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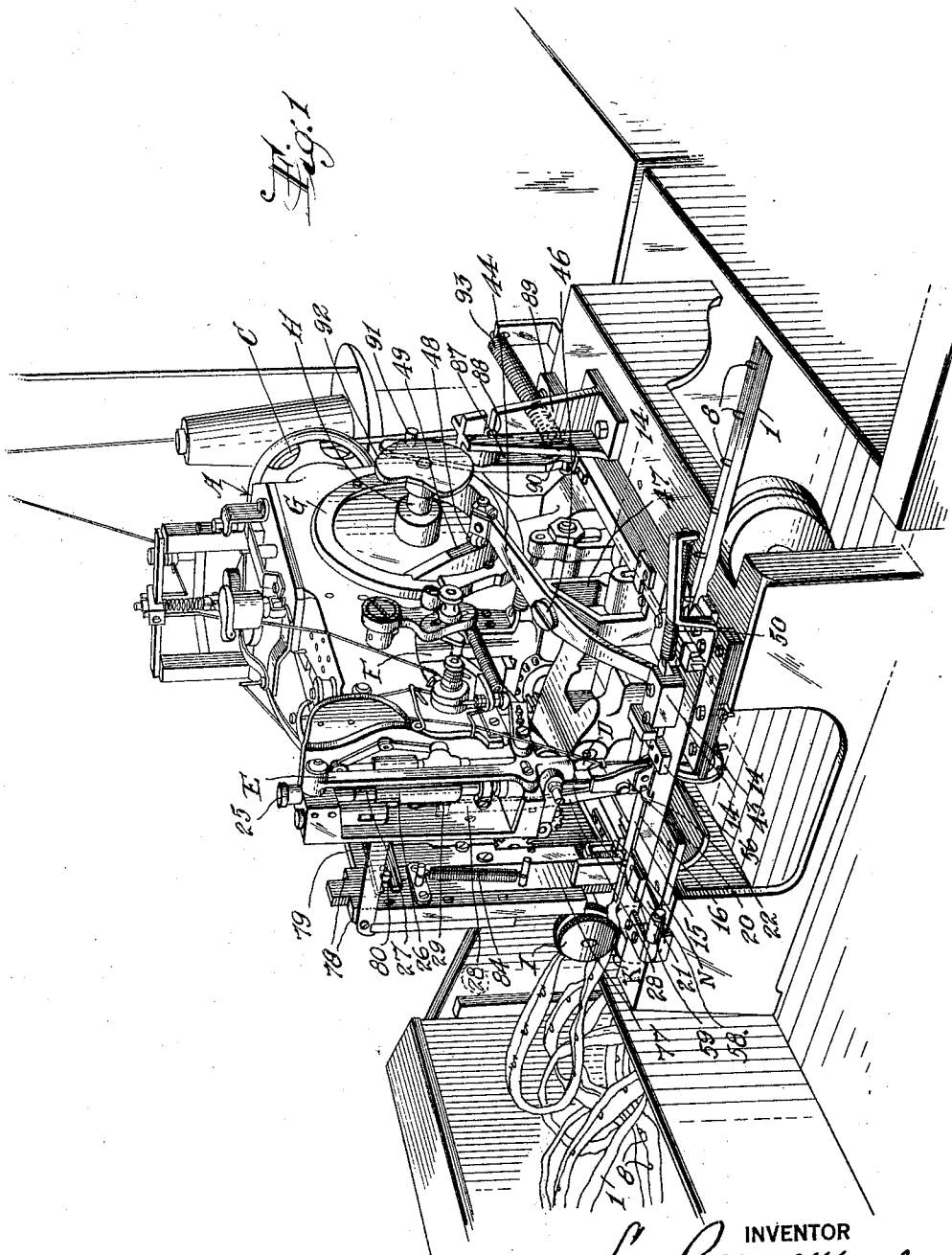
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1,899,902

METHOD OF AND APPARATUS FOR MAKING HOOK AND EYE TAPE

Filed Jan. 21, 1931

4 Sheets-Sheet 1



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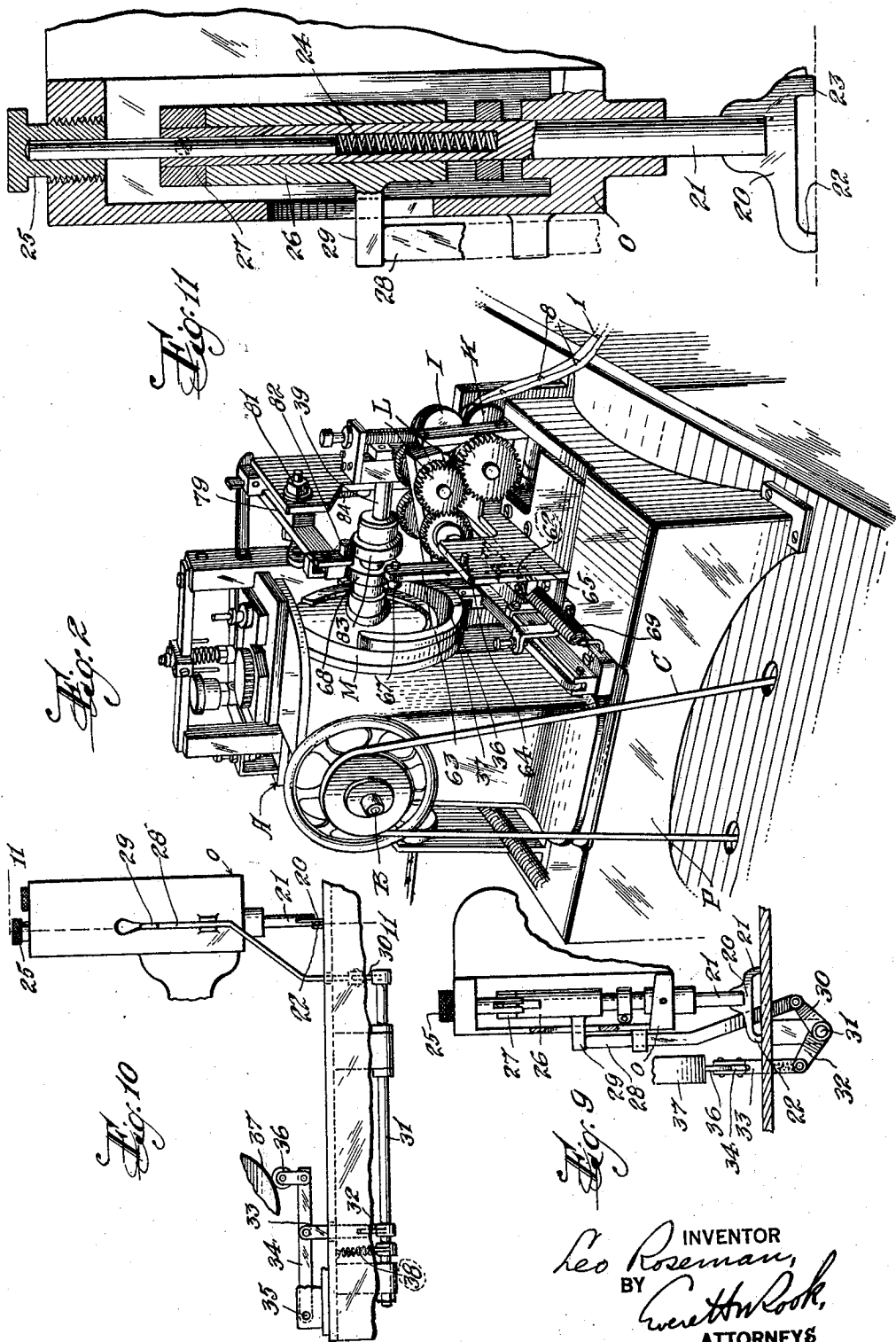
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METHOD OF AND APPARATUS FOR MAKING HOOK AND EYE TAPE

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4 Sheets-Sheet 2



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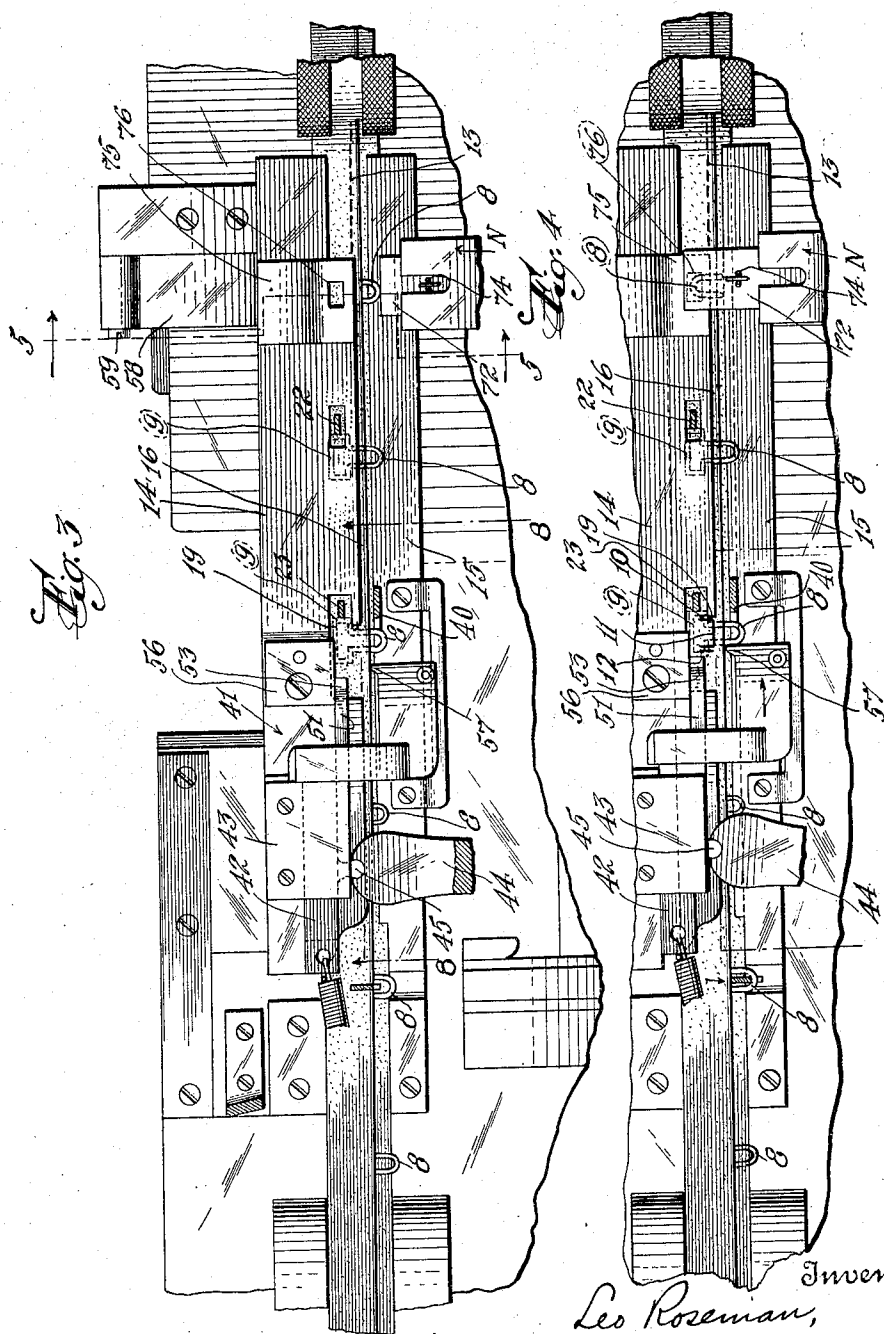
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METHOD OF AND APPARATUS FOR MAKING HOOK AND EYE TAPE

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4 Sheets-Sheet 3



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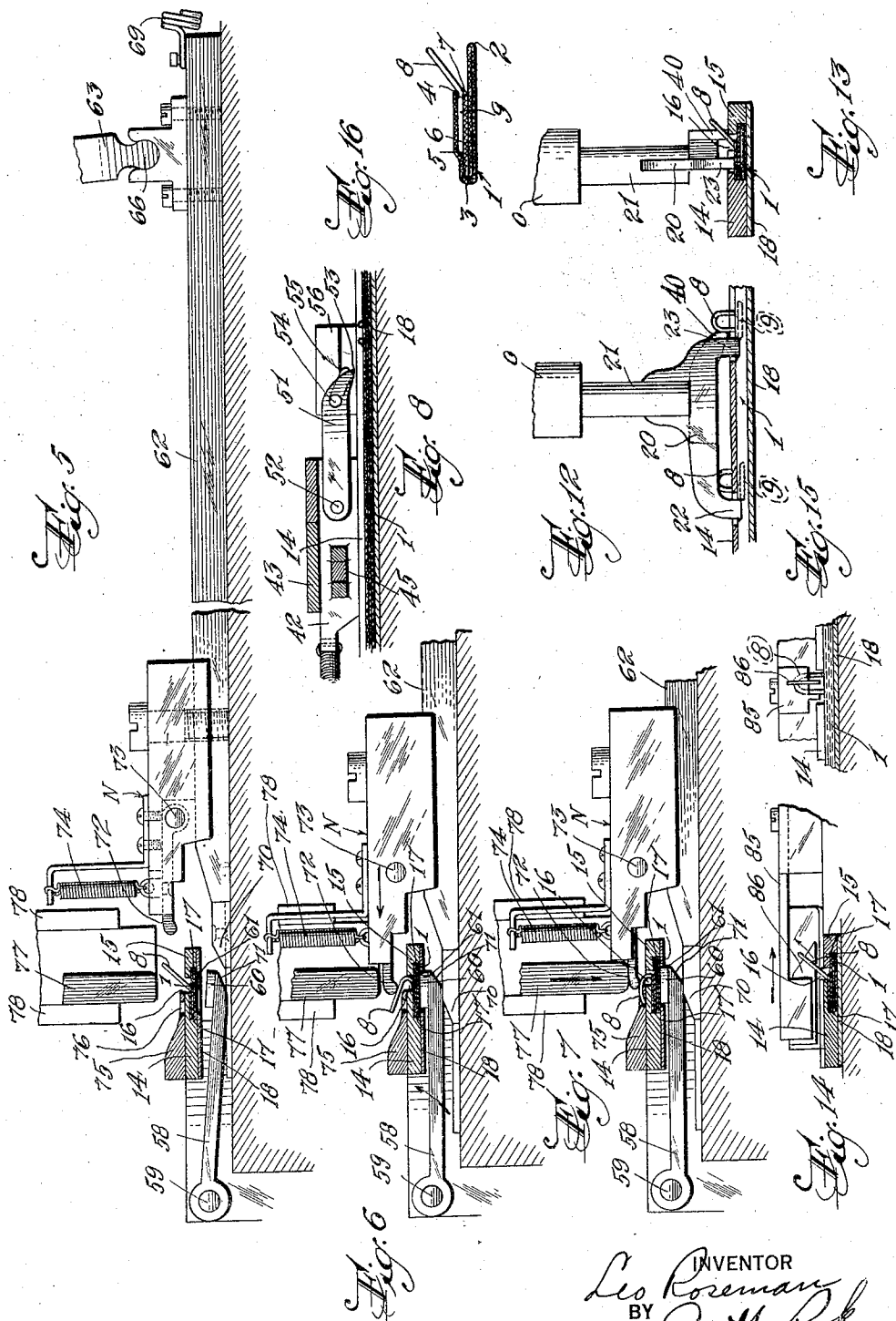
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METHOD OF AND APPARATUS FOR MAKING HOOK AND EYE TAPE

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4 Sheets-Sheet 4



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METHOD OF AND APPARATUS FOR MAKING HOOK AND EYE TAPE

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One object of the invention is to provide a novel and improved method of making fastener tape wherein the hook fastener elements are inserted through the tape in partially formed condition or as blanks, that is, before the portions of which the bills are to be formed have been fully bent to form the bills, and then said bill portions are bent to complete the bills.

A further object is to provide a method of this character wherein the hooks are sewed upon the strip either before or after the bills are completely formed, that is, the bills may be partially bent, then the hooks sewed, and then the bills completed, or hooks may be sewed and then completely formed, or the bills may be completely formed and then the hooks sewed.

Other objects are to provide a novel and improved apparatus for sewing the fastener elements upon the strip; to provide novel and improved apparatus for bending the bill portions of the hooks before or after sewing thereof upon the strip; to provide novel and improved apparatus for completing the formation of the fastener elements, and sewing the elements to the strip in one continuous operation, and to obtain other advantages and results as will be brought out by the following description.

For the purpose of illustrating the principles of my invention, I have shown it in connection with a known type of sewing machine which includes certain known parts essential to feeding or advancing fastener tape and stitching it, but the details of which form no part of the present invention; and the invention may be utilized in connection with other sewing machines without departing from the spirit or scope of the invention.

Referring to said drawings, in which corresponding and like parts are designated throughout the several views by the same reference characters,

Figure 1 is a perspective view of one end of a sewing machine embodying my invention;

Figure 2 is a similar view of the other end of the machine;

Figure 3 is an enlarged fragmentary top

plan view of the fastener tape guiding mechanism and the hook-bending apparatus, showing certain of the parts in one position;

Figure 4 is a similar view showing said parts in another position;

Figure 5 is an enlarged sectional elevation of the hook-bending apparatus, taken on the line 5—5 of Figure 3, showing the apparatus out of operation.

Figure 6 is a similar view, showing the apparatus performing the first step in bending the hook;

Figure 7 is a like view, showing the last step in bending the hook;

Figure 8 is a fragmentary vertical sectional view, on the line 8—8 of Figure 3;

Figure 9 is an end elevation of the stop foot mechanism for holding the tape against movement during the stitching of the hooks upon the tape, all parts not essential to illustration of this mechanism being omitted;

Figure 10 is a rear elevation thereof;

Figure 11 is an enlarged transverse vertical sectional view through the stop foot mechanism, taken on the line 11—11 of Figure 10;

Figure 12 is an enlarged fragmentary side elevation of the stop foot showing its cooperation with the fastener tape;

Figure 13 is a front elevation thereof;

Figure 14 is a transverse vertical sectional view, on the line 14—14 of Figure 1, showing the hook-positioning device;

Figure 15 is an end elevation of the hook-positioning device, and

Figure 16 is an enlarged transverse vertical sectional view through one form of fastening tape which may be made with my invention.

My invention is directed toward completing fastener tape of the general type illustrated in the drawings, particularly Figures 1, 3 and 16, said tape consisting of a strip 1 of fabric having one edge portion folded inwardly longitudinally upon the main portion, as at 2, and the other edge portion folded inwardly over the main portion at 3 and then returned at 4 to form a flap including two thicknesses 5 and 6 connected by the fold 4. The flap is provided with a plurality of slits 7 adjacent the fold 4 through each of which projects the bill portion 8 of a hook fastener

element having its base portion 9 arranged between the plies 5 and 6. The bill portion 8 is in partially formed condition, that is, it is not completely bent to form the bill but is substantially straight and projects at an inclination upwardly from the tape, as clearly shown in Figure 16. There are a plurality of these fastener hooks equidistantly spaced longitudinally of the strip 1. The hooks are assembled upon the strip as hereinafter described.

In carrying out my invention, the fastener tape so formed is fed or advanced with a step by step motion through a sewing mechanism by which a longitudinal line of stitches is formed along the fold 4 of the tape, said line of stitching including a plurality of lateral stitches extending transversely of the base portions 9 of the hooks. This tape feeding and sewing mechanism is in general old in the art, and no claim to novelty thereon is made. The tape is first fed a step equal to the distance between two of the hooks, whereupon movement of the tape is interrupted while lateral stitches 10 are made transversely of one side of the base of the hook (see Figure 4). Thereupon the tape is moved a step equal to the width of the bill portion of the hook so that a stitch 11 is formed transversely of the bill portion adjacent the base, after which movement of the tape is again interrupted and lateral stitches 12 are made at the other side of the bill portion across the base of the hook, whereupon the tape is moved another step equal to the distance between two hooks to continue the longitudinal line of stitching 13. This cycle of operation is repeated throughout the length of the tape being sewed.

As shown on the drawings, the sewing machine A includes the usual drive shaft B driven by a belt C from a suitable motor and actuating the needle bar D. The lateral stitches 10 and 12 are formed by lateral movement of the needle bar which is carried by a lever E oscillated through linkage F by a cam wheel G on a shaft H geared to the drive shaft B. This mechanism is old and well known, and generally illustrated in my Patent No. 1,742,221, dated January 7, 1930.

The tape is fed or advanced through the machine beneath the needle by feed rollers I and K between which the tape passes, and which are driven from the drive shaft B by known gear mechanism such as shown in Figure 6 of the drawings of my said Patent No. 1,742,221, said drive mechanism including means actuated by a cam M for intermittently connecting the gears L to the drive shaft B. As above stated, the details of this drive mechanism are unimportant to the present invention, it being necessary to understand merely that some means is provided for advancing the fastener tape in the manner above described.

The tape enters the machine through a guide shown in plan view in Figure 3 and in transverse section in Figure 5, said guide comprising two parallel top plates 14 and 15 arranged in spaced relation to provide a slot 16 between them. The undersides of these plates are cut away at 17 and have connected thereto a bottom plate 18 so as to provide a guideway for the fastener tape 1. The tape passes through the guide with the bill portions 8 of the hooks projecting upwardly through the slot 16, as clearly shown in Figures 3 and 5 of the drawings. Beneath the needle of the machine, the guide plate 14 is notched at 19 to provide a clearance for the needle during the stitching operation. Either before or after the stitching operation, the bill portions of the hooks are fully bent so as to complete the bills. In the form of the invention illustrated, the bills of the hooks are completed after the stitching operation, by a bending mechanism generally designated N.

In order to stop the hooks at the proper point beneath the needle and prevent twisting of the hooks during the sewing operation, I may utilize a stop foot mechanism which includes a stop foot 20 secured to the end of a rod 21 vertically slidable in the end O of the sewing machine which carries the needle bar D. This stop foot has two toes 22 and 23 to contact with the tape and engage the hooks during the sewing operation. These toes are so spaced apart that when the forward toe 23 is engaged by one side of the base portion of one hook, the other toe engages the same side of the base portion of the next preceding hook as the tape travels through the machine, as shown in Figure 12. The stop foot is normally pressed into contact with the tape by a compression spring 24 adjusted by a thumb screw 25, and slidable upon the rod 21 is a sleeve 26 which engages a collar 27 fast on the rod to raise the stop foot from the tape. This raising of the stop foot is accomplished by engagement of a link 28 with a lug 29 projecting from the sleeve 26, said link being pivotally connected at one end to a crank 30 on a shaft 31 mounted under the bed P of the machine. Upon this shaft 31 is another crank 32 to which is connected by a link 33 a lever 34 pivotally mounted at one end upon the bed of the machine, as at 35. The lever 34 has at the other end a roller 36 which follows a cam 37. The roller 36 is held in contact with the cam 37 by a tension spring 38. The cam 37 is shown as mounted on one side of the cam M which is mounted on a shaft 39 which is an extension of shaft H geared to the drive shaft B of the sewing machine. With this construction, the stop foot 20 is alternately raised and lowered from and into contact with the tape, and the movement of the cam 37 is so related to the movement of the tape

1 through the machine, that when a hook reaches the position beneath the needle for the formation of the first lateral stitches 10, the stop foot is pressed into contact with the tape adjacent the base of the hook to prevent further movement of the hook, as shown in Figure 12. The two toes 22 and 23 of the stop foot cooperate with each other in ensuring stoppage of the tape at the proper point. After the lateral stitches 10 are made, the stop foot is raised to permit the tape and hook to move during the formation of the stitch 11, the lateral stitches 12 and the succeeding longitudinal stitches 13 between said hook and the next succeeding hook.

To further ensure location of the hook in proper relation to the needle, the stop foot 20 has another toe 40 which engages the bill portion 8 of the hook at the same time that the toe 23 engages the base portion of the hook. Also, a pusher 41 is provided to cooperate with the stop foot. This pusher includes a body 42 slidable in a guide 43 and actuated by a lever 44 having a hinge connection 45 at one end with said body 42 and pivotally mounted between its ends at 46 on a bracket 47 secured to the base of the machine. The other end of the lever 44 carries a roller 48 which follows a cam 49 on the cam wheel G of the machine. The roller is held in contact with the cam by a tension spring 50. At one end, the body 41 carries a pusher dog 51 which is pivotally mounted at 52 on the body and has a pointed end 53 to engage the tape. The swinging end of the dog carries a pin 54 slidable in a downwardly inclined slot 55 in a block 56 secured against movement upon the machine. With this construction, when the body 41 is moved toward the needle from the positions shown in Figures 3 and 8 the pointed end 53 of the dog 51 is forced against the tape at the side of the base portion of the hook opposite the stop foot toe 23, as shown in Figure 4 of the drawings. Simultaneously with this movement, a pusher toe 57 carried by the body 42 is forced into engagement with the bill portion of the hook opposite the stop foot toe 40. The hook is thus accurately located with respect to the needle and held against movement between the pusher dog 51, pusher toe 57 and stop foot toes 23 and 40 so that the first lateral stitches 10 may be formed. The pusher dog is raised from the tape by movement of the body 41 in the other direction, and the movement of the pusher dog is approximately synchronous with the movement of the stop foot 20.

While the tape is stationary during the formation of the first lateral stitches 10 over one hook, the bill portion of a preceding hook is fully bent to complete the hook by the mechanism N. This mechanism includes a tape-clamping bar 58 pivotally mounted at one end, as at 59, upon the frame of the ma-

chine and underlying the tape guide. The other end of the clamping bar carries a block 60 which is adapted to pass through an opening 61 in the base of the guide and contact with the underside of the tape. This end of the clamping bar is forced into engagement with the underside of the tape by a slide bar 62 slidably mounted upon the frame of the machine to move in a horizontal plane. This bar is reciprocated by a lever 63 (see Figures 2 and 5) pivotally mounted at 64 on a bracket 65 mounted on the bed of the machine. One end of this lever has a hinged connection 66 with the slide bar and the other end carries a roller 67 following a cam 68 on the shaft 39. The follower roller 67 is held in engagement with the cam by a tension spring 69. This cam 68 is so shaped as to move the slide bar 62 into engagement with the clamp bar 58 during each period of rest of the tape while the first lateral stitches 10 of a following hook are being formed; and the slide bar has a wedge-shaped head 70 which cooperates with a beveled surface 71 on the clamp bar to force the clamp bar against the tape. The tape and hook fastener carried thereby are thus securely held in the guide, and tilting of the base portion of the hook is prevented.

Slightly after the clamp bar 58 has been moved to clamp the fastener, the bill portion 8 is bent to its final shape. This is accomplished by a bending plate 72 pivotally mounted at 73 on the slide bar 62 to swing downwardly. The plate is held normally in a substantially horizontal position by a tension spring 74. At the side of the slot 16 in the tape guide corresponding to the direction in which the bill of the hook is to be bent, is arranged an anvil block 75 which has a depression 76 therein.

As the slide bar 62 is moved toward the hook, the bending plate 72 engages the bill portion of the hook and bends the same downwardly and over the anvil plate 75, as clearly shown in Figure 6 of the drawings. Then the bending plate 72 is pressed downwardly by a ram 77 to force the end of the bill portion of the hook into the recess 76, whereby the bill is completed, as shown in Figure 7 of the drawings. The recess is provided for a clearance for the end of the bill so that the bill may be completely bent. This ram 77 is vertically slidable in a guide 78 fast secured to the machine, and is actuated by a lever 79 having a pin and slot connection 80 at one end with the ram (see Figure 1). This lever is pivotally mounted intermediate its ends, as at 81, (see Figure 2), and has at its other end a roller 82 which follows a cam 83 mounted on the shaft 39. The roller 82 is held in engagement with its cam by a tension spring 84 (see Figure 1). This ram is moved downwardly once during each period of rest of the tape while the lat-

eral stitches 12 are being formed, and is normally out of engagement with the bending plate 72, as shown in Figure 6. Accordingly, the bill portions of the hooks are successively completed, and the bill portion of one hook is formed while a succeeding hook is being stitched to the tape. It will be observed that the clamp bar 58 effectually prevents any tilting of the base portion of the hook during the bending of the bill portion, so that an accurate complete bend is ensured. Obviously, the slide bar 62 is moved away from the clamp bar 58 prior to the beginning of movement of the tape so as to free the tape in the guide. After the ram 77 is retracted, the end of the bill of the hook springs upwardly slightly due to the inherent resiliency of the metal so as to clear the extremity of the bill from the recess 76, and as the feed rollers begin movement of the tape the extremity of the bill rides over the edges of the opening 76 and the top of the anvil plate.

While the mechanism N is shown for bending the bill portions of the hooks after the hooks are stitched to the tape, obviously the mechanism N might be placed in advance of the sewing mechanism so as to bend the bills of the hooks before they are stitched upon the tape.

While not necessary to satisfactory operation of my machine, it is desirable in some instances to provide mechanism for ensuring that the hooks are properly positioned in the tape just prior to the sewing operation. This mechanism is shown as comprising a bar 85 slidable on the bed of the machine transversely of the tape guide. The end of this bar over the tape guide has a pointed tongue 86 to slip through the loop of the bill portion of each hook, as clearly shown in Figures 14 and 15. This bar is reciprocated by a lever 87 (see Figure 1), pivotally mounted at 88 on a bracket 89 and hingedly connected at 90 to the bar. The other end of the lever has a roller 91 which follows a cam 92 on the shaft H. The roller is held in engagement with its cam by a tension spring 93. The cam is so shaped and its movement is so related to the other parts of the machine, that the bar 85 is moved in the left-hand direction of Figure 1 to move the tongue 86 from the path of movement of the hooks while the tape is being advanced, and to move the bar 85 in the right-hand direction during one period of rest of the tape so as to pull the tongue 86 through the loop of the adjacent hook. This results in pulling the bill portion of the hook out of the slit in the tape into proper position, and also straightens the hook in the tape. Obviously, the bar 85 is so located with respect to the needle of the sewing machine, that when one hook is being engaged by the tongue 86.

Obviously, the exact form of the hooks

when the tape is fed into the machine, is relatively immaterial. The hooks are provided in the form illustrated due to the manner of inserting them into the tape. In accordance with my method, the tape is first slit and then the bill portion of the hook in partially formed condition is passed through the slit in assembling the hooks upon the strip of fabric, after which the strip is folded to form the tape, as shown in Figure 16.

While I have shown and described the invention as embodied in certain details of construction, it should be understood that this is primarily for the purpose of illustrating the principles of the invention, and that many modifications and changes may be made in the details of construction, by those skilled in the art, without departing from the spirit or scope of the invention.

Having thus described my invention, what I claim is:

1. The method of sewing fastener tape comprising a strip of fabric having hook fastener elements thereon, each including a base portion and a bill portion partially bent into the finished shape, said method consisting in progressively moving said strip of fabric in a fixed path step-by-step with alternate periods of movement and of rest, bending each bill portion to complete the bill during one period of rest and sewing the hook to the strip during another period of rest.

2. Apparatus of the character described for making hook fastener tape which comprises a strip of fabric having hook fastener elements thereon with the bill portions partially bent into the finished shape, including means for sewing the hooks on said strip, and means for completing the bending of said bill portions to finish the bills.

3. A machine for making hook fastener tape, comprising a guide to receive a strip of fabric having hook fastener elements thereon with the bill portions partially bent into the finished shape, means for moving said strip through said guide, means for sewing said hook elements upon said strip as the latter is moved, and means adjacent said guide to engage each bill portion and bend it to form the bill of the hook.

4. Apparatus of the character described comprising a guide to receive a strip of fabric having thereon a hook fastener element including a base portion and a bill portion partially bent into the finished shape, means for clamping said base portion against movement in said guide, and means adjacent said guide to engage said bill portion while said base portion is so clamped and bend the bill portion to complete the bill.

5. Apparatus of the character described comprising a guide to receive a strip of fabric having thereon a hook fastener element including a base portion and a bill portion

partially bent into the finished shape, said guide having a slot through which said bill portion projects, means for clamping said base portion against movement in said guide, and means movable transversely of said slot to engage said projecting bill portion and bend the latter to partially form the bill while said base portion is so clamped.

6. The method of making fastener tape consisting in forming a plurality of slits in a strip of fabric, inserting a hook fastener into each slit with the bill portion partially bent into the finished shape, and then bending the bill portion to complete the bill.

7. The method of making fastener tape consisting in forming a plurality of slits in a strip of fabric, inserting a hook fastener into each slit with the bill portion partially bent into the finished shape, bending the bill portion to complete the bill, and sewing the fasteners upon the strip.

8. The combination with means for feeding with a step-by-step movement fastener tape having fastener elements formed with exposed loops mounted thereon, of a device reciprocable transversely of the path of movement of said tape to pass through the loops of said fastener elements and locate said fastener elements in proper position, and means for actuating said device in timed relation to the movement of said fastener tape.

9. The combination with mechanism for sewing fastener elements on fastener tape, of means for feeding to said sewing mechanism with a step-by-step movement fastener tape having fastener elements thereon, and a pair of cooperating stop devices for positively locating each fastener element and holding it between them motionless with respect to the sewing mechanism while the sewing mechanism sews the fastener element to the tape.

10. Apparatus of the character described, comprising a guide to receive a strip of fabric having thereon a hook fastener element including a base portion and a bill portion partially bent into the finished shape, said guide having a slot through which said bill portion projects, an anvil plate at one side of said slot, means for clamping said base portion in said guide with said bill portion adjacent said anvil plate, a bending plate movable transversely of said slot to engage and bend said projecting bill portion over said anvil plate while said base portion is so clamped, said bending plate also being movable toward said anvil plate, and a ram for pressing said bending plate toward said anvil plate while the bending plate is in engagement with said bill portion to completely bend said bill portion into its finished shape on said anvil plate.

11. Apparatus of the character described comprising a guide to receive a strip of fabric having thereon a hook fastener element

including a base portion and a bill portion partially bent into the finished shape, said guide having a slot through which said bill portion projects and an anvil plate at one side of said slot, a bending plate movable transversely of said slot to engage and bend said projecting bill portion over said anvil plate to partially form the bill, and a ram to bend said bill portion against said anvil plate into finished form.

12. Apparatus of the character described comprising a guide to receive a strip of fabric having thereon a hook fastener element including a base portion and a bill portion partially bent into the finished shape, said guide having a slot through which said bill portion projects, and having an opening in its wall opposite said slot, means to enter through said opening and clamp said base portion against movement in said guide, and means adjacent said guide to engage and bend said projecting bill portion while said base portion is so clamped.

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