April 20, 1954 L. M. RABINOWITZ 2,675,770

APPARATUS FOR ASSEMBLING FASTENER ELEMENTS

Filed Jan. 3, 1952 2 Sheets-Sheet 1

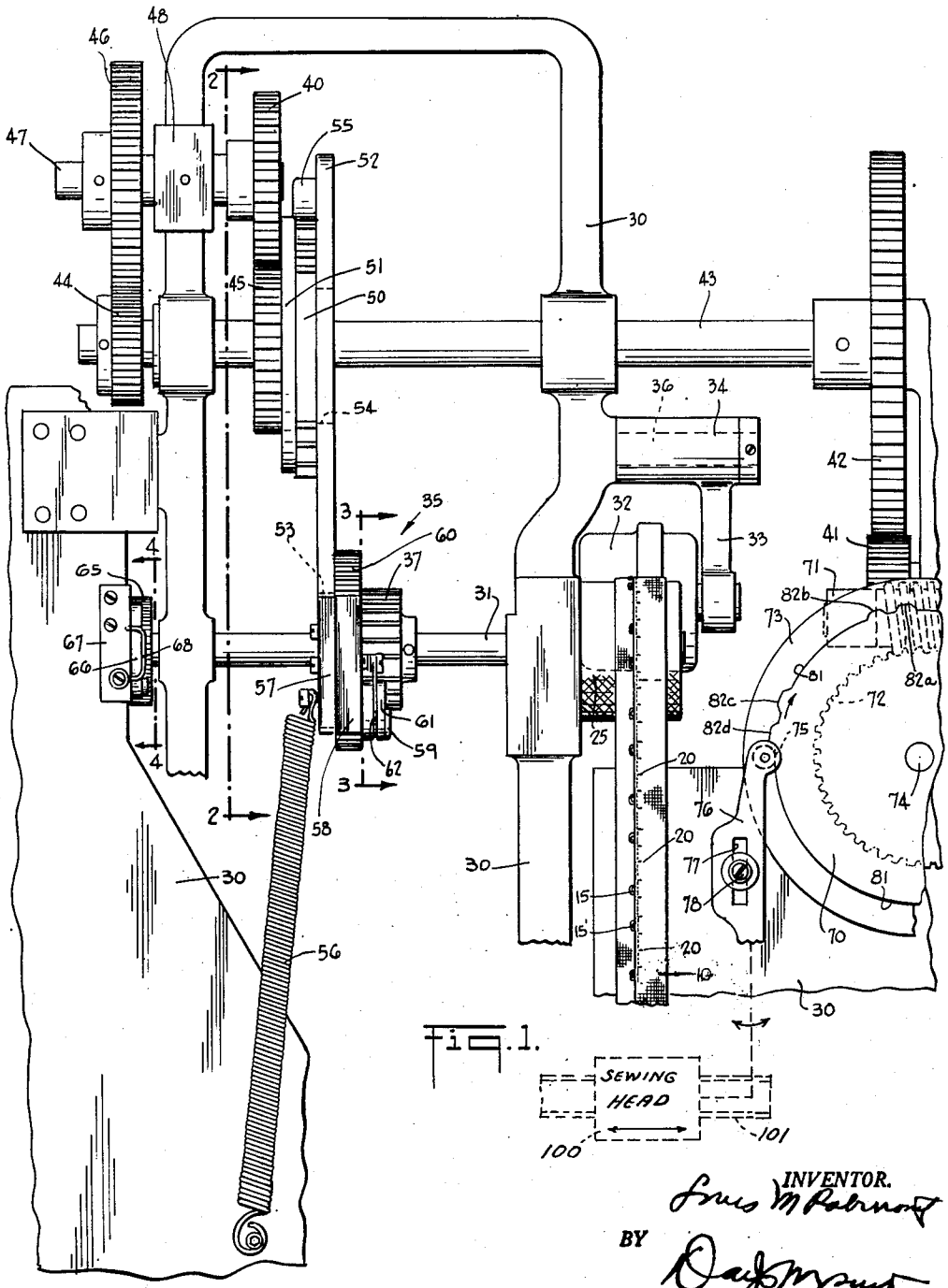


Fig. 1.

INVENTOR.
Louis M Rabinowitz
BY
Davis M Rabinowitz
his ATTORNEY

April 20, 1954 L. M. RABINOWITZ 2,675,770

APPARATUS FOR ASSEMBLING FASTENER ELEMENTS

Filed Jan. 3, 1952 2 Sheets-Sheet 2

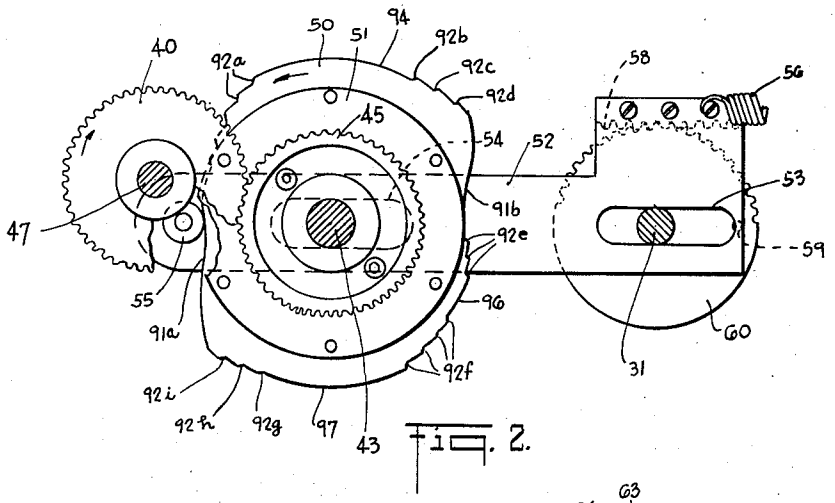


Fig. 2.

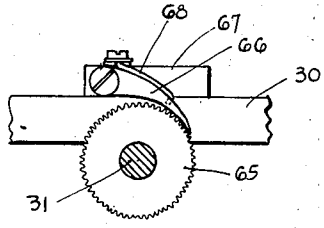


Fig. 4.

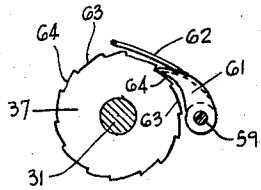


Fig. 3.

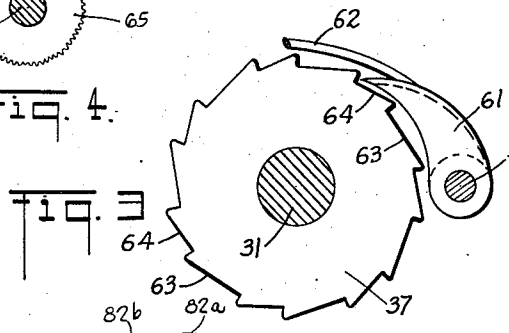


Fig. 3

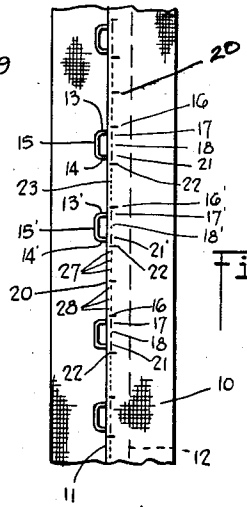


Fig. 6.

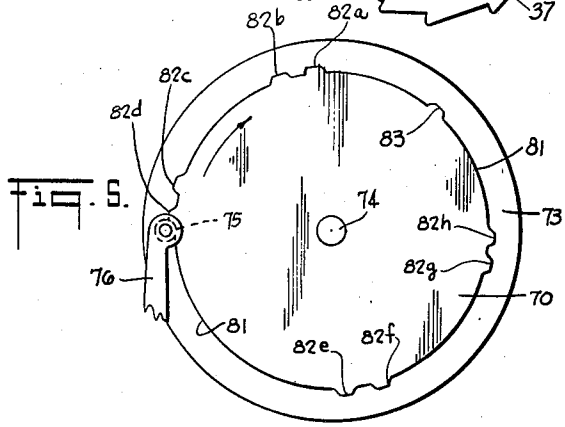


Fig. 5.

INVENTOR.
Louis M. Rabinowitz

BY
Dan J. Murray
his ATTORNEY

Patented Apr. 20, 1954 2,675,770

UNITED STATES PATENT OFFICE

2,675,770

APPARATUS FOR ASSEMBLING FASTENER ELEMENTS

Louis M. Rabinowitz, Brooklyn, N. Y.

Application January 3, 1952, Serial No. 264,788

3 Claims. (Cl. 112—2)

1

This invention relates to apparatus for assembling fastener elements, such as eyelets, in longitudinally spaced groups along an elongated fabric strip. More particularly, the inventive apparatus is directed to providing a novel stitching arrangement for the fasteners, and which is cyclically repeated along the strip.

These elongated strips containing fastener elements are widely used in the clothing art, particularly in the manufacture of lingerie items such as brassières. As presently manufactured, the eyelets are arranged in groups of two, or sometimes three, along the strip. A space equal to twice the distance between the eyelets of a pair is left between each pair. An operator can then sever the strip midway between each pair to provide shorter strips, each of which is secured to the free end of a brassière for cooperation with hooks on a similar strip secured to the other free end.

In the usual assembling of the eyelets to the strip, the latter is fed longitudinally relative to a sewing head which sews a uniform line of stitches along the strip. At predetermined spaced and uniform intervals, an eyelet is stitched to the strip, the motion of the strip being halted, stepped, and again halted during attachment of the two legs of the eyelet to the strip. To provide the larger spacing between the sets or pairs of eyelets, no eyelet is attached to the strip at every third location (when the eyelets are arranged in pairs). By severing the strip at these blank locations, shorter strips, each containing a uniformly spaced set of eyelets, are provided.

However, this arrangement has certain disadvantages. In the first place, the location of the cut is not definitely marked, so that the cutter must visually estimate the midpoint between eyelet sets. This frequently results in the short, cut strips being unequal in length, or with the eyelet set not centered therealong. Consequently, there is a possible mismating of the eyelets with their cooperating hooks when the strips are assembled to a garment.

More importantly, the amount of material remaining on each strip on each side of the eyelet set is far more than is needed either for structural support of the attached eyelets or for adequate attachment of the strip to a garment.

The present invention overcomes these disadvantages in a novel manner by providing a predetermined sequence involving stitches of differing lengths and relative orientations. Intermediate the sets of eyelets, the seam is composed of

2

a series of stitches characterized by a group of stitches at the cutting point including a pair of stitches of one character separated by a single stitch of a different character, thus providing a well-defined "marker" for the subsequent cut. The series of stitches between eyelet sets is preferably greater in length than the series of stitches securing the eyelets of each set to the strip, but substantially less than twice the spacing of the individual eyelets of each set.

The invention arrangement thus provides the distinct advantages of first, providing a definite "marker" for the subsequent cutting and which is distinct and outstanding from the immediately adjacent stitches, and, second, greatly reducing the length of fabric needed for a given number of eyelet sets. All this is effected solely by the stitching operation by varying the character of the stitches at preset intervals along the strip.

For an understanding of the invention principles, reference is made to the following detailed description of a typical embodiment thereof as illustrated in the accompanying drawing.

In the drawing:

Fig. 1 is a partial plan view of cyclical control apparatus for effecting the invention;

Fig. 2 is a vertical sectional view of the apparatus on the line 2—2 of Fig. 1;

Fig. 3 is an enlarged elevation view of a ratchet and pawl stepping mechanism for feeding the eyelet strip longitudinally;

Fig. 4 is an elevation view of a no-backlash arrangement for the stepping mechanism;

Fig. 5 is an elevation of a cam controlling lateral positioning of the sewing head relative to the strip; and

Fig. 6 is a partial plan view of a finished strip.

In accordance with the invention method, as applied to a strip 10, such as shown in Fig. 6, in which the eyelets are arranged in spaced pairs inserted laterally between overlapping edges, the sequence of stitching is as follows. Beginning with the leading leg 13 of the first eyelet 15 inserted between the lapped strip edges, the strip or tape is held fixed against longitudinal movement while the sewing head is reciprocated twice laterally of the strip to make a dual lateral or "tack" stitch 16 in advance of leg 13 to fix the eyelet against movement in one direction longitudinally of the strip. The sewing head then remains laterally fixed while the strip is stepped longitudinally in a sequence involving a long step, substantially one-half the long step, and a second long step. This forms a long stitch 17 binding leg 13 to the strip, a short stitch 18

between leg 13 and trailing leg 14 and a long stitch 21 binding leg 14 to the strip. Next, the tape remains stationary while the sewing head is reciprocated twice laterally of the strip to form another "dual" tack stitch 22 fixing the eyelet against movement in the opposite direction along strip 10.

With the sewing head laterally fixed, the strip is now advanced, in a series of short steps, to the position of the leading leg 13' of the next eyelet, and the next eyelet is positioned in the strip. For example, eight short steps may be given the strip in a typical practical embodiment. This forms a seam comprising a series of short stitches 23 uniting the lapped strip edge between the eyelets of one pair. The second eyelet is then stitched to the strip in the same sequence of lateral and longitudinal stitching as described in the immediately preceding paragraph, primed corresponding reference characters being used.

The novel "cut line" marking is now provided in the following manner and following the formation of the tack stitching securing the trailing leg 14' of the second eyelet 15 to the strip. The sewing head is maintained fixed in alignment with the seam. The strip is advanced three long steps to form three long stitches 27 (a different number may be used, if desired). Next, the strip 10 remains longitudinally stationary while a laterally extending tack stitch 20 is formed intermediate two eyelet groups. Then the strip is advanced three long steps to form three long stitches 28.

The cutting line is thus clearly indicated by a lateral tack stitch 20 intermediate the successive eyelet groups and separated from each group by the series of three long stitches 27 or 28.

Figs. 1 through 5 illustrate a preferred cycle control and strip stepping apparatus, according to the invention, for drawing strip 10 past a sewing head (not shown). The eyelet feeding mechanism may be of a conventional type known to the art, and has not been illustrated as it forms no part of the present invention.

Strip 10 is drawn past the sewing head by a knurled roller 25 fixed to a shaft 31 rotatably mounted in a frame 30. An idler roller 32 is rotatably mounted on a spring biased arm 33 having a hub 34 oscillatable on a stub shaft 36 secured to frame 30. Roller 32 presses the tape 10 against stepping roller 25 for frictional drawing of strip 10. Shaft 31 and drive roller 25 are stepped by a ratchet and pawl mechanism, generally indicated at 35, and including a ratchet wheel 37 fixed to shaft 31 and driven by the cycle control and stepping mechanism.

The latter includes a main driving pinion 41, rotated by a driving motor (not shown) and driving a gear 42 pinned to one end of a shaft 43 rotatable in frame 30. The opposite end of shaft 43 has fixed thereon a pinion 44 driving a gear 46 secured on one end of a short shaft 47 rotatable in a bearing 48 on frame 30. The opposite end of shaft 47 has fixed thereon a gear 40 driving a gear 45 pinned to a control cam 50 freely rotatable on shaft 43. A separation disc 51 is interposed between gear 45 and cam 50.

An arm 52 is juxtaposed with cam 50, extends parallel to the plane including shafts 31 and 43, and is formed with elongated slots 53 and 54 respectively receiving shafts 31 and 43. On the rear end of arm 52, a roller cam follower 55 is rotatably mounted. A tension spring 56, secured between the forward end of arm 52 and a remote part of frame 30, biases the arm to maintain roller 55 engaged with cam 50.

The forward end of arm 52 has an extension 57 to which is secured a rack 58 engaged with a gear 60 rotatable on shaft 31 and juxtaposed with ratchet 37. Gear 60 pivotally mounts a pawl 61 on a stud 59, and pawl 60 is biased by a spring 62 into engagement with ratchet 37. For a purpose to be described, ratchet 37 has alternate long and short teeth 63 and 64, respectively, as best seen in Fig. 3.

Back lash of the strip stepping mechanism is prevented by the arrangement shown in Figs. 1 and 4. This includes a fine toothed ratchet 65 engaged by a pawl 66 pivotally mounted on a bracket 67 on frame 30. A spring 68 secured to bracket 67 biases pawl 66 to engage ratchet 65.

When a lateral or tack stitch (16, 20, 22) is to be formed, the sewing head, schematically illustrated at 100 as laterally movable along a slide 101, is laterally shifted by the mechanism shown at the right of Fig. 1 and in Fig. 5. A worm 71 is driven by the same means driving pinion 41, so that worm 71 and pinion 41 are in synchronism with each other. The worm drives a worm gear 72 concentrically juxtaposed to a circular disc 73 against the opposite face of which a lobed cam 70 is concentrically juxtaposed. Gear 72, disc 73 and cam 70 are pinned together to form a unit rotatable on a shaft 74. Cam 70 is engaged by a roller cam follower 75 rotatably mounted on one end of an arm 76 having an elongated slot 77 adjustably receiving a pivot 78 on frame 30. The opposite end of arm 76 is secured to means (not shown) for laterally shifting the sewing head (not shown). When roller 75 rides on the circular part 81 of cam 70, the sewing head remains aligned with the main line of stitches. When roller 75 engages any of the lobes 82*a*–82*h*, or lobe 83, the sewing head is laterally reciprocated to form the tack stitches 16, 22 or the "cut" marking stitch 20.

Feeding of strip 10 longitudinally relative to the sewing head is effected by the cam 50, through roller 55, arm 52, rack 58, gear 60, and pawl 61, rotating ratchet 37 counterclockwise (Figs. 2 and 3) in two strokes for each cycle of the cam, each stroke involving a plurality of steps in a predetermined sequence and of predetermined values. This will best be understood from the following description of a typical cycle during which a pair of eyelets 15, 15' are assembled to strip 10 and the cut marking arrangement is provided.

In the positions of cams 50 and 70 shown in Figs. 2 and 5, and in Fig. 1, respectively, tack stitch 22 has just been formed to fix eyelet 15 longitudinally of strip 10. Roller 75 has just ridden off lobe 82*d* onto circular surface 81, and the sewing head is aligned with the seam stitches. Roller 55 has been riding into relatively shallow depression 91*a* causing arm 52 and rack 58 to be drawn to the right (Fig. 2) to rotate gear 60 clockwise an amount sufficient for pawl 61 to slip back over a short tooth 64 of ratchet 37.

As cam 50 rotates, roller 55 successively engages a series of step-like lobes 92*a*, each effecting a short movement of cam 52 and rack 58 to the left. Preferably, six (6) steps are provided with provision for a further "idle" step if desired. Each time roller 55 is thus stepped to the left, the strip 10 is moved through the length of a short stitch 23.

As roller 55 rides onto circular surface 94 of

cam 50, roller 75 is just at lobe 82e. Thus, while strip 10 remains stationary due to roller 55 remaining stationary, the sewing head is reciprocated twice, laterally of strip 10, as roller 75 rides over lobes 82e, 82f and back onto surface 81, to form the tack stitch 16' at leg 13' of eyelet 15'. Next, roller 55 rides over high step 92b, low step 92c, and high step 92d to form the long, short, long stitch sequence 17', 18', 21'. Roller 55 then starts to ride into deep depression 91b as roller 75 starts to ride over lobe 82g. The tape or strip remains stationary as the sewing head is reciprocated by virtue of roller 75 riding successively over lobes 82g, 82h to form tack stitch 22'.

Meanwhile, as roller 55 reaches the bottom of depression 91b, arm 52 is moved to the right, rotating gear 60 clockwise a sufficient amount to ride pawl 61 back over the next long tooth 63 of ratchet 37. Roller 55 then is stepped to the left by riding over the successively arranged relatively high steps 92e, preferably three (3) in number, to form the three long stitches, 27. As roller 55 rides along circular surface 96, strip 10 remains idle while the sewing head is reciprocated once laterally, as roller 75 rides over lobe 83, to form the "cut" marking lateral stitch 20.

The roller 55 then is stepped successively to the left by the relatively high steps 92f to form the long stitches 28, one of the four steps being an "idle" step if desired. As roller 55 rides along circular surface 97, roller 75 rides over lobes 82a, 82b to form the tack stitch 16 at the leading leg of the first eyelet 15 of the next eyelet group. Roller 55 then is stepped by the high, low, high steps 92g, 92h, 92i to form the long, short, long stitch sequence 17, 18, 21 between the eyelet legs. Roller 55 then rides over an "idle" step and into depression 91a as roller 75 rides over the successive lobes 82c, 82d to form tack stitch 22. The cycle is now complete and is repeated.

The reason for the alternating long and short teeth 63, 64 on ratchet 37 will be clear from an inspection of Figs. 2 and 6. Referring to Fig. 6, it will be noted that the center-to-center distance between the eyelets 15, 15' of each pair is substantially shorter than the center-to-center distance between the trailing eyelet 15' of one pair and the leading eyelet 15 of the next pair.

The distance between lateral stitch 22 for the trailing leg of eyelet 15 (Fig. 6) and the corresponding stitch 22 of eyelet 15' is represented by six short stitches, a long stitch, a seventh short stitch, and a second long stitch. Assuming, solely for comparison purposes, that each long stitch has twice the length of a short stitch, this distance is the equivalent of 11 short stitches, or 11 units of movement to the left of roller 55 and ratchet 52 of Fig. 2 from depression 91a to depression 91b.

Now the distance from the second stitch 22 (eyelet 15') of Fig. 6 to the next stitch 22 includes two sets of three long stitches, a seventh long stitch, a short stitch, and an eighth long stitch. Using the same stitch length relation as before, this represents 17 short stitches, or 17 units of movement to the left of roller 55 (Fig. 2) from depression 91b back to depression 91a.

Thus, the radially outward movement of roller 55 from the illustrated position of Fig. 2 to the top of step 92d is only about ⅔ its radial outward movement from depression 91b to the top of step 92i. As rack 52 is moved further to the left in the second half of the cycle than during the first half, it must be moved further to the right to start the second cycle in order to come back to its starting point at the end of the cycle. Therefore, if the dog 61 (Fig. 3) is to engage behind a ratchet tooth without any lost motion of ratchet 37 during movement of rack 52 to the left, the tooth 63 engaged at the start of the second half of the cycle must be longer than the tooth 64 engaged at the start of the first half of the cycle. Thus, the alternating long and short teeth of ratchet 37 are to accommodate the difference in the length of the "stroke" of rack 52 during the two halves of the cycle of cam 50.

The inventive apparatus thus form a novel eyelet strip in which there is a saving in materials as compared to such strips as previously formed. Additionally, a definite and clearly defined "cut" mark is provided by a lateral or tack stitch separated from each of two adjacent eyelet groups by a series of distinctively long stitches.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the invention principles, it will be understood that the invention may be otherwise embodied without departing from such principles.

What is claimed is:

1. In the manufacture of a continuous fastener strip in which fasteners are inserted at spaced intervals along the strip and between overlapped longitudinal portions of the strip and secured in place by a longitudinal stitched seam uniting such overlapped portions, the fasteners being arranged in spaced groups each including at least two fasteners, and the seamed strip being later severed between fastener groups to provide shorter strips each containing one group of fasteners, a sewing head, apparatus for drawing said strip longitudinally relative to the sewing head to form said seam comprising, in combination, a driven element engaged with the strip and operable to draw the same longitudinally past the sewing head, a control cam, driving means for said cam, a cam follower engaged with said cam, stepping means interconnecting said cam follower and said element responsive to movement of said cam follower by said cam, mechanism operable to shift the sewing head laterally of the strip to form a lateral stitch therein, and a second cam for operating said mechanism and driven by said driving means in timed relation with said control cam, said mechanism including a second cam follower engaged with said second cam and operable, when shifted, to move the sewing head laterally of the strip, said second cam having spaced cam lobes, separated by follower resting surfaces, to shift said second cam follower at predetermined intervals, said control cam having cam follower moving surfaces constructed to impart motion to said first cam follower to correspondingly step said element to form a longitudinal stitch in the seam and cam follower idling surfaces separating said moving surfaces, one of said cam lobes being engaged by said second cam follower each time the sewing head is substantially at the midpoint between fastener groups, said moving surfaces being engaged by said first cam follower immediately before and after said second cam follower engages said one cam lobe, and said first cam follower engaging one of said idling surfaces while said second cam follower rides over said one cam lobe, to form a laterally extending "cut" marking stitch substantially at the midpoint between fastener

groups and at least one longitudinal stitch on each side of said lateral "cut" marking stitch.

2. In the manufacture of a continuous fastener strip in which fasteners are inserted at spaced intervals along the strip and between overlapped longitudinal portions of the strip and secured in place by a longitudinal stitched seam uniting such overlapped portions, the fasteners being arranged in spaced groups each including at least two fasteners, and the seamed strip being later severed between fastener groups to provide shorter strips each containing one group of fasteners, a sewing head, apparatus for drawing said strip longitudinally relative to the sewing head to form said seam comprising, in combination, a driven element engaged with the strip and operable to draw the same longitudinally past the sewing head, a control cam, driving means for said cam, a cam follower engaged with said cam, stepping means interconnecting said cam follower and said element responsive to movement of said cam follower by said cam, mechanism operable to shift the sewing head laterally of the strip to form a lateral stitch therein, and a second cam for operating said mechanism and driven by said driving means in timed relation with said control cam, said mechanism including a second cam follower engaged with said second cam and operable, when shifted, to move the sewing head laterally of the strip, said second cam having spaced cam lobes, separated by follower resting surfaces, to shift said second cam follower at predetermined intervals, said control cam having cam follower moving surfaces constructed to impart motion to said first cam follower to correspondingly step said element to form a longitudinal stitch in the seam and cam follower idling surfaces separating said moving surfaces, one of said cam lobes being engaged by said second cam follower each time the sewing head is substantially at the midpoint between fastener groups, said moving surfaces being engaged by said first cam follower immediately before and after said second cam follower engages said one cam lobe, and said first cam follower engaging one of said idling surfaces while said second cam follower rides over said one cam lobe, to form a laterally extending "cut" marking stitch substantially at the midpoint between fastener groups and at least one longitudinal stitch on each side of said lateral "cut" marking stitch, at least a second one of said cam lobes being engaged by said second cam follower each time the sewing head is adjacent either side of a fastener and when said first cam follower is engaged with an idling surface to form a lateral stitch on each side of each fastener.

3. In the manufacture of a continuous fastener strip in which fasteners are inserted at spaced intervals along the strip and between overlapped longitudinal portions of the strip and secured in place by a longitudinal stitch seam uniting such overlapped portions, the fasteners being arranged in spaced groups each including at least two fasteners, and the seamed strip being later severed between fastener groups to provide shorter strips each containing one group of fasteners, a sewing head, apparatus for drawing said strip longitudinally relative to the sewing head to form said seam comprising, in combination, a driven element engaged with the strip and operable to draw the same longitudinally past the sewing head, a control cam, driving means for said cam, a cam follower engaged with said cam, stepping means interconnecting said cam follower and said element responsive to movement of said cam follower by said cam, mechanism operable to shift the sewing head laterally of the strip to form a lateral stitch therein, and a second cam for operating said mechanism and driven by said driving means in timed relation with said control cam, said mechanism including a second cam follower engaged with said second cam and operable, when shifted, to move the sewing head laterally of the strip, said second cam having spaced cam lobes, separated by follower resting surfaces, to shift said second cam follower at predetermined intervals, said control cam having first cam follower receiving surfaces constructed to impart a relatively short motion to said follower to correspondingly step said element a relatively shoft distance to form a relatively short stitch in the seam, second cam follower moving surfaces constructed to impart a relatively long motion to said follower to correspondingly step said element a relatively long distance to form a relatively long stitch in the seam, and cam follower idling surfaces separating said moving surfaces, one of said cam lobes being engaged by said second cam follower each time the sewing head is substantially at the midpoint between fastener groups, the surface of the control cam operative on said first follower when the sewing head is between fastener groups comprising two series of said second moving surfaces separated by an elongated idling surface at the midpoint, whereby said apparatus is thereupon conditioned to form two series of relatively long stitches between fastener groups and separated by a lateral "cut" marking stitch, at least a second one of said cam lobes being engaged by said second cam follower each time the sewing head is adjacent either side of a fastener and when said first cam follower is engaged with an idling surface to form a lateral stitch on each side of each fastener, the surface of said control cam engaged by said first follower when the sewing head is between the fasteners of a group comprising a series of said first moving surfaces to form a line of relatively short stitches between the fasteners of each group.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,801,570	Roseman	Apr. 21, 1931
1,905,504	Roseman	Apr. 25, 1933
2,034,689	Alberts	Mar. 24, 1936
2,067,371	Allis	Jan. 12, 1937