April 23, 1940. R. C. LEGAT 2,198,345

APPARATUS FOR AND METHOD OF MAKING FASTENERS

Filed Nov. 5, 1938

Fig. 1

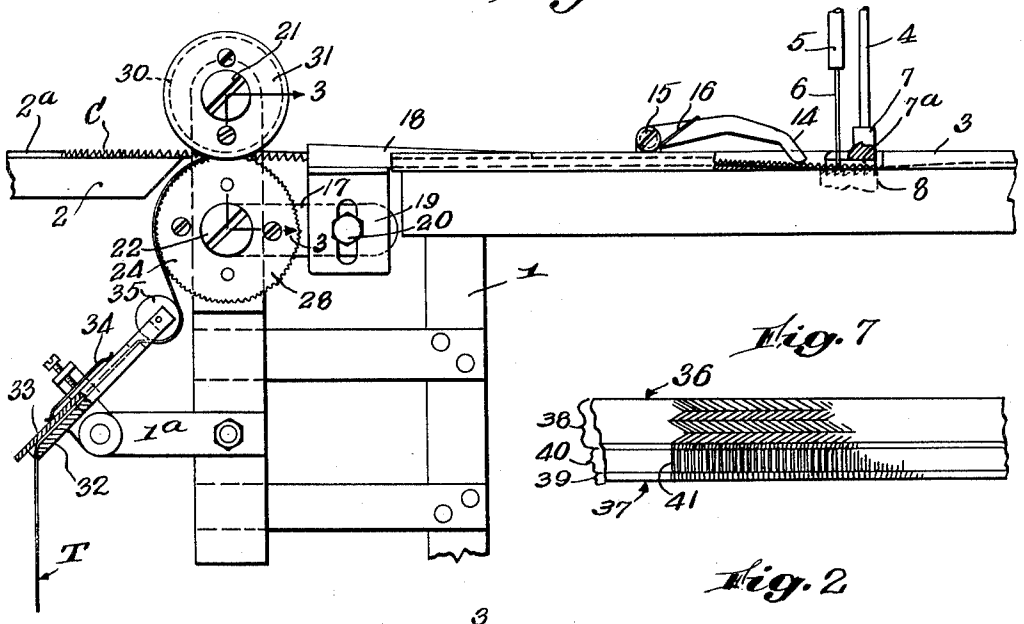


Fig. 7

Fig. 2

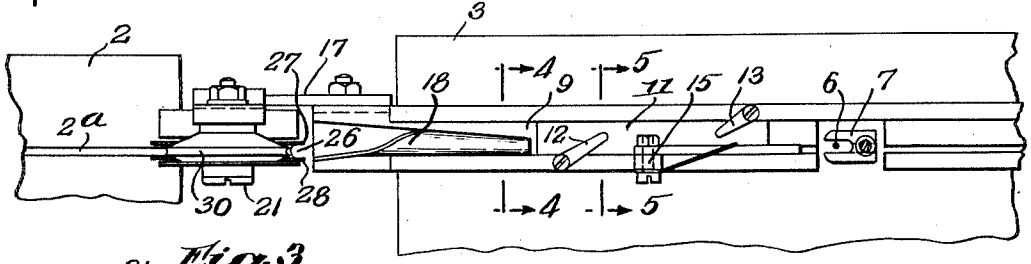


Fig. 3

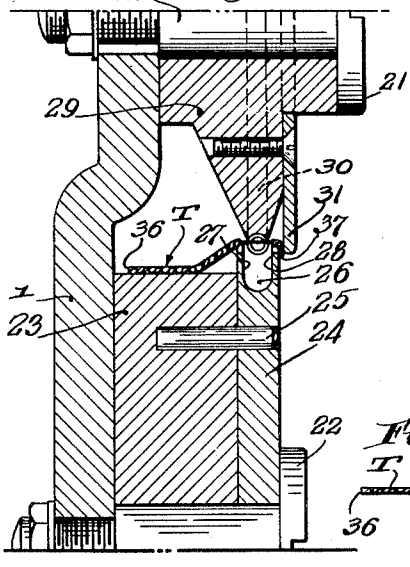


Fig. 4

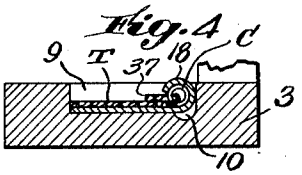


Fig. 5

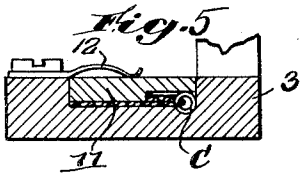


Fig. 6

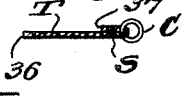
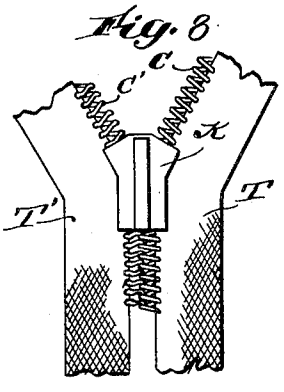


Fig. 8



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Patented Apr. 23, 1940

2,198,345

UNITED STATES PATENT OFFICE

2,198,345

APPARATUS FOR AND METHOD OF MAKING FASTENERS

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Application November 5, 1938, Serial No. 239,000

17 Claims. (Cl. 112—2)

This invention pertains to slide-actuated fasteners, particularly to fasteners of the kind in which the fastener elements of one at least of the opposed series are constituted by the successive turns of an open coil of wire, and relates more especially to an improved machine for and method of assembling such a wire coil with and uniting it to a textile tape.

In accordance with one customary mode of procedure, the wire coil is first cut into lengths each appropriate to form a fastener, and then each such length is united to the tape by first placing the coil in end-to-end relation to the tape, causing the end of the coil to pierce the tape and then, by turning the coil about its own axis, causing it to screw itself into the tape, each rotation of the coil causing its end to engage and pierce the tape at a point in advance of the previous point of piercing corresponding to the pitch of the coil.

While this method of procedure is wholly practical in making fasteners of moderate lengths and from undeformed cylindrical coils, and capable of rapid performance by a skilled worker, it is not so readily performed when making long fasteners or when using a coil deformed to provide hook-like fastener elements as disclosed, for example, in the patent to Prentice No. 1,724,311, dated August 13, 1929. On the other hand, very long fasteners are now commonly required by the trade, and there would be a considerable advantage in preparing the completed fastener stringer, including the united tape and coil, in great lengths as a stock product so that fasteners, whether short or long, could be made merely by cutting off proper lengths from such stock material. Moreover, it is customary to employ a deformed coil to form at least one of the series of fastener elements.

In accordance with the present invention provision is made for assembling the tape and wire coil very rapidly and without limitation as to length and whether the coil be cylindrical or deformed, and for uniting them to form a completed stringer member; and the operation of assembling and uniting is performed progressively, rapidly and easily and without necessity for high skill upon the part of the operator and without limitation as to maximum length of the completed product other than such as may be imposed by the possible lengths of coil or tape obtainable for assembly.

In attaining the desired result in accordance with the present invention, a stringer tape is first prepared by usual methods of weaving, braiding or the like, but in which a predetermined width of the tape adjacent to but inwardly of one edge is of ladder-like texture, being devoid of longitudinally extending yarns. A suitably formed wire coil is then disposed above this ladder-like portion of the tape, the axis of the coil being disposed parallel to the length of the tape, and the coil is then pressed against the tape so that the convolutions of the coil enter between the transversely extending constituent yarns of the tape. Then the edge portion of the tape is folded over the coil so that these transversely extending yarn elements embrace the convolutions of the coil, and the folded-over edge of the tape is permanently united to the body of the tape, for example, by sewing stitches.

In the performance of this novel method of procedure the coil and tape are progressively advanced by suitable feed mechanism and brought into proper registry and pressed together, and are then further advanced through a folding device which automatically folds the edge of the tape over onto the body of the tape and about the wire coil. Then as the assembled parts continue to advance, a sewing mechanism unites the edge of the tape to the body portion,—the entire operation being carried out progressively and automatically.

In the accompanying drawing, in which one desirable mechanism appropriate for performing the above operation is illustrated by way of example,

Fig. 1 is a fragmentary diagrammatic side elevation, partly in vertical section, illustrating the apparatus;

Fig. 2 is a fragmentary diagrammatic plan view, with certain parts omitted;

Fig. 3 is a section to enlarged scale on the line 3—3 of Fig. 1;

Figs. 4 and 5 are fragmentary vertical sections, to larger scale, on the lines 4—4 and 5—5, respectively, of Fig. 2;

Fig. 6 is a transverse section, to substantially the same scale as Fig. 5, through the completed stringer;

Fig. 7 is a fragmentary diagrammatic plan view of a piece of tape appropriate for use in the practice of the improved process; and

Fig. 8 is a fragmentary diagrammatic front elevation of a fastener embodying a stringer made in accordance with the present invention.

Referring to the drawing, the numeral 1 designates the frame of the machine, said frame supporting a pair of substantially horizontal bed members 2 and 3. The bed member 3 forms a

portion of a sewing machine device including a presser foot bar 4 and a needle bar 5, the latter being provided with a sewing needle 6. The presser foot bar 4 carries the presser foot 7,—the bed being provided below this foot with a suitable opening for the reception of the usual feed dog 8. It is to be understood that the needle bar, presser foot bar and feed dog, as well as parts cooperable with the needle 6 for forming sewing stitches (not here shown), will be operated in properly timed relation by mechanisms such as are commonly used in sewing machines of known type.

The bed 3 is provided with an elongate shallow groove or slot 9 of a width substantially equal to that of the completed stringer device. Near one edge this groove or slot 9 is furnished with a deepened portion 10 preferably of curved contour designed to receive the wire coil. For a portion of its length the groove or channel 9 is furnished with a cover plate 11 held downwardly by means of spring fingers 12 and 13. Preferably these spring fingers are so arranged that they may be swung away from the cover plate to permit ready removal of the latter. For a portion of its length the cover plate is cut away along one edge for the reception of a presser dog 14 which is disposed to overlie the deepened part 10 of the groove or channel and which is pivoted at 15 on a bracket carried by the bed plate 3 and which is pressed downwardly by means of a spring 16. This dog 14 is designed to overlie the wire coil just in advance of the presser foot 7 so as properly to position the coil as it advances beneath the presser foot.

For the accommodation of the wire coil during the sewing operation, the presser foot is provided with a channel 7a (Fig. 1), and for guiding the wire coil toward its point of assembly with the tape the bed plate 2 is furnished with a longitudinally extending slot or groove 2a (Fig. 2).

To the left of the bed plate 3 the machine frame is provided with a bracket 17 which supports a folder device 18. This folder preferably is of the usual scroll type used as an attachment for sewing machines for turning a hem and preferably is provided with a supporting member 19 which is adjustably connected to the bracket 17 by means of a bolt 20.

To the left of the bracket 17 the machine frame is furnished with a pair of horizontal stub shafts 21 and 22, respectively, having their axes in the same vertical plane.

The stub shaft 22 carries a freely rotatable tape-guiding roll comprising the portion 23 having a cylindrical edge surface designed to support the body portion of the tape T and a part 24 of somewhat larger diameter than the part 23 and connected to the latter by means of a pin 25. The part 24 is of a width substantially corresponding to the width of the ladder-like part of the tape, as above referred to, and has a circumferential groove 26, preferably of a depth substantially greater than the radius of the wire coil and whose walls are defined by thin flange portions 27 and 28, each of which is toothed at its edge.

On the stub shaft 21 is mounted a coil-guiding roll 29, preferably having a tapering rim whose edge is of a width less than the width of the groove 26, said edge having a peripheral groove 30 of a curved contour substantially conforming to the curvature of the wire coil C which is to be assembled with the tape but which preferably is of a depth slightly less than the radius of the wire coil. The outer face of the roll 29 is provided with a tape-clamping flange 31 designed to overlie the outer surface of the toothed flange 28 of the lower roll member 24, being spaced from said outer face a distance substantially equal to the thickness of the tape.

A bracket 1a extending to the left of the main frame 1, as shown in Fig. 1, supports a tape guiding plate 32. This plate has associated with it a tensioning member 33 pressed toward the plate by an adjustable spring 34. The tape T passes between the members 32 and 33 and then beneath a roller 35 by means of which it is guided into engagement with the roll members 23 and 24 and so that the ladder-like portion of the tape is directly above the groove 26 with its borders impaled upon the teeth at the edges of the flanges 27 and 28, respectively, and with its selvage edge so overlapping the outer surface of the roll member 24 as to be caught and clamped against such surface by the clamping flange 31.

The tape employed for this purpose is of the general type illustrated in Fig. 7. This tape T may be made by a weaving or braiding operation from suitable textile material and has the selvages 36 and 37. That portion of the tape indicated at 38, and which may be referred to as the body portion, is of close texture comprising both longitudinal and transverse yarn elements, and the marginal portion 39, closely adjacent to the selvage edge 37 likewise has both longitudinal and transverse elements. However, the ladder-like part indicated at 40, adjacent to the margin 39, is devoid of longitudinally extending elements and comprises yarns 41 which extend only transversely and which are thus freely separable.

In the operation of the mechanism, the wire coil C is disposed in the groove 2a of the bed member 2 and the tape T is interposed between the members 32 and 33, and then the coil and tape are drawn forwardly between the upper and lower roll members and into and through the folder 18,—and thence through the channel 9 and beneath the presser foot 7 of the sewing machine mechanism. The plate 11 is then properly positioned and the sewing machine started in operation.

The feed mechanism of the sewing machine causes the tape and coil to progress toward the right as viewed in Fig. 1. The ladder-like portion 40 of the tape overlying the groove 26 receives the coil C, which is properly guided by the groove in the upper roll 29, and this upper roll, being suitably spaced with reference to the lower roll 24, not only guides the coil so as to overlie the part 40 of the tape, but also presses the coil into the substance of the tape so that its convolutions enter between the parallel yarn members 41 of the tape. As the coil and tape continue to advance, the margin 39 of the tape leaves the roll member 24 and also the clamping member 31 (by means of which such margin is positively gripped while the coil is being pressed transversely into the tape) and then passes into the folder device 18, where the margin 39 of the tape (as well as the part 40 of the tape) is caused to be folded over until the margin 39 is disposed upon the body 38 of the tape (Fig. 4).

The parts as thus positioned enter beneath the spring-pressed cover plate 11 which keeps them in proper relative position as they advance toward the sewing mechanism. As they continue to advance, the coil is pressed down by the presser dog 14 so that it is delivered properly into

the channel 7a of the presser foot, and as the coil and tape advance beneath the presser foot, the needle 6, with its associated parts, forms sewing stitches permanently uniting the margin 39 of the tape to the body portion 38. During the folding operation the yarn elements 41 of the tape are caused to embrace the convolutions of the wire coil so that the coil is thereby permanently but flexibly anchored to the tape throughout its length.

The result of the above operation is to form a stringer tape such as shown in Fig. 6, in which the body and edge portions of the tape are united by the sewing stitches S, the wire coil C extending along one edge of the completed stringer and being firmly bound to the tape T.

Such a stringer, resulting from the association of a tape and coil may be used in forming a fastener device such as shown in Fig. 8. In this figure two tapes T and T1, with their associated coils C and C1, respectively, are shown as assembled and as provided with the slider K to form a fastener of the type illustrated, for example, in the patent to Prentice No. 1,724,311, dated August 13, 1929, it being noted that in this fastener one coil is a cylindrical coil and the other is a deformed coil, and that either type of coil may be assembled with its tape with equal facility by the machine herein disclosed.

While a desirable form of mechanism has herein been illustrated by way of example, it is to be understood that the invention is not necessarily limited to the precise details shown, but is considered inclusive of any and all equivalents and substitutions falling within the scope of the appended claims.

I claim:

1. Apparatus for use in assembling with and uniting to an open wire coil a textile tape having a ladder-like area including transverse yarns but devoid of longitudinally extending yarns and extending longitudinally of the tape adjacent to but spaced inwardly from one selvage, said apparatus comprising means for guiding the coil and tape to move endwise along convergent paths, means operative to support the ladder-like portion of the tape at its borders only, and means operative to press the coil transversely toward said ladder-like portion of the tape while the latter is so supported thereby to cause the convolutions of the coil to enter between the transverse yarns of the ladder-like portion of the tape.

2. Apparatus for use in assembling with and uniting to an open wire coil a textile tape having a ladder-like area including transverse yarns but devoid of longitudinally extending yarns and extending longitudinally of the tape adjacent to but spaced inwardly from one selvage, said apparatus comprising means for guiding the coil and tape to move endwise along convergent paths, means operative to support the ladder-like portion of the tape at its borders only, means operative to press the coil transversely toward said ladder-like portion of the tape while the latter is so supported thereby to cause the convolutions of the coil to enter between the transverse yarns of the ladder-like portion of the tape, and means operative to fold that selvage of the tape which lies adjacent to said ladder-like portion about the coil and over onto the body of the tape thereby to wrap the transverse yarns of said ladder-like portion about convolutions of the coil.

3. Apparatus for use in assembling with and uniting to an open wire coil a textile tape having a ladder-like area including transverse yarns but devoid of longitudinally extending yarns and extending longitudinally of the tape adjacent to but spaced inwardly from one selvage, said apparatus comprising means for guiding the coil and tape to move endwise along convergent paths, means operative to support the ladder-like portion of the tape at its borders only, means operative to press the coil transversely toward said ladder-like portion of the tape while the latter is so supported thereby to cause the convolutions of the coil to enter between the transverse yarns of the ladder-like portion of the tape, means operative to fold that selvage of the tape which lies adjacent to said ladder-like portion about the coil and over onto the body of the tape thereby to wrap the transverse yarns of said ladder-like portion about convolutions of the coil, means operative permanently to secure said selvage of the tape to the body portion of the tape, and means operative progressively and concomitantly to move the coil and tape through the zones of operation of the guiding, pressing, folding and uniting means.

4. Apparatus as set forth in claim 1 characterized in that the tape guiding means includes adjustable means operative to apply tension to the moving tape.

5. Apparatus as set forth in claim 1, characterized in that the means for supporting the ladder-like portion of the tape comprises a part having a groove of a depth at least as great as the radius of the wire coil, the opposite walls of the groove having retaining elements engageable with the opposite borders respectively of the ladder-like portion of the tape for holding said ladder-like portion taut and bridging the groove while the coil is being pressed against said ladder-like portion.

6. Apparatus as set forth in claim 1, characterized in that the means for supporting the ladder-like portion of the tape comprises a roll having spaced radial flanges defining between them a groove of a width at least as great as the diameter of the wire coil, and teeth projecting from the outer edges of said flanges operative by impalement of the borders of the ladder-like portion of the tape to hold the latter taut and bridging the groove in the roll.

7. Apparatus as set forth in claim 2, further characterized in having a scroll-type folder through which the tape and coil are drawn, thereby progressively to curl the selvage of the tape over the coil and into contact with the body of the tape.

8. Apparatus as set forth in claim 3, characterized in having sewing machine mechanism for permanently uniting the selvage of the tape to the body of the tape by sewing stitches.

9. Apparatus for assembling and uniting an open wire coil with a textile tape having a ladder-like portion inwardly of one of its selvages, said apparatus comprising a peripherally grooved roll having means adjacent to the opposite edges of the groove, respectively, for engaging the borders of the ladder-like portion of the tape thereby to hold it taut and bridging the groove, and a second roll turning about an axis parallel to the axis of the first roll and having a peripheral groove for guiding the wire coil, the axes of the rolls being so spaced that as the tape and coil pass between the rolls the coil is forced transversely into the ladder-like portion of the tape.

10. Apparatus for assembling and uniting an open wire coil with a textile tape having a ladder-like portion inwardly of one of its selvages, said

apparatus comprising a peripherally grooved roll having means adjacent to the opposite edges of the groove, respectively, for engaging the borders of the ladder-like portion of the tape thereby to hold it taut and bridging the groove, a coil-guiding roll turning on an axis parallel to the axis of the first roll, said second roll having a flange which overlaps the outer race of the first roll and which is so spaced from the latter as to clamp the selvage edge of the tape between them.

11. Apparatus for assembling and uniting an open wire coil with a textile tape having a ladder-like portion, said apparatus comprising a peripherally grooved tape-guiding roll having means adjacent to the opposite edges of the groove, respectively, for engaging the borders of the ladder-like portion of the tape, and a coil-guiding roll turning about an axis parallel to the axis of the first roll, the edge of the second roll being of a thickness less than the width of the groove in the first roll and having a peripheral, transversely curved coil-guiding channel, said channel being of a depth less than the radius of the coil.

12. Apparatus for assembling and uniting an open wire coil with a textile tape having a ladder-like portion inwardly of one of its selvages and which comprises transversely extending yarns only, said apparatus comprising a tape-guiding roll comprising means operative by engagement with the borders of the ladder-like portion of the tape to hold it taut and bridging the groove, coil-guiding means operative to dispose the coil in contact with the ladder-like portion of the tape, a scroll-type folder operative progressively to curl the selvage of the tape about the coil, sewing means operative permanently to unite the turned selvage to the body of the coil, and means operative to hold the selvage substantially in contact with the body of the tape as the tape and coil move from the folder to the sewing means.

13. Apparatus for assembling and uniting an open wire coil with a textile tape having a ladder-like portion inwardly of one of its selvages, said apparatus comprising a tape-guiding and a coil-guiding roll constructed and arranged to press the wire coil transversely into the substance of the ladder-like portion of the tape, folding means operative to curl the selvage of the tape about the coil and into contact with the body of the tape, means operative permanently to unite the selvage to the body of the tape, means providing a guide channel leading from the folding means to the uniting means, and a spring-pressed removable cover for said channel.

14. Apparatus for assembling and uniting an open wire coil with a textile tape having a ladder-like portion inwardly of one of its selvages, said apparatus comprising a tape-guiding and a coil-guiding roll constructed and arranged to press the coil into the substance of the ladder-like portion of the tape, means operative to fold the selvage of the tape over the coil and into contact with the body of the tape, means for uniting the selvage to the body of the tape, and a spring-pressed foot operative to engage the coil and properly to position the latter as the assembled tape and coil approach the uniting means.

15. Apparatus for assembling and uniting an open wire coil with a textile tape having a ladder-like portion inwardly of one of its selvages and which comprises transversely extending yarns only, said apparatus comprising means operative to guide the tape and coil along converging paths into contact, means operative to press the coil transversely into the substance of the tape, folding means operative to curl the selvage of the tape over the coil and into contact with the body of the tape, and stitch-forming instrumentalities operative permanently to unite the selvage of the tape to the body portion of the tape, said stitch-forming instrumentalities including a presser foot and a feed dog, the presser foot having a channel in its under surface for the accommodation of the coil.

16. Apparatus for assembling and uniting an open wire coil with a textile tape having a ladder-like portion inwardly of one of its selvages, said apparatus comprising a roll having an open peripheral groove and teeth adjacent to the opposite edges of the groove, respectively, said teeth being operative by impalement of the borders of the ladder-like portion of the tape to hold the latter taut and bridging the groove, means for clamping the selvage of the tape thereby to prevent it from slipping when subjected to pressure, advancing and guiding means operative to position the coil so as to lie longitudinally of the ladder-like portion of the tape, and means operative to press the coil transversely against the taut ladder-like portion of the tape thereby to cause its convolutions to enter between the transverse yarns of the ladder-like portion of the tape.

17. Method of assembling with and uniting to an open wire coil a textile tape having a ladder-like area extending longitudinally thereof and inwardly of one selvage, which comprises the successive steps of moving the tape and wire coil endwise through a zone in which they are caused to approach a parallel relation, then moving them endwise through a zone in which the ladder-like portion of the tape is held transversely taut and supported at its borders only while the coil is pressed transversely of the plane of the tape into said ladder-like portion of the tape, then moving them endwise through a zone in which the selvage of the tape is progressively curled about the coil so as to be in contact with the tape and concomitantly to wrap the ladder-forming elements of the tape about convolutions of the coil, then moving them endwise through a zone in which the folded tape is held under compression, and then moving them endwise through a zone in which the selvage of the tape is permanently united to the body of the tape.

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