims thereof, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters indicate corresponding parts in the several views and wherein Fig. 1 is a top plan view of the portion of a sewing machine illustrating particularly the feeding mechanism embodied in my invention; Fig. 2 is a view illustrating the neck portion of a pajamas coat having a facing strip applied thereto in accordance with my invention; Fig. 3 is a view illustrating the neck portion of a garment made from woven fabric and finished in accordance with my invention; Fig. 4 is a fragmentary view

illustrating the manner in which the neck portion of a garment is folded at the edge and faced or covered with a folded strip; Fig. 5 is a front elevation of a construction shown in Fig. 1; Fig. 6 is a left hand end elevation partly broken away of the construction shown in Fig. 5; Fig. 7 is a perspective view of the throat plate and side plate illustrating the folders in position; Fig. 8 is a perspective view of the main feed dog; Fig. 9 is a perspective view of the differential sliding feed dog and driving connection therefor; and Fig. 10 is a transverse detail section taken through the throat plate and main feed dog.

Before explaining in detail the present improvements and mode of operation thereof, it is desired to have it understood that the invention is not limited to the details of construction and arrangement of parts which are illustrated in the accompanying drawings, since the invention is capable of other embodiments, and that the phraseology which is employed is for the purpose of description and not of limitation.

I am aware that sewing machines have been in use for finishing the necks and fronts of knit garments, particularly knitted underwear. This has been accomplished by means of the so-called collarette binding machine, which has been used for the purpose of applying a collarette knit strip of fabric as a binding for the raw edge of the neck opening of knit garments. The feeding of this knit strip around the neck opening was accomplished by stretching the two folded edges of the knit binding strip, and by means of a feed mechanism acting upon the neck of the garment to cause it to feed in the proper path, more or less goods would be gathered and fed into the collarette binding strip, enabling various sizes of neck openings to be accommodated.

Due to the fact that knitted fabrics are capable of being stretched to a considerable extent it was possible to arrange a differential feed mechanism in front of the needle which operated to stretch the knit fabrics, thereby enabling the neck of the garment to be fed in a circular path. A feed operating in this manner however cannot be used in the finishing of the necks of woven fabric garments for the reason that there is practically no stretch to a woven fabric and there is also practically no stretch to the folded woven strip used for finishing the raw edge of the neck portion, so that therefore the feeding action applicable for finishing the necks of knitted garments is impracticable in finishing the necks of woven garments, since in applying a woven folded strip to the neck of a woven garment a feeding action must be produced which will not result in the puckering or distortion of the fabric garment.

In the present machine I have not only provided means for simultaneously folding the raw edge of the neck portion of the garment, and folding and applying a woven strip thereto, but also feeding mechanism so located and controlled as to feed the inner edge of the folded strip to the stitching mechanism faster than the main feed operates to feed such inner edge from the stitching position, and I also provide feeding mechanism acting upon the outer edge of the folded strip to feed such edge from the stitching position somewhat faster than the main feed operates to feed the inner edge from the stitching position. As a result of this construction, the neck portion and binding strip are fed in a curved or circular path, and by means of controlling mechanism it is possible for the operator to readily reverse the curved or circular path of feed, and it is also possible to control the action of the feeding mechanism so that the fabric may be fed out from the stitching mechanism in a straight path.

In the drawings I have only illustrated the front portion of the bottom of the machine frame, which is sufficient to enable those skilled in the art to clearly understand the invention, the top portion of the machine not being herein shown since it does not form a part of this invention. The present invention may be applied to any multiple needle sewing machine but is herein shown as embodied in a well known machine of the Metropolitan Sewing Machine Corporation, which machine is provided with the usual top and bottom rotary shafts, one for driving the needle mechanism and the other for driving the looper and feeding mechanism.

The machine frame comprises a suitable bed plate 1, the forward end of which carries a bearing 2, in which the lower shaft 3 rotates. Secured to the left hand end of the shaft 3 is a stitch regulating disc 4 which carries the usual adjustable crank pin 5 which gives movement to a feed driving connection or rod 6, one end of which has a bearing on the crank pin 5. The opposite end of the connecting rod 6 has a bearing which is secured to a feed rocker frame shaft 7 (see Fig. 6), which rocks in the top bearing of the feed rocker frame 8. This frame is pivotally supported at its lower end by a bearing 9 extending from the base or bed plate which houses a rocker shaft 10 secured to the feed rocker frame 8.

Pivotally connected to the rocker shaft 7 is a feed bar 11 which projects forwardly and overhangs the shaft 3, the forward end thereof being shown at 12, (see Fig. 1). The forward portion 12 of the feed bar 11 rests upon a feed lift eccentric 13 secured to the rotary shaft 3, this eccentric revolving and transmitting an up and down movement to the main feed dog mechanism 14. The main

feed dog 14 is clamped to the end of feed bar 12 (see Figs. 8 and 10) by means of screws 17 which pass through a depending shank portion 18 of the feed dog and by means of slots 18^a the screws 17 may be adjusted so as to adjust the height of the feed dog relatively to the throat plate and presser foot. This feed dog 14 is of peculiar construction for the purpose of accomplishing the feeding operation, and comprises a plurality of feed surfaces 15, which in the present instance include three outer feed members of substantially the same length and an inner feed member of less length, and the several feed members or surfaces are separated by slots 16 into which extend bars of the throat plate hereinafter described. The main or foundation feed therefor is effected by the feed lift eccentric 13 imparting up and down movement and the crank 5 imparting through the medium of the connections described, an endwise reciprocatory motion.

Secured to the outer end of the feed dog shank 18 is a forwardly projecting member 19 provided with a channel 20 in the form of a T-slot, the side opening 21 communicating with this slot being adapted to receive a hub 22 of link 23, the latter being pivotally connected by means of a screw 24 to a T-block 25 secured to the shank 26 of a differential feed dog 27. The T-slot 20 thus forms a guideway for the T-shaped guide block 25 during the reciprocation of the feed dog 27 through the medium of the connections 22 and 23.

The feed dog 27 operates as a differential feed and comprises a pair of feed surfaces of different lengths separated by means of a slot 28 into which extends a bar of the throat plate. Beneath the rear portion of the feed surface 27 is an overhanging shoulder 29, this shoulder riding upon the upper edge 30 of the feed shank 18 (see Figs. 8 and 9) so that in this manner the feed teeth of the differential feed dog are supported and maintained at the same height as the feed teeth of the main feed dog 14. It will be understood therefore that the differential feed 27, since it is slidingly supported at one end by the main feed 14, is given up and down movement corresponding to such movement of the main feed, but by virtue of the connections 22 and 23 it will be seen that the differential feed is given an independent reciprocating movement.

The forward end of the link 23 (see Figs. 1, 5 and 6) is pivotally connected by means of the screw 31 to a depending segmental or curved lever 32, which is secured at its lower end 35 to a rock shaft 36 which rocks in a bearing 33 secured by means of a screw 34 (see Fig. 6) to the machine base 1. A collar 37 limits the endwise movement of the rock shaft 36 in this bearing. Mounted upon the

segmental lever 32 is a sliding block 38 which is held in position for sliding movement on the lever 32 by means of a plate and attaching screws 39 (see Fig. 5). The sliding block 38 is adjustable upon the lever 32 by mechanism hereinafter described which is under the control of the operator. For the purpose of oscillating or rocking the lever 32 in order to reciprocate the link 23 and the differential feed dog 27, one end 41 of the connecting rod 42 is connected to the block 38 by means of a shoulder screw 40 (see Fig. 5). The other end 43 of the connecting rod 40 is pivotally connected to the crank pin 5 of the disc 4 so that upon rotation of the disc 4 by means of the shaft 3, endwise reciprocation is given to the connecting rod 42.

From the foregoing it will be seen that the main feed dog 14 operates in the usual manner as a four-motion feed, and that the differential feed dog 27 is given the same rise and fall movement as the main feed but is reciprocated independently thereof, and the reciprocatory stroke of the differential feed may be varied by shifting the slide block 38 up or down the segmental lever 32. The further down the slide block is shifted on the lever 32 the greater will be the movement or stroke of the differential feed dog, since this stroke is increasingly multiplied as the block 38 approaches the rock shaft 36.

In order to shift the slide block 38 into various adjusted positions upon the lever 32, I have provided mechanism which may be operated either by a foot treadle or a knee shift, the latter being herein shown by way of example. In the present instance the knee shift consists of a bell crank lever having arms 44 and 48 (see Fig. 5) which lever is pivoted at 45 to a bracket 46 secured to the under side of the work table 47 upon which the sewing machine rests. To the outer end of the arm 48 is secured at 49 for free movement the lower end of an actuating rod 50. The rod 50 extends up through the work table and the upper end thereof is pivotally connected by means of a shoulder screw 52 (see Fig. 6) which is tapped into the head of the screw 40. By shifting the arm 44 of the bell crank lever it will be seen that the slide block 38 will be shifted in the proper direction on the segmental lever 32.

Under certain conditions of operation I have found it desirable to provide means for causing the slide block 38 to automatically return to the highest position on the lever 32 so that the normal stroke of the differential feed will be the shortest stroke thereof. This I accomplish by means of a spring 53 (see Fig. 6) secured to one end of a projecting member 54 attached to the connecting rod 6 and at the other end secured by a member 55 to the lever connection 42. Where the spring is located above the crank

pin 5 the slide block 38 upon release of the bell crank lever 44 will be shifted to the top of the lever 32. The connecting members 54 and 55 may be reversed by readily loosening the set screws which connect the same to the connecting members 6 and 42 so as to cause these members to project downwardly instead of upwardly as herein shown. In this case the spring 53 would extend in a plane below the center of the crank pin, so that the action of the spring on the connection 42 would result in automatically returning the slide block 38 to the bottom of the lever 32. In this instance therefore the normal stroke of the differential feed would be its longest stroke. Thus where it is desirable for certain classes of work to have the differential feed dog make a long stroke during the greater portion of the stitching operation this may be momentarily shortened by shifting the slide block 38 upwardly on the lever 32, the spring 53 being adjusted to extend below the crank pin 5. In this case the operator is relieved from maintaining a constant pressure with the knee against the knee shift except at comparatively short intervals. Where the character of the work is such that a fixed adjustment of the slide block 38 on the lever 32 is desirable, locking screw 56 carried by the slide block 38 may be tightened so as to hold the slide block in fixed adjusted position.

Secured to the shaft 3 is an eccentric 57 upon which operates the connecting member 58, the forward end 59 of which projects toward the front of the machine and is pivotally connected by means of a shoulder screw 60 to a slide block 61 (see Figs. 1, 5, and 10). The slide block 61 may be of similar construction to the slide block 38 and is controlled for sliding movement upwardly and downwardly upon a segmental lever 62, which in like manner may be similar to the lever 32. The lever 62 at its lower end is secured to a rock shaft 64 having a bearing for rocking movement in the bearing 63. The rock shaft 64 is held against endwise movement by means of a collar 66 secured to the shaft.

Pivotally secured to the top of lever 62 by means of a shoulder screw 67 (see Fig. 5) is a feed blade supporting member 68 (see Figs. 5 and 10). This member 68 is bifurcated at 72 so as to embrace the upper end of lever 62. The member 68 is provided with a projecting portion 73 to which is adjustably secured by screws 74 a feed blade 75, the latter being provided with slots for the reception of the screws 74, and to permit the proper adjustment of the blade 75 with relation to the stitching position (see Fig. 1). The forward end of the feed blade 75 may be narrowed as at 76 to suit the character of the work. The member 68 is under the control of a spiral spring 69, one end of

this spring being attached to the head of the screw 70, and the other end 71 of the spring being bent at right angles so as to project under the member 68 and normally rock it upwards (see Fig. 1). The action of the spring 69 holds the blade end 76 against the folded edge of the binding strip so as to feed it under the presser foot, the dotted line position of the feed blade 75 as shown in Fig. 10 illustrating the end 76 of the blade coacting with the presser foot and throat plate.

I have found in practice that it is advantageous to have the end 76 of the feed blade not more than one-eighth of an inch wide so that as it acts upon the folded edge of the binding strip it will not form pleats or ruffles but will act to crowd the goods together at the extreme edge, thereby contracting the inner edge of the circle and at the same time avoiding any tendency to wrinkle or distort the fabric.

The stroke of the feed blade 75 can be varied by shifting the slide block 61 up and down the lever 62, and means for controlling the adjustment of the feed block 61 is provided which operates independently of the controls for the differential feed mechanism, so that the different feeding effects as well as the reversing of the circular direction of the feed may be instantaneously obtained at the will of the operator. The means for controlling the stroke of the feed blade 75 is similar to the mechanism heretofore described for controlling the stroke of the differential feed and comprises a knee shift (see Fig. 5) in the form of a bell crank lever having arms 77 and 80 pivoted at 78 to a bracket 79 secured to the table 47 of the machine. Pivotally secured at 81 to the bell crank lever arm 80 is a connecting rod 82 which passes up through the table. The upper end 83 of this rod is pivotally connected by a shoulder screw 84 tapped into the head of the screw 60. A spring 85 is mounted upon the connecting rod 82, one end of which bears against the table 47, and the other end against a collar 86 adjustably secured to the rod 82. With the spring in this position the slide block 61 is normally held in position at the upper part of the lever 62, since upon release of the knee shift 77 the expansion of the spring will force the rod 82 upwardly, thereby shifting the slide block 61 toward the top of the lever 62. Where it is desired to have the slide block 61 normally assume a position at the bottom of the lever 62 the spring 85 may be removed and placed on the rod 82 beneath the table. At the same time the position of the bell crank lever 77 could be reversed so that the pressure of the knee would force the rod upwardly against the tendency of the spring to pull the rod downwardly. By this reversal of the spring

and collar 86 the feed blade would be operated normally with its greatest stroke, and to modify this stroke the knee shift would be operated by the operator. It is understood of course that where desired a foot treadle may be utilized instead of a knee shift.

The forward bearing 2 of the sewing machine base terminates in an upwardly projecting portion 87 forming a support for the forward end of the cloth plate 88. The cloth plate is secured at its forward end to this support and at its rear end to a portion 89 of the overhanging arm of the machine frame which extends downwardly and laterally so as to form at 90 a rest for the cloth plate. The cloth plate is also supported by an upwardly projecting lug 91 of the looper bracket 92. A horizontal looper shaft 93 extends through the bracket 92 and operates in bearings 94 and 95 at opposite ends of looper bracket 92. This looper shaft has an endwise movement in the bearings 94 and 95 as well as a rocking movement given thereto by an eccentric 96 operating in the connection 97. The forward end of the connection 97 is pivotally connected at 98 by shoulder screw 99 to a crank arm 100 which is secured to the looper shaft 93 whereby the movement of the eccentric operates to rock the looper shaft. The endwise movement of the looper shaft is obtained by a pair of gears (not shown) which transmit rotary movement to a shaft 101 (see Fig. 5) rotating in the bearing 102. The shaft 101 is a crank shaft which operates between the arms of a fork member 103, a portion of which is shown in Figs. 1 and 5. The mechanism for operating the looper shaft forms no part of this invention and hence a detailed description thereof is not considered necessary. The looper shaft 93 is secured to the looper holders 104 for carrying suitable loopers 105 which are of the four-motion type. This looper mechanism is well known in the art and therefore a further detailed description thereof is not deemed necessary herein.

Cooperating with the loopers is the usual means for controlling and conducting the looper thread (not shown), and also cooperating with each looper 105 is an eye-point thread carrying needle 106 for making the stitches. A presser foot bar 107 carries a presser foot shank 108 to which is secured a presser foot 109 having an upturned toe 110. Although the present invention is shown as applied to a machine for making a double thread chain stitch, it will be understood that any other form of stitch mechanism may be substituted therefor where practicable, for instance a single chain stitch or lock stitch.

Coacting with the feed and presser foot is a throat plate 111 which is secured to the

cloth plate so as to have the feed openings register with the feed members of the main and differential feed dogs which operate in said openings. The bars 113 separating the slots 112 register with the slots 16 and 28 of the main and differential feed dogs so that the presser foot 109 can clamp the work thereon.

The throat plate is provided with needle holes 114 and the plate is also cut away along the lines 115, 116, and 117 for the reception of a slide plate 118 and for permitting the same to project up close to the stitching position as shown at 119. The slide plate 118 is held in cooperative relation with the throat plate by friction so that it can be quickly removed and replaced for threading the loopers and for permitting access to the mechanism beneath the cloth plate. The slide plate 118 is recessed at 120 and in this recess is located a strip folder guide 121 which is adjustably secured in place by a pair of screws 122 extending through slots 123 of the arm 124 to which the folder guide is attached. This folder guide has an entrance end 125 to receive the strip of fabric. As the strip of fabric is drawn through the folder and as its edges engage right and left scrolls 126 the edges of the strip are gradually turned upward over the tongue 127 of the folder, which is slotted lengthwise at 128 to facilitate passing the end of the strip through the folder.

The scrolls 126 of the folder terminate in overhanging walls 129 to which walls the bracket 124 is secured for supporting the folder. This strip folder guide tapers toward the delivery end 130 thereof so as to narrow the strip to the extent to which the edges are folded over. Thus the strip at its delivery end may be about one-half of an inch narrower than at its entrance end so that about one-fourth of an inch of the raw edges of the strip is turned over and folded down as it passes through the folder and is thereby guided directly to the needles and feeding mechanism.

For the purpose of hemming the raw edge of the neck of the garment a hem folder guide 131 is provided. This guide has a table or rest 132 upon which the goods may be passed over as they are guided into the machine. This table projects into the folder and the edge of the goods is folded down over the edge 133 of the table and turned under upon reaching the needles. This hem guide 131 is carried by a bracket 134 adjustably secured by screws and slots 135 to the slide plate 118.

The position of the strip folder guide and the hemming guide with relation to the needles is important, and it is important to have these guides occupy as little space as possible so as not to interfere with the handling of the work, and also to permit

the strip and the garment fabric to be guided directly to the stitching position with a minimum of friction and without distorting the shape of the neck of the garment or causing the hemmed edges to be drawn away from the needles while stitching around the curves.

The executive end 76 of the feed blade 75 coacts with a spring 137 which projects from the folder guide 121. This feed blade acting upon the edge of the folded strip overcomes the tension or drag of the strip as it passes through the folder and feeds it to the needle by contracting the inner edge of the circle of the neck. By changing the stroke of this feed blade through adjustment of the slide block 61 on the lever 62, the size or curvature of the neck can be controlled.

Referring to Fig. 2, the body of the garment shown in this figure is made up of two front sections A and B and a back section C. These sections are connected by the shoulder seams D. The folded strip of facing E for covering the raw edge is stitched down with two rows of stitches F which extend up the front portion A of the garment, around the corner A', then around the circular portion of the neck, then across the back section C, around the circular portion of the section B and then around the curved edge B' down the front to form the button stay. Fig. 2 represents a pajamas coat which is usually made with these round corners at the neck. It will be noticed that the curved portions at each side of the neck form reverse curves and hence it is necessary to shift the adjustment of the feeding mechanism in order to feed around these corners or curves. Not only is a shift in the feed mechanism necessary, but this shift must be graduated so as to give the exact curvature required for the particular garment.

Fig. 3 illustrates a garment having a front section A with the button hole facing extending up to the edge of the neck opening and forming therewith a square corner A'. In applying the finishing strip to this type of garment the neck portion is finished in a separate operation from that of the front sections A and B, that is, the entire neck is stitched by commencing at the corner A' of one section, stitching around the curved portion of the section A, across the back section C and around the other section B. The work is accomplished by finishing up successive garments and then cutting these apart after a bundle has been completed. In finishing this style of garment the feeding mechanism can have a fixed adjustment unless the curvature on the back section C does not correspond with the curvature on the front sections A and B.

Fig. 4 illustrates a body fabric G having a folded hem portion H and a strip I having the edges J thereof turned over or folded.

The folded edge H and the inner folded edge of the strip are stitched along the inner circle at K and the opposite folded edge of the strip I is stitched to the body of the garment along the outer circle at L.

In the operation of the machine the feed sections 27 of the differential feed operate through openings 136 in the throat plate along the outer curved line L, while the sections 15 of the main feed 14 operate through slots 112 in the throat plate and upon the central portion and adjacent to the inner edge and stitched line K of the strip I. The end 76 of the feed blade 75 operates directly upon the extreme inner folded edge of the facing strip along the line K so as to contract the inner curved portion of the garment.

It will be noted that control for the movement or stroke of the feed blade 75 is entirely independent of the control for the differential feed 27. Furthermore it will be particularly noted that the differential feed 27 acts on the goods in the rear of the left hand needle, while the feed blade 75 acts on the goods in advance of the right hand needle. Thus by varying the stroke or movement of the differential feed 27 which acts on the goods in the rear of the left hand needle and by varying the movement of the feed blade 75, which acts on the goods in advance of the right hand needle, it is possible to feed the goods in different circles or curves.

When the slide block 38 is adjusted to its lowest position on the lever 32 and the differential feed 27 is thereby increased to its greatest stroke, and when the slide block 61 is also adjusted to its lowest position on the lever 62 to likewise give the feed blade 75 its greatest stroke, the work is fed in a circle from left to right as the goods leave the stitching mechanism. To effect the feeding of the goods on a reverse curve, in other words to cause the work to feed in a circle from right to left as the goods leave the stitching mechanism it is merely necessary to decrease the stroke of the feed blade 75 by shifting the block 61 to the top of the lever 62, and also to reduce the stroke of the differential feed 27 by shifting the block 38 to the top of lever 32. In this instance the outer or left hand stitch line will be retarded and the right hand stitch line will be advanced, so that as a result the inner edge of the folded strip will be fed from the stitching position faster than the outer edge is fed from the stitching position. This is due to the fact that the differential feed has a slight back-feeding action toward the operator when the slide block 38 is adjusted to the top of the lever 32. On account of the connecting rod 42 extending in the opposite direction to the connection 6 and with the shaft 3 turning in the direction of the

arrow (see Fig. 6), the crank pin 5 as it rotates is brought to a position where the lever 32 is caused to move somewhat towards the operator, thereby feeding the work backwards during a portion of its stroke prior to effecting the advance feed movement. This backward movement of the differential feed occurs when the main feed is advancing the work past the stitching mechanism. As a result, at this time when the goods are being fed in a circle from right to left, the differential feed acting upon the left hand edge of the folded strip and by its backward movement retards the same, while the main feed acting on the center of the folded strip feeds this part of the strip faster. This backward movement of the differential feed is very effective when the slide block 38 is adjusted on the lever 32 above an imaginary horizontal center line passing through the axis of the shaft 3. The time of movement of the differential feed is therefore materially effected by the swinging of the connecting rod 42 in a circular path.

From the foregoing it is important to note that the differential feed 27 acts upon the fabric in the rear of the needle and when the goods are fed in a circle from right to left this feed does not act to stretch the fabric but rather as a reverse feed or a feed which retards the movement of the goods so as to permit the other parts of the goods to be fed relatively thereto, thereby effecting a circular feeding. It will be further noted that the action of the differential feed blade 75 is in front of a needle to contract one edge of the fabric before reaching the stitching position, that the main feed acts in rear of the needles and the differential feed 27 acts in rear of a needle to feed the opposite edge of the fabric. Thus none of the feeds operate at the stitching point in association with the needles, and the two differential feeds operate independently one at each side of the needles, in effect to swing the edges of the binding strip in a curve around the main feed.

It is to be understood that by describing in detail herein any particular form, structure or arrangement, it is not intended to limit the invention beyond the terms of the several claims or the requirements of the prior art.

Having thus explained the nature of my said invention and described a way of constructing and using the same, although without attempting to set forth all of the forms in which it may be made, or all of the modes of its use, I claim:

1. The combination of feeding mechanism, stitching mechanism operative to automatically and simultaneously form a plurality of spaced curved lines of stitching in a garment fabric, said feeding mechanism comprising a pair of feed devices each hav-

ing the feed portion thereof located and acting on the fabric entirely at one side of said stitching mechanism, and means for independently reciprocating said feed devices.

2. The combination of stitching mechanism having a pair of needles, and means for feeding a fabric relatively to said needles to cause the same to simultaneously stitch the fabric in a curved path, said means comprising a main feed member, and a plurality of independent feed members.

3. The combination of stitching mechanism having a pair of needles, and means for feeding a fabric relatively to said needles to cause the same to simultaneously stitch the fabric in a curved path, said means including a feed device operating entirely in advance of one needle and a feed device operating entirely in rear of the other needle.

4. In a sewing machine the combination of stitching mechanism and feeding mechanism for automatically feeding a fabric relatively to said stitching mechanism to cause the latter to simultaneously form a pair of curved lines of stitching, said feeding mechanism comprising a pair of feed devices including a differential feed device acting on the fabric entirely at one side of the stitching mechanism, and means for independently operating said feed device.

5. In a sewing machine the combination of a plurality of needles for stitching a strip to a body fabric, means for folding the edges of a strip of woven material, means for folding the edge of a body fabric of woven material, means for feeding said strip and fabric relatively to the needles, and means for controlling said feeding means to cause the same to feed the strip and fabric in any one of different curved paths, said feeding means including a pair of feed members acting on opposite edges of the strip entirely at opposite sides of said needles.

6. In a sewing machine, the combination of a plurality of needles for simultaneously stitching the opposite edges of a strip to the face of a body fabric, means in rear of the stitching mechanism for feeding one edge of the strip, and means acting on the other edge only of the strip and entirely in advance of the stitching mechanism for feeding such edge.

7. In a sewing machine the combination of mechanism for stitching a strip to the face of a body fabric, means in rear of the stitching mechanism for feeding one edge of the strip, means in advance of the stitching mechanism for feeding the other edge of the strip, and means intermediate said pair of means for feeding the strip.

8. In a sewing machine the combination of a plurality of needles for simultaneously stitching the opposite edges of a strip to the face of a body fabric, means in rear of the stitching mechanism for feeding one edge

of the strip, means acting on the strip entirely in advance of the stitching mechanism for feeding the other edge of the strip, and means for varying the stroke of both of said feeding means.

9. In a sewing machine the combination of a plurality of needles for simultaneously stitching the opposite edges of a strip to the face of a body fabric, means acting on the strip entirely in rear of the stitching mechanism for feeding one edge of the strip, means acting on the strip entirely in advance of the stitching mechanism for feeding the other edge of the strip, means for varying the stroke of both of said feeding means, and means under the control of the operator for operating said last means.

10. In a sewing machine the combination of mechanism for stitching a strip to the face of a body fabric, means in rear of the stitching mechanism for feeding one edge of the strip, means in advance of the stitching mechanism for feeding the other edge of the strip, means intermediate said pair of means for feeding the strip, and means for regulating the stroke of one feeding means relatively to the other.

11. In a sewing machine the combination of mechanism for stitching a strip to the face of a body fabric, means for feeding one edge of said strip at one speed, means for feeding the other edge of said strip at a faster speed, means for causing said first means to feed faster than said second means at another time, and means intermediate said pair of means for feeding the strip.

12. In a sewing machine, the combination of stitching mechanism comprising a pair of needles for simultaneously stitching the opposite edges of a strip, three feeding means for feeding the strip relatively to said stitching mechanism, one feeding means operating to feed an edge of the strip away from one of said needles and another feeding means operating to feed the opposite edge toward the other needle, and means for independently reciprocating each of said feeding means.

13. In a sewing machine the combination of stitching mechanism, a main feeding means for acting upon the fabric, independent feeding means in advance of said stitching mechanism for acting upon the fabric, independent feeding means in rear of said stitching mechanism for acting upon the fabric, and means for controlling one of said feeding means to cause the same to feed at different speeds.

14. In a sewing machine the combination of stitching mechanism comprising a plurality of needles for simultaneously stitching the opposite edges of a fabric, means for feeding the fabric from the stitching mechanism, and independent means supported for operation against the bottom of the fabric

substantially entirely at one side of a needle for feeding the fabric.

15. In a sewing machine, the combination of mechanism for stitching a strip to the face of a garment fabric, a presser foot, a main feeding means coacting with said presser foot in rear of said stitching mechanism, and a differential feeding means operating beneath said presser foot and having the feed portion thereof located and operating entirely at the rear side of said stitching mechanism.

16. In a sewing machine the combination of stitching mechanism, a presser foot, a main feeding means and a differential feeding means coacting with said presser foot at one side of said stitching mechanism, feeding means coacting with said presser foot at another side of said stitching mechanism, and a pair of independent means separately controlled for automatically varying the stroke of said last feeding means and said differential feeding means.

17. In a sewing machine the combination of stitching mechanism comprising a plurality of needles, means for folding and guiding the edge of a body fabric to one of said needles, means for folding and guiding the opposite edges of a strip to both of said needles, a presser foot, a differential feeding means located at one side of said stitching mechanism for feeding one edge of said strip, feeding means located at the opposite side of said stitching mechanism for feeding the opposite edge of said strip, feeding means operating between said first and second feeding means for feeding the strip, and means for controlling certain of said feeding means whereby one edge of said strip may be fed faster than the other edge.

18. In a sewing machine the combination of stitching mechanism comprising a plurality of needles, means for folding and guiding the edge of a body fabric to one of said needles, means for folding and guiding the opposite edges of a strip to both of said needles, a presser foot, a differential feeding means located at one side of said stitching mechanism for feeding one edge of said strip, feeding means located at the opposite side of said stitching mechanism for feeding the opposite edge of said strip, feeding means operating between said first and second feeding means for feeding the strip, and a pair of means for controlling said first and second feeding means, whereby the opposite edges of said strip may be fed at different speeds.

19. In a sewing machine, the combination of mechanism comprising a plurality of needles for simultaneously stitching the opposite edges of a strip to the face of a garment fabric, feeding means acting upon the central portion of said strip, and feeding

means having the feed portion thereof located entirely in advance of a needle and operating independently of said first feeding means for feeding an edge of the strip to the stitching mechanism faster than the central portion of the strip is fed by said first feeding means.

20. In a sewing machine the combination of mechanism for stitching a strip to the face of a body fabric, feeding means acting upon the central portion of said strip for feeding the same, feeding means for feeding faster one edge of the strip to the stitching mechanism than the central portion of said strip is fed by said first feeding means, and feeding means for feeding the opposite edge of said strip from the stitching mechanism faster than the central portion of said strip is fed by said first feeding means.

21. In a sewing machine the combination of stitching mechanism, means for folding and guiding the edge of a body fabric to the stitching mechanism, means for folding and guiding the opposite edges of a strip to the stitching mechanism, means for feeding one folded edge of the strip, and means for feeding the opposite folded edge of a strip, one of said means operating to feed a folded edge of the strip to the stitching mechanism faster than the opposite folded edge is fed to the stitching mechanism, and the other feeding means operating to feed said last folded edge from the stitching mechanism faster than said first folded edge is fed from the stitching mechanism.

22. In a sewing machine the combination of stitching mechanism comprising a plurality of needles, a pair of independent feed devices acting on the fabric at one side of said stitching mechanism, an independent feed device acting on the fabric at the opposite side of said mechanism, and means for varying the stroke of one or more of said feed devices relatively to the others.

23. In a sewing machine, the combination of needle mechanism comprising a pair of needles spaced apart for simultaneously stitching the opposite edges of a binding strip, a presser foot, a rotary shaft, a main feed device, a pair of differential feed devices located and operating entirely at opposite sides of said needle mechanism and on opposite edges only of the strip, means for operating said devices from said shaft, and means under the control of the operator for independently varying the stroke of each differential feed device.

24. In a sewing machine, the combination of stitching mechanism comprising a plurality of needles for simultaneously stitching the opposite edges of a binding strip to the edge of a fabric, a plurality of differential feed devices located entirely at opposite sides of the stitching mechanism and operating on opposite edges only of the strip,

one of said devices having a single working edge operating in advance of a needle at the edge of the fabric, and means for independently operating each of said devices.

25. In a sewing machine the combination of needle mechanism for simultaneously forming a plurality of rows of stitches, a main feeding means and a differential feeding means located at one side of said needle mechanism, feeding means located at the opposite side of said needle mechanism, means for reciprocating all of said feeding means, means for independently controlling the reciprocatory stroke of said differential feeding means, and means for independently controlling the reciprocatory stroke of said third feeding means.

26. In a sewing machine the combination of a pair of stitch forming means, a pair of differential feed devices at opposite sides of said means, a rotary shaft, and a pair of members connected to said shaft for operating said feed devices.

27. In a sewing machine the combination of needle mechanism for simultaneously forming a plurality of rows of stitches, a presser foot, feeding means cooperating with said presser foot, means for reciprocating said feeding means and comprising a segmental lever and a member slidably connected thereto.

28. In a sewing machine the combination of needle mechanism for simultaneously forming a plurality of rows of stitches, a presser foot, feeding means cooperating with said presser foot, means for reciprocating said feeding means, said means comprising a rotary shaft, a segmental lever connected to said feeding means, and a member connected to said shaft and shiftably connected to said lever.

29. In a sewing machine the combination of needle mechanism for simultaneously forming a plurality of rows of stitches, a presser foot, feeding means cooperating with said presser foot, means for reciprocating said feeding means, said means comprising a rotary shaft, a pair of members, one connected to the shaft and one to said feeding means, means for shiftably connecting said members together, and means under the control of the operator for shifting said connection.

30. In a sewing machine the combination of needle mechanism, a main feed dog having a toothed operating surface, a differential feed dog having a toothed operating surface, a rotary shaft, means connected to the shaft for reciprocating the main feed dog, means connected with the shaft independently of said means for reciprocating the differential feed dog, means connected to the shaft for imparting up and down movement to the main feed dog and also to the differential feed dog through the me-

dium of the main feed dog, and means for independently varying the reciprocatory stroke of said differential feed dog.

31. In a sewing machine the combination of needle mechanism, a main feed dog located at one side of said needle mechanism, a differential feed dog located at the same side of said needle mechanism, feeding means located at the opposite side of said needle mechanism, a rotary shaft, means connected to the shaft for reciprocating said feed dogs and feeding means, said reciprocating means comprising an oscillating lever, and a member connected to said shaft and to said lever intermediate the ends thereof, and means under the control of the operator for shifting the connection between said member and lever.

32. In a sewing machine, the combination of needle mechanism for simultaneously stitching the opposite edges of a strip to a body fabric, a presser foot, feeding means entirely in rear of said needle mechanism and acting on one edge only of the strip, a feed blade located entirely at the opposite side of said needle mechanism, and acting on the opposite edge only of the strip, means for reciprocating said feed blade, and means for varying the reciprocatory stroke thereof relatively to said feeding means.

33. In a sewing machine, the combination of a plurality of needles for simultaneously stitching the opposite edges of a strip, a presser foot, a pair of feeding means cooperating with the presser foot, each feeding means located entirely at one side of a needle and acting on the opposite edges of the strip, a pair of swinging members pivotally supported at the lower ends thereof and each connected at its upper end to one of said feeding means, a rotary shaft, and a pair of operating members each eccentrically connected to said shaft and extending in opposite directions and connected to said swinging members.

34. In a sewing machine, the combination of a plurality of needles for simultaneously stitching the opposite edges of a strip, a presser foot, a pair of feeding means cooperating with the presser foot, each feeding means located entirely at one side of a needle and acting upon opposite edges of the strip, a pair of pivotally supported means connected to said feeding means, a rotary shaft, a pair of members eccentrically connected to said shaft and extending in opposite directions and connected to said pivotally supported means, and means for varying the point of connection of one of said members with said means.

35. In a sewing machine, the combination of a pair of needles for simultaneously stitching the opposite edges of a strip, a pair of differential feed devices acting on opposite edges of said strip, a main feed

device, a rotary shaft, a swinging operating member connected to each feed device, a pitman connected to each operating member and eccentrically connected to said shaft, and means for independently varying the point of connection of a pair of said pitmen with the operating members thereof.

36. In a sewing machine the combination of stitching mechanism, three independent feeding devices, a rotary shaft, a swinging operating member for each device, means for connecting said shaft to each operating member, and means for adjusting one of said means.

37. In a sewing machine the combination of needle mechanism, means for folding and guiding the edges of a strip to said mechanism, means for folding and guiding the edge of a garment fabric thereto, a main feeding means located at one side of the needle mechanism for acting upon said strip intermediate the edges thereof, a differential feeding means located at the same side of said needle mechanism for acting against one edge of the strip, a rotary shaft, a swinging lever, a slide member shiftably connected to said lever, means for connecting said shaft and slide member, means for connecting said lever and differential feeding means and guided through the medium of said main feeding means for reciprocatory movement, means for imparting up and down movement to said main feeding means and to said differential feeding means through the medium of said main feed, means connected to said slide member for shifting the same to vary the stroke of the differential feed, feeding means located at the opposite side of the needle mechanism for acting upon the opposite edge of said strip, a swinging lever, a slide member shiftably connected to said lever, means for connecting said slide member to said shaft, means for connecting said lever to said last feeding means, and means connected to said slide member for shifting the same thereby to vary the stroke of said last feeding means.

38. In a sewing machine the combination of stitching mechanism, and mechanism for applying a strip of woven material to the edge of a body fabric of woven material, and for automatically feeding said strip and edge in a curved path relatively to the stitching mechanism, said stitching mechanism comprising means for simultaneously stitching the opposite edges of said strip to the body fabric, and said second mechanism including three independent feed devices.

39. In a sewing machine the combination of stitching mechanism comprising a pair of needles, means for folding the edges of a strip of woven material, means for folding the edge of a body fabric of woven material, and three independent feeding means

for feeding said strip and fabric in a curved path relatively to the stitching mechanism.

40. In a sewing machine the combination of stitching mechanism having a pair of
5 needles, means for folding a fabric in position to be stitched by said needles, and means for feeding the fabric relatively to said needles to cause the same to stitch the fabric in a curved path, said last means
10 comprising a pair of differential feed devices acting upon the fabric entirely at opposite sides of the needles.

41. In a sewing machine, the combination of mechanism for simultaneously forming
15 a pair of rows of stitches in the opposite edges of a fold formed at the edge of a garment fabric, means located and acting on the fold entirely at one side of said

mechanism for feeding one edge of the fold at one speed, and means located and acting
20 on the fold entirely at the opposite side for feeding the opposite edge of the fold at a different speed.

42. In a sewing machine the combination of stitching mechanism for forming a pair
25 of rows of stitches in a folded edge of a garment fabric, and a pair of independent means, one adjacent to each row of stitches for feeding the fabric in different curved paths, each of said means acting on the
30 fabric entirely at one side of said mechanism.

Signed at Nyack, N. Y., this 22nd day of June, 1923.

ALBERT H. WEIS.