

SPECIFICATION

Apparatus for attaching an end stop to a slide fastener stringer

- 5 The present invention relates to an apparatus for attaching a top end stop to an end of a row of coupling elements of a slide fastener stringer.
- 10 Prior Art:
A top end stop having a U-shaped or Y-shaped cross section including a pair of opposed spaced legs is attached to a longitudinal edge of a slide fastener stringer tape by putting the tape edge between the spaced legs and deforming or clinching the legs toward each other over the tape edge by a pair of relatively movable punches. In applying the top end stop, it is necessary to supply it correctly between the punches and to press the punches toward each other while the top end stop is being maintained stably between the punches against any displacement.
- 25 One of the prior proposals to meet the above requirements is disclosed in Japanese Patent Publication No. 39-4425 which shows an apparatus for automatically supplying a top end stop between a pair of opposed punches and clinching the top end stop over the longitudinal edge of a stringer tape that has been inserted between the opposed legs of the top end stop. The prior device comprises a drive cylinder having a first punch and a driven tubular cylinder fitted over the drive cylinder and having a second punch, the first and second punches being supplied with an end stop therebetween. With the end stop supported between the punches, the drive and driven cylinders are turned about their axes through a predetermined degree to a clinching position, at which a longitudinal edge of a stringer tape is inserted between the legs of the end stop. Then the drive cylinder is actuated to cause the first punch to move toward the second punch on the driven cylinder as it is held at rest, thereby clinching the legs of the end stop over the longitudinal tape edge.
- 50 The problem with the known device is that a relatively large end stop cannot be attached properly because the first punch moves along an arcuate path about the axis of the drive cylinder, and fails to apply uniform clinching forces over the entire area of the legs of the end stop.

SUMMARY OF THE INVENTION

- According to the present invention, a slide fastener end stop attaching apparatus has a pair of punch arms pivotally mounted on a punch holder mounted on a shaft rotatably supported on a frame. The punch arms have a pair of respective punches at one end for clinching the legs of an end stop about a longitudinal edge of a slide fastener stringer

tape. Punch actuator means is operatively mounted on the punch holder and acts on the other ends of the punch arms for moving the punches toward and away from each other.

- 70 The punch arms and the punch holder are pivotally movable through substantially an angle of 90 degrees between end stop applying and end stop supplying positions in response to angular movement of the shaft about its own axis. First means is mounted on the frame for energizing the punch actuator means to move the punches towards each other to clinch the end stop legs about the longitudinal tape edge when the punch arms are in the end stop applying position. Second means mounted on the frame energizes the punch actuator means to move the punches away from each other for receiving an end stop therebetween when the punch arms are in the end stop supplying position.

The invention will be described by way of example with reference to the accompanying drawings, wherein:—

- Figure 1 is a front elevational view of an end stop attaching apparatus provided in accordance with the present invention;
Figure 2 is a side elevational view of the end stop attaching apparatus shown in Fig. 1;
Figure 3 is a cross-sectional view taken along line III-III of Fig. 2;
Figure 4 is an exploded perspective view of a central portion of the end stop attaching apparatus;
Figure 5 is an enlarged perspective view of a top end stop attachable by the end stop attaching apparatus;
Figure 6 is a fragmentary plan view of a pair of slide fastener stringers with a pair of the end stops shown in Fig. 5 attached thereto;
Figures 7 and 8 are side elevational views of a portion of the apparatus, illustrating the manner in which a top end stop is attached to a slide fastener stringer tape; and
Figures 9 to 11 are side elevational views of a portion of the apparatus, illustrating the manner in which a top end stop is fed to a position between a pair of clinching punches.
- The principles of the present invention are particularly useful when embodied in an end stop attaching apparatus such as shown in Fig. 1, generally designated by the reference numeral 12.
- The end stop attaching apparatus 12 comprises a frame 13, a horizontal shaft 14 rotatably supported on the frame 13, and a punch holder 15 in the form of a disc mounted on an end of the shaft 14. The shaft 14 is angularly pivotable about its own axis through a predetermined angle (90 degrees in the illustrated embodiment) by a suitable mechanism such as a rack and pinion 14a. As shown in Figs. 2-4, the punch holder 15 has a pin 16 located eccentrically with respect to the shaft 14. A pair of punch arms 17, 18

is pivotally mounted on the pin 16. Each of the punch arms 17, 18 has a bearing lug 19, 20 (Fig. 4), respectively, including overlapping portions through which the pin 16 extends, the punch arms 17, 18 lying substantially flush with each other.

The punch holder 15 has a diametrical groove 21 including a shallow portion 22 and a deep portion 23, the pin 16 projecting from the shallow groove portion 22. A pair of segmented stop plates 24, 25 is mounted on the punch holder 15 and located one on each side of the groove 21 for limiting pivotal movement of the punch arms 17, 18 which are disposed therebetween.

The punch arms 17, 18 have a pair of opposed punches 26, 27 at one end thereof, the punches 26, 27 respectively having a pair of teeth 28, 29 projecting toward each other. A space 30 is present between the punch arms 17, 18 and extends from the punches 26, 27 to the lugs 19, 20.

A punch actuator 31 includes an elongated slide 32 slidably disposed in the deep groove portion 23. The slide 32 has a pair of converging cam surfaces 33, 34. The punch actuator 31 also includes a pair of cam followers 35, 36 (Fig. 7) in the form of rollers rotatably mounted on the ends of the punch arms 17, 18, respectively, which (ends) are remote from the punches 26, 27, the rollers 35, 36 being in rolling engagement with the slanted cam surfaces 33, 34, respectively. Thus, the punches 26, 27 are movable toward each other in response to the movement of the rollers 35, 36 away from each other, such movement being caused by sliding movement of the slide 32 toward the center of the punch holder 15. The slide 32 has a slot 37 (Fig. 3) into which a pin 38 projects from the punch holder 15. A helical compression spring 39 acts between the pin 38 and an end of the slot 37 to urge the slide 32 in a direction to normally close the punches 26, 27.

As shown in Fig. 4 each of a pair of links 40, 41 is pivotally connected at one end to one of the punch arms 17, 18 at the end thereof remote from the punches 26, 27, the other ends of the links 40, 41 being pivotally connected to a pin 42 on the slide 32. Movement of the slide 32 away from the center of the punch holder 15 causes the links 40, 41 to move toward each other, whereupon the punches 26, 27 are moved away from each other.

An end stop holder 43 comprises a bifurcated slide 44 slidably disposed in the shallow groove portion 22 in the punch holder 15, the bifurcated slide 44 having a pair of legs 45, 46 located one on each side of the pin 16. A support 47 is mounted on the slide 44 and is located in the space 30 between the punch arms 17, 18. The support 47 has a slot 48 opening toward the punches 26, 27.

A helical compression spring 49 acts between the pin 16 and the support 47 (Fig. 3) to urge the slide 44 radially outwardly of the punch holder 15.

As illustrated in Fig. 5, a typical top end stop 50 comprises a head 51 and a pair of legs 52, 53 extending from the head 51 in spaced relation to each other. The top end stop 50 is carried in position (Fig. 11) by the punches 26, 27 with the head 51 (Fig. 5) disposed in the slot 48 (Fig. 2 or 4) in the support 47, the legs 52, 53 (Fig. 5) being resiliently held against the teeth 28, 29 (Figs. 2 and 4) on the punches 26, 27 by the spring-biased end stop holder 43.

As shown in Figs. 2 and 3, a retainer 54 mounted on the frame 13 has an arcuate surface 55 engaging the support 47 of the end stop holder 43, thereby preventing the end stop holder 43 from moving out of the shallow groove portion 22. As shown in Figs. 1 and 3, a cover plate 56 fixed to the pin 16 covers the punch arms 17, 18.

As shown in Fig. 2, a reciprocable ram 57 is supported for horizontal movement on the frame 13 for pushing the slide 32 radially inwardly of the punch holder 15 to close the punches 26, 27. A slide retraction lever 58 is pivotally mounted on the frame 13 by a pin 59. The lever 58 has an arcuate arm 60 which is normally held against the periphery of the punch holder 15 under the bias of a tension spring 61 acting between the lever 58 and the frame 13. An actuation rod 62 is pivotally mounted on the lever 58. When the actuation rod 62 is retracted (moved to the right as shown), the lever 58 is pivoted counterclockwise to enable the arcuate arm 60 to engage the pin 42 on the slide 32 and to thus retract the slide 32 away from the center of the punch holder 15, whereupon the punches 26, 27 move away from each other.

A punch opening lever 63 is mounted on a controllably driven shaft 64 (Figs. 1 and 2) pivotally supported on the frame 13. The punch opening lever 63 has a horizontal flange 65 which can be engaged with the pin 42 on the slide 32 for effecting retraction of the slide 32 radially outwardly, thereby moving the punches 26, 27 away from each other. The punch opening lever 63 is pivotally movable to allow the horizontal flange 65 to move up and down.

An end stop supply 67 comprises a chute 68 having a pair of rails 69, 70 along which a row of top end stops 50 is stored and fed, a pusher rod 71 disposed between the chute rails 69, 70 and vertically reciprocally mounted on the frame 13 for discharging one of the top end stops 50 at a time from the chute 68, and a pair of support arms 72, 73 pivotally mounted on the frame 13 for jointly supporting the discharged top end stop 50 therebetween. The support arms 72, 73 are urged toward each other under the force of a

tension spring 74 acting between the support arms 72, 73. The pusher rod 71 is movable downwardly to push the endmost top end stop 50 past the support arms 72, 73 as they are forced apart (by the end stop 50) against the bias of the spring 74.

The support 47 on the slide 44 (Fig. 2) has a pin 75 projecting forwardly away from the punch holder 15 beyond the punch arms 17, 18. A retainer plate 76 is pivotally mounted by a pin 77 on the frame 13. The retainer plate 76 has a free end 78 engageable by the pin 75 on the support 47 and is disposed to cover an area in which the support arms 72, 73 and the slot 48 in the support 47 coact with each other. The retainer plate 76 is urged by a tension spring 79 to pivot about the pin 77 in a counter-clockwise direction into a substantially horizontal position in which the other end of the retainer plate 76 engages a feeler 80 of a fixed limit switch 81 to actuate the limit switch 81.

The end stop attaching apparatus 12 is sequence-controlled by a suitable control device energizable in response to actuation of a foot switch (not shown). Such control device includes a motorized sequential timer switch which can be started by actuation of the limit switch 81.

The operation of the end stop attaching apparatus 12 is as follows: As shown in Fig. 7, a longitudinal edge of a slide fastener stringer tape 82 is inserted between the spaced legs (52, 53) of a top end stop 50 supported by and between the punches 26, 27 on the punch holder 15. The holder 15 is held in a first position at an end of its angular movement by means of the shaft 14 (Fig. 1). The foot switch is actuated to cause the ram 57 to push the slide 32 radially inwardly of the punch holder 15, whereupon the cam surfaces 33, 34 move the rollers 35, 36 away from each other, thereby enabling the punches 26, 27 to clinch the legs of the end stop 50 about the longitudinal edge of the stringer tape 82. As shown in Fig. 8, the ram 57 is then retracted and, at the same time, the actuation rod 62 is pulled against the force of the spring 61 to cause the arcuate arm 60 to engage and move the pin 42 away from the punch holder 15. The links 40, 41 are pulled toward each other, causing the punches 26, 27 to move away from each other. The attached end stop 50 on the stringer tape 82 is pushed outwardly by the spring-biased support 47, and is released from the punches 26, 27 as shown.

The shaft 14 is then angularly moved substantially through 90 degrees to bring the punch holder 15 to a second position shown in Fig. 9 at the other end of its range of angular movement. At this time, the pin 42 and the horizontal flange 65 of the horizontal punch opening lever 63 engage from below.

Engagement of the pin 42 with the flange 65

causes the links 40, 41 to be moved together, whereupon the punch arms 17, 18 are pivotally moved to spread the punches 26, 27 fully away from each other. The support 47 is allowed to move radially outwardly into abutting engagement with the support arms 72, 73 under the bias of the spring 49. Simultaneously, the pin 75 moves the retainer plate 76 angularly about the pin 77 against the force from the spring 79 (Fig. 2), thereby disengaging the limit switch 81 as shown. At this time, the endmost top end stop 50 is supported by and between the support arms 72, 73, with the head 51 of the end stop 50 entering the slot 48 in the support 47. The support 47 is pushed by the pusher rod 71 against the force of the spring 49 until the end stop 50 is positioned between the punches 26, 27 as they remain held apart from each other (Fig. 10). Downward movement of the support 47 allows the retainer plate 76 to pivot under the bias of the spring 79 to its initial horizontal position, whereupon the retainer plate 76 engages the feeler 80 and activates the limit switch 81. Activation of the limit switch 81 enables the timer switch to be started.

As shown in Fig. 11, the punch opening lever 63 is then pivoted upwardly about the pin 64 to allow the flange 65 to disengage from the pin 42. The slide 32 moves radially inwardly under the force of the spring 39 (Fig. 3) and the cam surfaces 33, 34 cause the rollers 35, 36 to move apart thereby enabling the punches 26, 27 to hold the end stop 50 therebetween. The legs of the end stop 50 are held against the teeth 28, 29 of the punches 26, 27 under the force of the spring 49. The timer switch, upon lapse of a predetermined time interval, causes the shaft 14 to be returned to bring the punch holder 15 into the first position, providing that the limit switch 81 is actuated. Thus, one cycle of operation is completed. While the end stop 50 is being supplied from the support arms 72, 73 into the position between the punches 26, 27, the free end 78 of the retainer plate 76 prevents the end stop 50 from falling accidentally off the apparatus 12.

If no end stop is present in Fig. 11 between the punches 26, 27, the support 47 is moved radially outwardly under the bias of the spring 49, pushing the punches 26, 27 apart until the support 47 engages the arms 72, 73. The retainer plate 76 is pivotally moved by the pin 75 about the pin 77, thereby disengaging the limit switch 81. With the limit switch 81 not engaged upon lapse of a predetermined time controlled by the timer switch, the shaft 14 remains stopped maintaining the punch holder 15 in its second position. Accordingly, the end stop attaching apparatus 12 is held inoperative until an end stop 50 is supplied between the punches 26, 27.

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CLAIMS

1. An apparatus for attaching an end stop having a pair of spaced legs to a longitudinal edge of a slide fastener stringer tape, said apparatus comprising:
- 5 a frame; a shaft rockably supported on said frame for angular movement about its own axis between first and second positions; a punch holder mounted on said shaft; a pair of punch arms pivotally supported on said punch holder and having a pair of opposed clinching punches, respectively, for receiving the legs of the end stop therebetween, said punch arms being jointly angularly movable with said shaft; punch arm actuator means operatively mounted on said shaft for moving said punches towards and away from each other; said punch holder having a groove, said punch arm actuator means comprising a slide movable in and along said groove, said slide having a pair of cam surfaces, a pair of cam followers on said punch arms, respectively, engaging said cam surfaces, and a pair of links each pivotally connected to said slide and one of said punch arms, said clinching punches being movable toward each other by the action of said cam surfaces and cam followers in response to movement of said slide; first means on said frame for driving said punch arm actuator means to enable said punches to clinch the end stop legs about the longitudinal tape edge and then to release the clinched legs in said first position of said shaft; and second means on said frame for driving said punch arm actuator means to enable said punches to receive and hold the legs of a further end stop in said second position of said shaft.
2. An apparatus according to claim 1, including a pin on said punch holder, said pin pivotally supporting said punch arms.
3. An apparatus according to claim 2, said punch arms having a pair of bearing lugs, respectively, including over-lapping portions pivotally mounted on said pin.
4. An apparatus according to claim 2 or 3, including a pair of spaced stops carried on said punch holder and disposed for limiting pivotal movement of said punch arms.
5. An apparatus according to any preceding claim, said clinching punches being located at one end of said punch arms, and said punch arm actuator means acting on the other end of said punch arms.
6. An apparatus according to any preceding claim, said punch arm actuator means including a spring urging said slide in said first direction.
7. An apparatus according to claim 6, said spring acting between said slide and said punch holder.
8. An apparatus according to any preceding claim, said cam surfaces being slanted toward each other along said first direction, said cam followers comprising a pair of rollers rotatable against said cam surfaces.
9. An apparatus according to any preceding claim, said first driving means comprising a ram on said frame for pushing said slide in said first direction and a lever pivotally mounted on said frame for retracting said slide in said second direction.
10. An apparatus according to claim 9, including a pin on said slide pivotally connecting said links, said lever being engageable with said pin.
11. An apparatus according to any preceding claim, said second driving means comprising a lever pivotally mounted on said frame and engageable with said slide for moving said slide in said second direction.
12. An apparatus according to claim 11, including a pin on said slide pivotally connecting said links, said lever being engageable with said pin.
13. An apparatus according to claim 1, said punch holder having a groove including an end stop holder slidably mounted in said groove and having a support for holding the end stop with its legs supported by said clinching punches, respectively.
14. An apparatus according to claim 13, said clinching punches comprising a pair of teeth, respectively, projecting toward each other, said end stop holder having spring means for urging said support in a direction to press the end stop legs against said punch teeth, respectively.
15. An apparatus according to claim 14, said spring means acting between said support and said punch holder.
16. An apparatus according to claim 14 or 15, said support having a slot for receiving a portion of the end stop.
17. An apparatus according to claim 1, including end stop supply means mounted on said frame for supplying the end stop between said clinching punches when said punch arms are in said second position.
18. An apparatus according to claim 17, said end stop supply means comprising a chute fixed to said frame for containing a row of end stops, a pusher rod reciprocally mounted on said frame for discharging the endmost one of the stops from said chute, and a pair of support arms pivotally mounted on said frame for jointly supporting the discharged end stop therebetween before the end stop is received by said clinching punches.
19. An apparatus according to claim 18, including a spring urging said support arms toward each other, said pusher rod being movable to force the end stop toward said clinching punches past said support arms as they are moved apart from each other against the force of said spring.
20. An apparatus according to claim 17, 18 or 19, including a punch holder mounted on said shaft and pivotally supporting said



punch arms thereon, including and end stop holder slidably mounted on said punch holder, said end stop holder having a support for holding the end stop, and a spring urging said support against said support arms when said clinching punches have been moved apart from each other in said second position of said shaft.

21. An apparatus for attaching an end stop to a slide fastener stringer, comprising:
- 10 a frame; a shaft rockably supported on said frame for angular movement about its own axis through an angle of substantially 90 degrees between first and second positions at the ends of the 90 degree angular movement of said shaft; a punch holder mounted on said shaft; a pair of punch arms pivotally mounted on said punch holder and having a pair of clinching punches, respectively, at one end thereof, said punch arms being jointly angularly movable with said shaft; punch arm actuator means operatively mounted on said punch holder for moving said punches toward each other when said shaft is in said first position and for moving said punches away from each other when said shaft is in said second position; end stop holder means mounted on said punch holder for supporting the end stop between said clinching punches while said shaft is being angularly moved from said second to said first position; and end stop supply means mounted on said frame for supplying the next end stop between said punches when said shaft is in said second position; said punch holder having a groove, said punch arm actuator means comprising a slide movable in and along said groove, said slide having a pair of cam surfaces, a pair of cam followers on said punch arms, respectively, engaging said cam surfaces, and a pair of links each pivotally connected to said slide and one of said punch arms, said clinching punches being movable toward each other by the action of said cam surfaces and cam followers in response to movement of said slide.

22. An apparatus for attaching an end stop to a slide fastener stringer, comprising:
- 50 a frame; a shaft rockably supported on said frame for angular movement about its own axis through an angle of substantially 90 degrees between first and second positions at the ends of the 90 degree angular movement of said shaft; a punch holder rockably supported on said shaft for corresponding angular movement through an angle of substantially 90 degrees; a pair of punch arms pivotally mounted on said punch holder and having a pair of opposed clinching punches for clinching the end stop therebetween; punch arm actuator means operatively mounted on said punch holder for moving said clinching punches toward and away from each other; first means on said frame for driving said actuator means to move said punches toward

- each other when said punch holder is at one end of its angular movement; and second means on said frame for driving said actuator means to move said punches away from each other when said punch holder is at the other end of its angular movement; said punch holder having a groove, said punch arm actuator means comprising a slide movable in and along said groove, said slide having a pair of cam surfaces, a pair of cam followers on said punch arms, respectively, engaging said cam surfaces, and a pair of links each pivotally connected to said slide and one of said punch arms, said clinching punches being movable toward each other by the action of said cam surfaces and cam followers in response to movement of said slide.
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