

SPECIFICATION

Method of and apparatus for attaching an end stop to a slide fastener stringer tape

5 The present invention relates to a method of and an apparatus for attaching an end stop to a slide fastener stringer tape.

A wide variety of methods and apparatus
10 have been proposed for attaching end stops to longitudinally spaced, coupling element-free portions of the longitudinal beaded edge of a slide fastener stringer tape. For the application of U-shaped end stops having a pair of clinching
15 legs, it has been customary to spread apart a pair of stringer tapes at their opposed coupling element-free portions, to erect the stringer tapes so that their beaded edge portions are directed upwardly, and to apply a
20 pair of end stops to the stringer tapes with the end stops legs clinched about the beaded edge portions. With such a prior art arrangement, however, feeding and positioning of the stringer tapes has to be carried out in a
25 complicated operation, which needs a complex mechanism.

According to a first aspect of the present invention there is provided an apparatus for attaching a U-shaped end stop having a pair
30 of clinching legs to a longitudinal marginal edge portion of a slide fastener stringer tape, said apparatus comprising:

(a) means for intermittently advancing the slide fastener stringer tape along a path of
35 travel in a longitudinal direction thereof; and
(b) means for delivering end stops successively in a direction substantially normal to the path of travel of the stringer tape, for automatically turning the end stop about one of its
40 legs until the legs are placed one on each side of the longitudinal marginal edge portion of the stringer tape, and then clinching the end stop legs about the longitudinal marginal edge portion while the stringer tape is at rest.

45 According to a second aspect of the present invention there is provided a method of attaching a U-shaped end stop having a pair of clinching legs to a longitudinal marginal edge portion of a slide fastener stringer tape, said
50 method comprising the steps of:

(a) intermittently advancing the slide fastener stringer tape along a path of travel in a longitudinal direction thereof;
(b) delivering the end stop toward the
55 stringer tape individually in a direction substantially normal to said path of travel;
(c) turning the end stop about one of its legs so as to place the legs one on each side of the longitudinal marginal edge portion of
60 the stringer tape; and
(d) clinching the legs about the longitudinal marginal edge portion while the stringer tape is at rest.

The invention will be described by way of
65 example with reference to the accompanying

drawings, in which:

Figure 1 is a fragmentary plan view of a pair of slide fastener stringers to which a pair of end stops have been attached, respectively,
70 in accordance with a method of the present invention;

Figure 2 is an enlarged plan view of metal from which an end stop is to be made;

Figure 3 is an enlarged front elevation view
75 of an end stop;

Figure 4 is an enlarged transverse cross section view of a slide fastener stringer with an end stop being mounted on a longitudinal edge thereof;

80 *Figure 5* is a front elevation view, with portions in cross section, of an end stop attaching apparatus according to the present invention;

Figure 6 is an enlarged vertical cross-section view of a guide block and end stop
85 shaping means, showing the position of the parts in which a pair of metal pieces are ready for being shaped into a pair of end stops;

Figure 7 is a view similar to Fig. 6, showing
90 the position of the parts in which a pair of end stops are ready for being driven toward a die means; and

Figures 8 to 11 inclusive are enlarged fragmentary cross section views illustrating sequential steps of an end stop attaching operation.

Fig. 1 shows a pair of coupled slide fastener stringers 1, 2 comprising a pair of elongate stringer tapes 3, 4, respectively, and
100 a plurality of longitudinally spaced chains 5 of interengaged rows of coupling elements mounted on the opposed longitudinal marginal beaded edge portions 6, 7 of the respective stringer tapes 3, 4. The slide fastener
105 stringers 1, 2 jointly have a plurality of coupling element-free gaps or spaces 8 each interposed between adjacent ones of the longitudinally spaced chains 5.

A pair of end stops 9, 10 are attached to
110 the beaded edge portions 6, 7, respectively, at one end of each of the coupling-element-free spaces 8 and are aligned with each other transversely of the slide fastener stringers 1, 2. Each end stop 9, 10 is made from a flat
115 blank piece 11 of metal (Fig. 2) cut off from an elongate metal piece 12. The flat blank piece 11 is bent over about its central portion and shaped into the form of a U having a pair of parallel, spaced clinching legs 13, 14 (Fig.
120 3), to serve as the end stop 9, 10.

Fig. 4 illustrates one of the end stops 9 installed on the stringer tape 3 with the clinching legs 13, 14 placed one on each side of the longitudinal beaded edge portion 6 of the tape 3.

An end-stop-attaching apparatus 15 shown in Fig. 5 generally comprises a frame 16, an anvil block 17 mounted on the frame 16, and a guide block 18 mounted on the frame 16
130 for vertical movement toward and away from

the die block 17. A stringer guide 19 is mounted on the frame 16 at its lefthand side as shown. The stringer guide 19 has a horizontal slot 20 for the passage of the slide fastener stringers 1, 2, which are fed by means of a driven roller 21 and an idler roller 22, between which the stringers 1, 2 pass.

As best shown in Fig. 7, the anvil block 17 has a pair of anvil recesses 23, 24 open upwardly toward the guide block 18 and spaced from each other in a direction transverse to the slide fastener stringers 1, 2 extending between the stringer guide 19 and the rollers 21, 22. The anvil block 17 also has a pair of substantially horizontal upper surfaces 25, 26 for supporting the stringer tapes 3, 4 thereon with the longitudinal beaded tape edge portions 6, 7 located over the anvil recesses 23, 24, respectively.

As illustrated in Fig. 5, a detector 27 for detecting a coupling-element-free space 8 in the coupled slide fastener stringers 1, 2 is pivotally and horizontally movably supported on the frame 16. The detector 27 has an upwardly directed pawl 28 and a roller 29 rotatably riding on a spring-loaded lever 30. The detector 27 is urged by the spring-loaded lever 30 normally upwardly to cause the pawl 28 to engage a chain 5 of the slide fastener stringers 1, 2 from below.

A chain splitter or separator 31 (Figs. 1 and 5) is mounted on the frame 16 for vertical movement toward and away from the slide fastener stringers 1, 2. A stringer holder 32 (Figs. 5 and 7) is vertically movably supported on the frame 16 and includes a horizontal presser 33 having an opening 34.

The slide fastener stringers 1, 2 are moved along a horizontal path of travel by rotation of the rollers 21, 22. When one of the coupling element-free spaces 8 comes out of the slot 20 in the stringer guide 19, the pawl 28 moves upwardly into said one of the spaces 8 under the force of the spring-loaded lever 30.

Continued rotation of the rollers 21, 22 causes an end of a following one of the chains 5 to engage the pawl 28 and to move the detector 27 forwardly with the slide fastener stringers 1, 2. When the detector 27 is moved a predetermined distance, it engages a limit switch (not shown), which is then actuated to stop the rotation of the rollers 21, 22. At the same time, the actuation of the limit switch causes the chain splitter 31 to move upwardly and spread the slide fastener stringers 1, 2 apart from each other (Fig. 1), and also causes the stringer holder 32 to move downwardly until the horizontal presser 33 engages and holds the slide fastener stringers 1, 2 in place on the anvil block 17.

As shown in Figs. 6 and 7, the guide block 18 has a pair of substantially vertical slots 35, 36 extending parallel to each other in registration with the anvil recesses 23, 24, respectively. The slots 35, 36 have open ends

facing downwardly toward the anvil recesses 23, 24 respectively. The guide block 18 has a pair of respective vertical walls 37, 38 defining the corresponding slots 35, 36 and facing toward each other. A pair of shoulders 39, 40 are disposed respectively on the walls 37, 38 and are located adjacent to the open ends of the vertical slots 35, 36. The walls 37, 38 have a pair of recesses 41, 42 contiguous to the shoulders 39, 40, respectively. The guide block 18 has a pair of corners 43, 44 that act as blades for cutting off blank metal strips as will be described later.

A pair of punches 45, 46 are vertically movably disposed respectively in the slots 35, 36.

A slide 47 (Fig. 5) is horizontally movably supported on the frame 16 and has a pair of spaced bender projections 48, 49 (Figs. 6 and 7) that are in vertical alignment with a pair of respective grooves 50, 51, in the guide block 18 which extend along and communicate with the respective vertical slots 35, 36. The slide 47 is normally urged by a spring 52 (Fig. 5) in a direction to cause the bender projections 48, 49 to extend into the slots 35, 36 through the grooves 50, 51, respectively.

The slide 47 has a cam follower 53 located between the bender projections 48, 49 and disposed for slidable engagement with an inclined cam surface 54 (Fig. 5) on the guide block 18.

As shown in Figs. 6 and 7, a pair of opposite guide arms 55, 56 mounted on the frame 16 guide the vertical movement of the guide block 18 therebetween. The guide arms 55, 56 have a pair of respective feeding slots 57, 58 extending horizontally in a direction transverse to the slide fastener stringers 1, 2 for the passage therethrough of a pair of the elongate metal strips 12, 12 respectively. The guide arms 55, 56 have a pair of corners 59, 60 acting as blades which cooperate with the corners 43, 44, respectively, of the guide block 18 in severing the elongate metal strips 12, 12.

The pair of elongate metal strips 12, 12 are inserted from opposite sides into the feeding slots 57, 58 until the strips 12, 12 abut against the cam follower 53, as illustrated in Fig. 6. Then, the guide block 18 is lowered to enable the corners 43, 44 to shear the metal strips 12, 13 on the corners 59, 60 of the guide arms 55, 56. Continued downward movement of the guide block 18 causes flat blank pieces thus cut off to be bent on the bender projections 48, 49, respectively, in cooperation with the vertical slots 35, 36. As the guide block 18 is moved downwardly, the cam surface 54 engages and pushes the cam follower 53, whereupon the slide 47 is moved horizontally against the bias of the spring 52 to thereby allow the bender projections 48, 49 to be retracted from the vertical slots 35,

36, respectively. The bent blank pieces, which serve as end stops 9, 10, are thus left in the vertical slots 35, 36, and are retained therein by their legs resiliently held against the walls of the vertical slots 35, 36 (Fig. 7).

The guide block 18 includes a central leg 61 disposed between the vertical slots 35, 36. The anvil block 17 includes a central land 62 disposed between the anvil recesses 23, 24 and positioned in vertical alignment with the central leg 61 of the guide block 18. The central land 62 is higher than the upper surfaces 25, 26 of the anvil block 17, and is wider than the central leg 61 of the guide block 18.

When the guide block 18 is lowered until the central leg 61 rests on the central land 62, (Fig. 8), the punches 45, 46 start descending to push the end stops 9, 10 downwardly. As the punches 45, 46 move downwardly, the legs 13 of the end stops 9, 10 slide resiliently against the walls 37, 38 and then are received in the recesses 41, 42, respectively.

At this time, the stringer tapes 3, 4 are placed on the upper surfaces 25, 26 with the longitudinal beaded edges 6, 7 located over the anvil recesses 23, 24, respectively. The shoulders 39, 40 are disposed over the upper surfaces 25, 26 of the anvil block 17.

On further downward movement of the punches 45, 46, the end stops 9, 10 are turned about the legs 13 that engage the shoulders 39, 40, respectively (Fig. 9), as the other legs 14 move into the anvil recesses 23, 24 and under the longitudinal beaded edges 6, 7 of the stringer tapes 3, 4. The end stops 9, 10 are turned through approximately 90 degrees until the legs 14 of the end stops 9, 10 are disposed on the bottoms of the anvil recesses 23, 24 (Fig. 10); with the legs 13 over the upper side of the beaded edges 6, 7 and the legs 14 under the lower side of the beaded edges 6, 7. Finally the punches 45, 46 are forced downwardly to clinch the legs 13, 14 of the end stops 9, 10 about the beaded edges 6, 7, respectively, as shown in Fig. 11.

Although a preferred embodiment has been shown and described in detail, it should be understood that various changes and modifications can be made therein without departing from the scope of the appended claims.

CLAIMS

1. An apparatus for attaching a U-shaped end stop having a pair of clinching legs to a longitudinal marginal edge portion of a slide fastener stringer tape, said apparatus comprising:

- (a) means for intermittently advancing the slide fastener stringer tape along a path of travel in a longitudinal direction thereof; and
- (b) means for delivering end stops successively in a direction substantially normal to the

path of travel of the stringer tape, for automatically turning the end stop about one of its legs until the legs are placed one on each side of the longitudinal marginal edge portion of the stringer tape, and then clinching the end stop legs about the longitudinal marginal edge portion while the stringer tape is at rest.

2. An apparatus according to claim 1, wherein said last-mentioned means comprises a guide block having a slot for receiving the end stop therein, a punch movable axially in said slot, and a shoulder in said slot with which (shoulder) said one of the legs of the end stop is engageable for being turned upon being moved by said punch.

3. An apparatus according to claim 2, wherein said slot has an open end, said shoulder being located adjacent to said open end.

4. An apparatus according to claim 2 or 3, wherein said guide block has a wall partly defining said slot, said wall having a recess contiguous to said shoulder for receiving said one of the end stop legs.

5. An apparatus according to claim 1, 2, 3 or 4 further comprising an anvil block having an anvil recess opening toward said last-mentioned means.

6. An apparatus according to claim 5, wherein said anvil block has a surface for supporting the stringer tape thereon with the longitudinal marginal edge of the stringer tape located over said anvil recess.

7. An apparatus according to claim 1, wherein said last-mentioned means comprises a movable guide block having a slot for receiving the end stop therein, further comprising means responsive to movement of said guide block for forming the end stop from a blank piece of metal.

8. An apparatus according to claim 7, said forming means comprising a slide movable in a direction substantially normal said slot, said slide having a bender projection extending normally into said slot and cooperative therewith for bending the blank piece of metal into the U-shaped end stop in response to the movement of said guide block, and said bender projection being retractable out of said slot in response to engagement of said slide with said guide block.

9. A method of attaching a U-shaped end stop having a pair of clinching legs to a longitudinal marginal edge portion of a slide fastener stringer tape, said method comprising the steps of:

(a) intermittently advancing the slide fastener stringer tape along a path of travel in a longitudinal direction thereof;

(b) delivering the end stop toward the stringer tape individually in a direction substantially normal to said path of travel;

(c) turning the end stop about one of its legs so as to place the legs one on each side of the longitudinal marginal edge portion of



36, respectively. The bent blank pieces, which serve as end stops 9, 10, are thus left in the vertical slots 35, 36, and are retained therein by their legs resiliently held against the walls of the vertical slots 35, 36 (Fig. 7).

The guide block 18 includes a central leg 61 disposed between the vertical slots 35, 36. The anvil block 17 includes a central land 62 disposed between the anvil recesses 23, 24 and positioned in vertical alignment with the central leg 61 of the guide block 18. The central land 62 is higher than the upper surfaces 25, 26 of the anvil block 17, and is wider than the central leg 61 of the guide block 18.

When the guide block 18 is lowered until the central leg 61 rests on the central land 62, (Fig. 8), the punches 45, 46 start descending to push the end stops 9, 10 downwardly. As the punches 45, 46 move downwardly, the legs 13 of the end stops 9, 10 slide resiliently against the walls 37, 38 and then are received in the recesses 41, 42, respectively.

At this time, the stringer tapes 3, 4 are placed on the upper surfaces 25, 26 with the longitudinal beaded edges 6, 7 located over the anvil recesses 23, 24, respectively. The shoulders 39, 40 are disposed over the upper surfaces 25, 26 of the anvil block 17.

On further downward movement of the punches 45, 46, the end stops 9, 10 are turned about the legs 13 that engage the shoulders 39, 40, respectively, (Fig. 9), as the other legs 14 move into the anvil recesses 23, 24 and under the longitudinal beaded edges 6, 7 of the stringer tapes 3, 4. The end stops 9, 10 are turned through approximately 90 degrees until the legs 14 of the end stops 9, 10 are disposed on the bottoms of the anvil recesses 23, 24 (Fig. 10), with the legs 13 over the upper side of the beaded edges 6, 7 and the legs 14 under the lower side of the beaded edges 6, 7. Finally, the punches 45, 46 are forced downwardly to clinch the legs 13, 14 of the end stops 9, 10 about the beaded edges 6, 7, respectively, as shown in Fig. 11.

Although a preferred embodiment has been shown and described in detail, it should be understood that various changes and modifications can be made therein without departing from the scope of the appended claims.

CLAIMS

1. An apparatus for attaching a U-shaped end stop having a pair of clinching legs to a longitudinal marginal edge portion of a slide fastener stringer tape, said apparatus comprising:

- (a) means for intermittently advancing the slide fastener stringer tape along a path of travel in a longitudinal direction thereof; and
- (b) means for delivering end stops successively in a direction substantially normal to the

path of travel of the stringer tape, for automatically turning the end stop about one of its legs until the legs are placed one on each side of the longitudinal marginal edge portion of the stringer tape, and then clinching the end stop legs about the longitudinal marginal edge portion while the stringer tape is at rest.

2. An apparatus according to claim 1, wherein said last-mentioned means comprises a guide block having a slot for receiving the end stop therein, a punch movable axially in said slot, and a shoulder in said slot with which (shoulder) said one of the legs of the end stop is engageable for being turned upon being moved by said punch.

3. An apparatus according to claim 2, wherein said slot has an open end, said shoulder being located adjacent to said open end.

4. An apparatus according to claim 2 or 3, wherein said guide block has a wall partly defining said slot, said wall having a recess contiguous to said shoulder for receiving said one of the end stop legs.

5. An apparatus according to claim 1, 2, 3 or 4 further comprising an anvil block having an anvil recess opening toward said last-mentioned means.

6. An apparatus according to claim 5, wherein said anvil block has a surface for supporting the stringer tape thereon with the longitudinal marginal edge of the stringer tape located over said anvil recess.

7. An apparatus according to claim 1, wherein said last-mentioned means comprises a movable guide block having a slot for receiving the end stop therein, further comprising means responsive to movement of said guide block for forming the end stop from a blank piece of metal.

8. An apparatus according to claim 7, said forming means comprising a slide movable in a direction substantially normal said slot, said slide having a bender projection extending normally into said slot and cooperative therewith for bending the blank piece of metal into the U-shaped end stop in response to the movement of said guide block, and said bender projection being retractable out of said slot in response to engagement of said slide with said guide block.

9. A method of attaching a U-shaped end stop having a pair of clinching legs to a longitudinal marginal edge portion of a slide fastener stringer tape, said method comprising the steps of:

- (a) intermittently advancing the slide fastener stringer tape along a path of travel in a longitudinal direction thereof;
- (b) delivering the end stop toward the stringer tape individually in a direction substantially normal to said path of travel;
- (c) turning the end stop about one of its legs so as to place the legs one on each side of the longitudinal marginal edge portion of



the stringer tape; and

(d) clinching the legs about the longitudinal marginal edge portion while the stringer tape is at rest.

5 10. A method according to claim 9, wherein the end stop is delivered with its legs directed toward said path of travel.

10 11. A method according to claim 9, further comprising the step of forming the U-shaped end stop from a blank piece of metal.

12. A method according to claim 9, wherein the end stop is turned substantially through 90 degrees about said one of its legs.

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