Nov. 4, 1941. L. KOPPEL 2,261,552

APPARATUS FOR MAKING SLIDE FASTENERS

Filed June 30, 1939 2 Sheets-Sheet 1

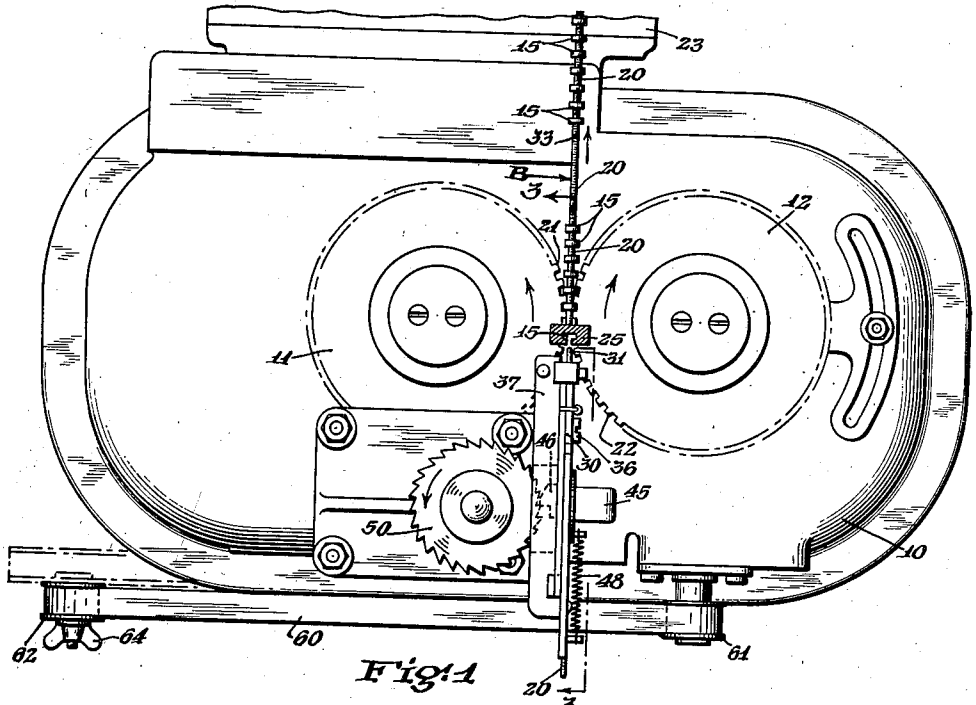


Fig. 1

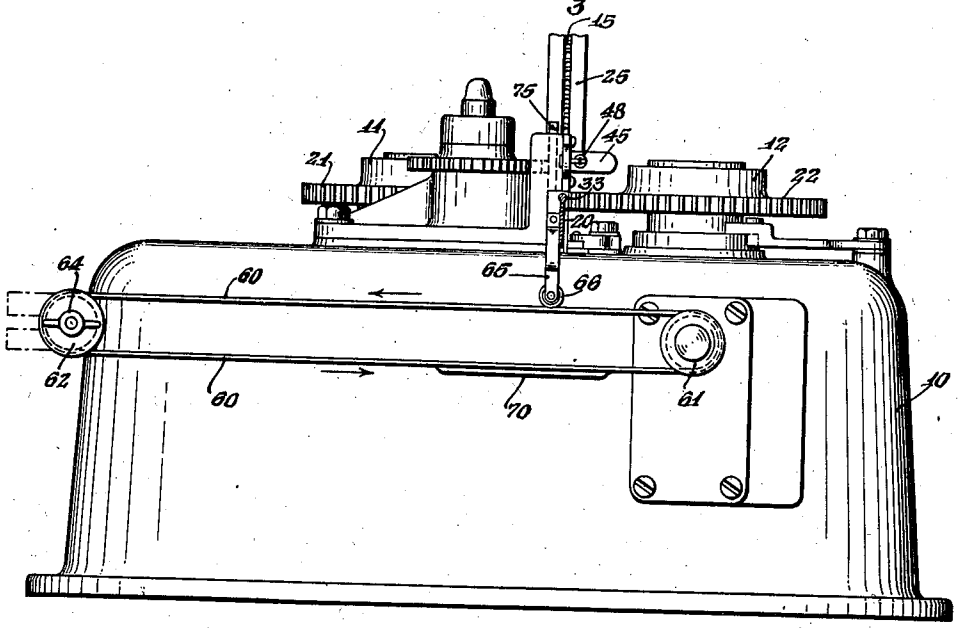


Fig. 2

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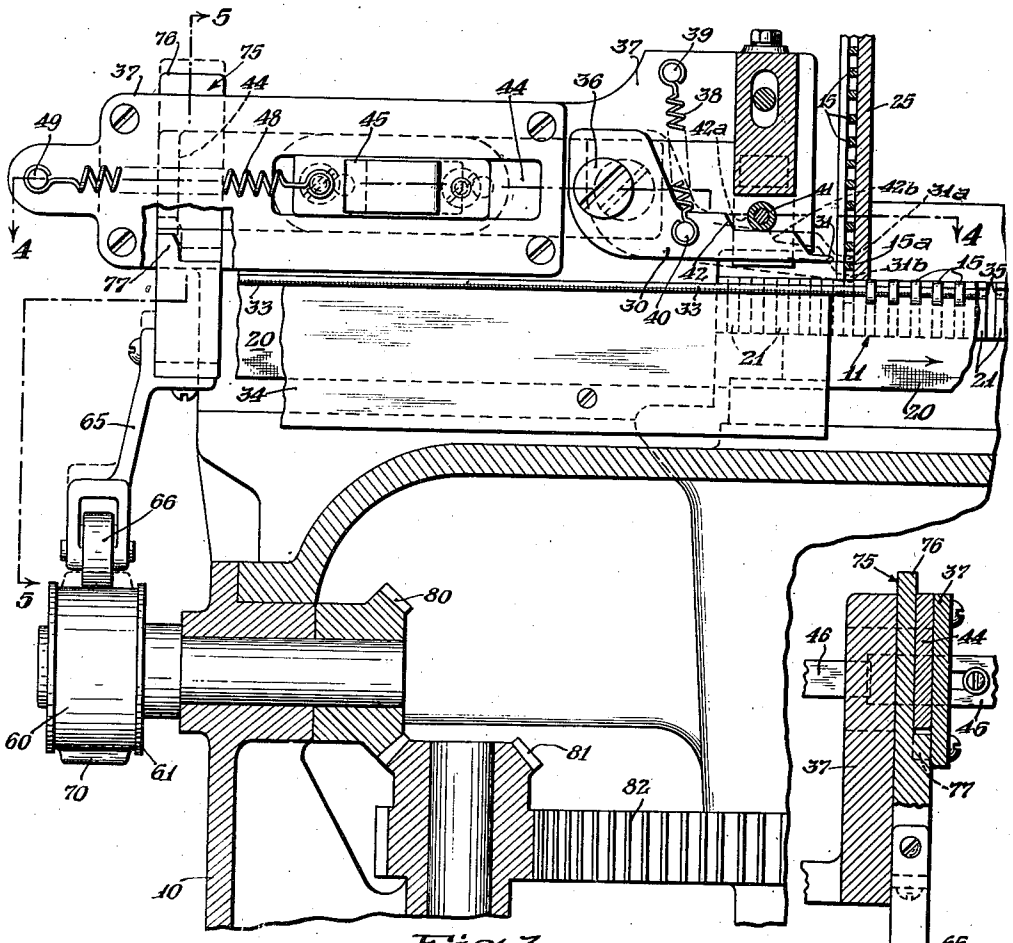


Fig. 3

Fig. 5

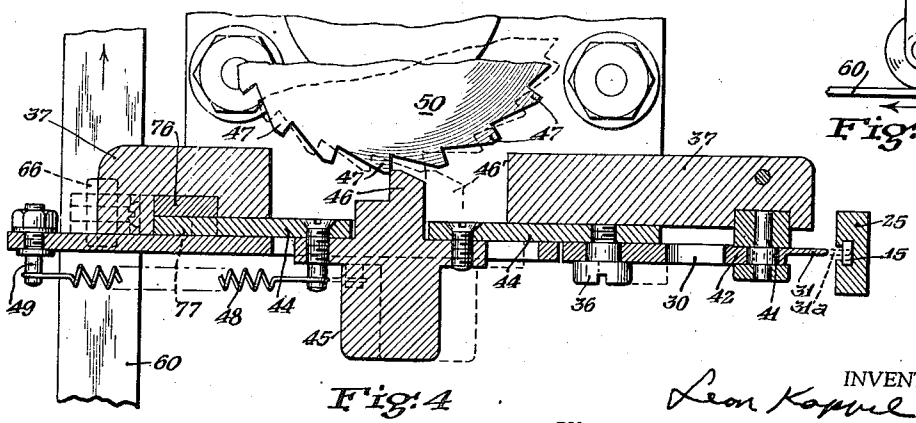


Fig. 4

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UNITED STATES PATENT OFFICE

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APPARATUS FOR MAKING SLIDE FASTENERS

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Application June 30, 1939, Serial No. 282,214

12 Claims. (Cl. 153—1)

This invention relates to novel apparatus for making slide fasteners, and more particularly for applying fastener elements on a tape.

In accordance with the present invention, the fastener elements are arranged in a magazine above a continuously fed tape and individually impelled by positive feeding action to straddle the tape at pre-determined closely spaced positions. Clamping means are provided to successively clamp the elements onto the tape as they are positioned thereon.

In view of the relatively small size of the fastener elements and the requirement of their being accurately spaced on and rigidly fastened to the tape for satisfactory fastener action, much difficulty was encountered in the prior art in attempting to manufacture the slide fasteners at high speeds. The present invention provides a novel trigger mechanism for gripping the fastener elements and pressing them in proper position onto the tape for clamping. The trigger mechanism is capable of high speed operation, cooperating with the clamping means for greatly increasing the production rate of the slide fasteners as compared to prior methods.

Another important feature of the invention resides in novel means for accurately controlling the length of the slide fasteners made on a continuous tape, providing successive blank regions therealong at proper predetermined spacings. Said means comprises a cam element controlling the functioning of the trigger mechanism. The machine is capable of variation as to the length of the processed fastener which is determined by the width and position of the blank regions thereon.

It is accordingly an object of the present invention to provide novel apparatus for high speed fastener element application to a continuously moving tape.

Another object of the invention is to provide a novel positive trigger mechanism for individually positioning fastener elements on a tape.

A further object of the invention is to provide a fastener element positioning device operable at high speeds and novel means to control the operation thereof for accurately determining the processed lengths on a continuous tape.

These and other advantages, capabilities and features of the invention will appear from the subjoined detailed description of a specific embodiment thereof illustrated in the accompanying drawings, in which

Figure 1 is a plan view showing the fastener clamping and trigger feed mechanism.

Figure 2 is an elevational view thereof, showing the arrangement for controlling the processed lengths on the tape.

Figure 3 is an enlarged elevational view of the trigger mechanism as seen along 3—3 in Figure 1.

Figure 4 is a horizontal cross-sectional view through the enlarged trigger mechanism taken along 4—4 in Figure 3.

Figure 5 is a vertical cross-sectional view through the processed strip length control device as taken along 5—5 in Fig. 3.

Referring to the drawings, Figures 1 and 2 respectively plan and elevational view of a preferred construction, show the mechanism of the present invention mounted upon a frame 10 housing the necessary drive means and gearing for the system. Toothed clamping wheels 11 and 12 are arranged in a horizontal plane and are individually driven in synchronism at a predetermined speed by means enclosed in housing 10 and understood by those skilled in the art. The toothed wheels 11—12 are rotated in opposite directions without meshing, whereby the respective opposing teeth 21—22 thereof define pockets of common length but gradually decreasing width as the teeth approach their closest proximity at a zone formed at the plane passing between and through the axes of the toothed wheels. The fastener elements or scoops 15 are fed to straddle the tape 20 within a pocket being defined as the opposing teeth of the wheels approach one another at a fastener element feed station in advance of the zone aforesaid, so that as the pocket being defined approaches and attains its smallest width at the zone aforesaid, the walls between the sets of opposing teeth defining the pocket progressively press against the jaws of the fastener element straddling the tape to firmly clamp the same to the tape in the required spaced relationship.

The pitch or spacing between the respective pockets and defined by the length of the teeth is equal to the requisite spacing between the respective fastener elements 15 being clamped onto the tape. The tape is drawn from a feed roll at the front of the machine through a guide by and between the opposing teeth of the clamping wheels 11 and 12 as they attain their closest proximity at the center plane zone through the axes of the respective wheels, the tape 20 being guided in a vertical plane perpendicular to the horizontal plane of the wheels 11—12. It is to be understood that different orientations for clamping wheels 11—12 and tape 20 from that shown are feasible, particularly in view of the

positive fastener element feeding and positioning features of this invention.

Fastener elements 15 are supplied to the tape in a chute or magazine 25, arranged in the proper direction for straddling tape 20 when impelled thereto. Enlarged view Figure 3 shows elements 15 in cross-section arranged in chute 25 for feeding onto vertical tape 20. A trigger or hammer element 30 is provided for positive impelling of elements 15 onto tape 20. Trigger 30 has a finger 31 designed to move between adjacent elements 15 in the magazine and force the lowermost one 15a onto tape 20. In the preferred structure trigger finger 31 is moved horizontally until it is between the lowermost fastener element 15a and the one resting on top of it, as shown in the dotted position 31a in Figures 3 and 4. As soon as finger 31 is at position 31a means are provided to impel it in a direction towards tape 20. In this case finger 31 moves from 31a to 31b as indicated in Figure 3 impelling fastener element 15a onto tape 20 in a straddled relation thereon preparatory for clamping by toothed wheels 11—12. Tape 20 has a bead 33 onto which elements 15 are placed for clamping, said tape being guided in vertical guide channel 34 and the bead thereof by grooves 35 in the toothed wheels 11—12.

The trigger 30 is accordingly moved towards magazine 25 and after reaching the lowest fastener element 15a in the chute impels the same downwardly in straddling position onto the tape 20. The movement of the trigger is synchronized with that of the clamping wheels 11—12 so that a fastener element being disposed in straddling relationship by virtue of its gravity movement in the chute on the upper surfaces of opposing teeth of the wheels at the feeding station, and resting thereon as the wheels rotate until a pocket formation is developed under the feeding station by and between the opposing teeth on the surface of which the fastener element rests and the next adjacent set of opposing teeth, is impelled by the trigger in straddling relationship onto the tape present in the pocket being thus defined. The trigger is withdrawn immediately thereafter and as it moves forward towards the magazine to act on the next following fastener element in the chute, such fastener element has in the meantime dropped onto the upper surfaces of the next adjacent set of opposing teeth above referred to.

Trigger 30 is a plate member pivoted on screw 36 to slide bar 44 supported in upright 37. A spring 38 has one end 39 attached to upright 37, and its other end 40 to the trigger plate 30. Trigger 30 is accordingly normally spring biased upwardly against roller 41. The surface of trigger 30 coacting with roller 41 is designed to permit trigger 30 to move in a horizontal direction until finger 31 reaches position 31a in magazine 25 and then move trigger 30 downwardly. A compound cam-like coacting surface having a stepped section 42 imparts this action on trigger 30 as it is moved towards magazine 25 as will now be evident.

Slide bar 44 attached to trigger 30 is reciprocated towards and from magazine 25 in the following manner: a single toothed unit 45, secured with slide member 44 has a tooth 46 arranged to coact with toothed gear member 50. Gear 50 is uniformly provided with teeth 47 adapted to successively engage with single tooth 46 of unit 45. A spring 48 is attached between unit 45 and stationary upright 37 on rear bolt 49. Spring 48 accordingly biases slide member 44 to its return position after being moved towards magazine 25.

The coacting portions of teeth 47 and tooth 46 are preferably flat as shown. As gear 50 rotates in the counterclockwise direction it moves coacting tooth 46 to the right towards magazine 25. Slide bar 44 is accordingly impelled in that direction carrying with it trigger 30. Trigger 30 rides horizontally until finger 31 is at 31a above bottom fastener element 15a. Step 42 on the cam surface of trigger 30 abuts fixed roller, shown at position 42a in Figure 3, and forces finger 31 downwards to position 31b as trigger 30 is further advanced.

Trigger 30 is in its extreme right position when finger 31 has impelled fastener element 15a onto tape 20. At this position tooth 46 is in the dotted position 46' as seen in Figure 4 at the end of its engaging position with the tooth 47 of gear 50. As gear 50 rotates and tooth 46 reciprocates linearly, the successive teeth 47 slip off engagement with tooth 46 in a fixed pre-determined manner. As soon as the teeth slide out of engagement, spring 48 returns slide bar 44 to the left, to its normal or initial position. The return motion of bar 44 and attached trigger 30 is sufficiently rapid so that tooth 46 is in the starting position (shown in solid in Figure 4) before the next tooth 47 of uniformly rotating gear 50 reaches there. The cycle is repeated when tooth 46 is again abutted by a tooth 47.

Trigger 30 is accordingly reciprocated at a proper rate and distance by the disclosed mechanism. The cycle of trigger 30 depends on the pitch between teeth 47 on gear 50, since slide bar 44 moves forward and returns in the time it takes successive teeth 47 to move into engagement position. The advance or forward movement of slide bar 44 depends on the degree of coaction provided between the flat abutting portions of teeth 47 with tooth 46. The return speed of bar 44 and trigger 30 depends on the force of spring 48.

The cyclic duration of the trigger action determines the spacing of fastener elements on tape 20. This duration is made equal to the time taken for successive clamping actions by toothed wheels 11—12 on the positioned fasteners 15. The peripheral speed of clamping wheels 11—12 and the speed of gear 50 is controlled in any suitable manner by gearing not shown, but enclosed within housing 10. The respective fastener impelling and fastener clamping actions are synchronized in a given machine, preferably by intermeshing gearing from a common drive. Although the tape feed is controlled by the cooperating teeth of wheels 11—12, a tape feed mechanism independent of the wheels may be applied herein.

An important feature of the present invention resides in the control of the spacing between fastener processed tape sections to determine the individual lengths of the slide fastener sections on the continuous tape 20. In Figure 1 a blank section B is shown on the tape. Severing tape 20 at the section B provides the separated slide fastener section. The length of space B determines the length of the free end portions of the individual sections. The successive positions of the blank portions B on the processed tape determines the actual length of the individual sections. In accordance with the invention, means are provided for arresting the fastener element feeding mechanism for a pre-determined duration

and at pre-determined intervals to accurately determine the formation of the blank areas B.

In the preferred construction, a belt 60 is driven by gearing within housing 10 and pulleys 61 and 62 projecting on the side, as seen in Figures 1 and 2. Pulley 62 is the idler pulley which is variably positionable on projection 63 by bolt 64. A connecting rod 65 coacts with belt 60 through roller 66 which rides thereon. A raised section 70 is affixed to belt 60 which acts as a cam surface to raise connecting rod 65 when the blank section B is to be effected on tape 20. Means 75 are provided with connecting rod 65 to coact with slide bar 44 to arrest the motion thereof at its extreme right displaced position when rod 65 is moved upwards by surface 70.

The arresting means 75 comprises a bar 76 secured to rod 65 and extending upwards in upright 37 adjacent the left end of slide bar 44. Figures 4 and 5 show detail cross-sections through the means 75, showing how bar 76 lies adjacent bar 44, and is vertically slidable. At the lower portion of bar 76 projects section 77 which underlies slide bar 44. A face view of element 77 is seen in Figure 3. Section 77 is raised when elevated portion 70 of belt 60 reaches roller 66 and moves into the path of slide 44 at the extreme left side, as shown in dotted line in Figure 3. When projection 77 of arresting means 75 is raised it forces slide bar to remain in its rightmost position, slightly beyond the coaction region of tooth 46 with teeth 47, as shown in dotted line in Figure 4. Gear 50 accordingly continues to rotate without acting on tooth 46 the cyclic action of which is thus stopped.

When slide bar 44 is held from reciprocation by stop 77, finger 31 of trigger 30 is at position 31b within magazine 25. Thus the fasteners 15 in the magazine will not move but be stationary while the reciprocation has ceased and trigger 30 is stationary. The tape 20 however continues its normal advance through the machine and clamping gears 11—12 rotate in their usual manner. The length of the blank space B is determined by the speed of tape 20 and the duration of the arresting action by means 75. The duration is controlled by the interval during which raised surface 70 coacts with roller 66, which in turn depends on the length of surface 66 and the speed with which it moves.

The control belt 60 is driven by gearing 80—81—82 within frame 10, as seen in Figure 3. The drive member is not shown but may well be the common source for the machine. The time for one revolution of belt 60 is equal to the time which the machine requires to make a required length of slide fastener, including the blank section B. The length of raised surface 70 on belt 60 is such that its ratio to the belt length equals the ratio of the required length of blank space B to the total length of the slide fastener desired. Thus, after a desired length of tape 20 is secured with spaced fasteners 15, surface 70 on belt 60 reaches roller 66 on rod 65 to raise arresting means 75 and stop the feeding of fasteners to tape 20 until pre-determined blank space B is formed. When surface 70 passes, rod 65 drops by gravity or spring action and the fastener feeding process continues in the manner already described.

It is obvious that various changes and modifications may be made to the details of construction without departing from the general spirit of the invention as set forth in the appended claims.

What is claimed is:

1. Mechanism for positioning fastener elements upon a moving tape comprising a magazine containing a row of elements for successive feeding to the tape, means for individually impelling said elements into position on the tape including a trigger member having a cam surface and a finger, and mechanism for moving the finger of said trigger over the fastener element adjacent said tape and against the element towards the tape until the fastener element straddles the tape in readiness for clamping thereon; said mechanism comprising a slide bar member pivotally carrying said trigger member, means for reciprocating said slide bar and trigger towards and away from said magazine; a fixed pin arranged to press on the cam surface of said trigger as the trigger is reciprocated whereby the finger of said trigger in its movement towards the magazine is laterally and vertically displaced.

2. Mechanism for positioning fastener elements upon a moving tape comprising a magazine containing a row of elements for successive feeding to the tape, means for individually impelling said elements into position on the tape including a trigger member having a finger and mechanism for moving the finger of said trigger over the fastener element adjacent said tape and against the element towards the tape until the fastener element straddles the tape in readiness for clamping thereon; said mechanism comprising a slide bar member pivotally carrying said trigger member, means for reciprocating said slide bar and trigger towards and away fom said magazine; a fixed pin arranged to press on a surface portion of said trigger as the trigger is reciprocated, a spring for mechanically biasing said pivoted trigger member against said pin, the finger of said trigger being moved into said magazine over said one fastener element as said trigger surface portion rides on said pin and being directed downwardly towards the tape by a suitable conformation on said trigger surface portion coacting with said pin to correspondingly impel said one fastener element onto the tape.

3. Mechanism for positioning fastener elements upon a moving tape comprising a magazine containing a row of elements arranged one above the other for successive feeding to the tape, means for individually impelling said elements into position on the tape including a trigger member having a finger and mechanism for moving the finger of said trigger over the bottom one of said fastener elements and against the element towards the tape until the fastener element straddles the tape in readiness for clamping thereon; said mechanism comprising a slide bar member pivotally carrying said trigger member, means for reciprocating said slide bar and trigger towards and away from said magazine including a rotatable toothed disc; a fixed pin arranged to press on a surface portion of said trigger as the trigger is reciprocated, a spring for mechanically biasing said pivoted trigger member against said pin, the finger of said trigger being moved into said magazine over said one fastener element as said trigger surface portion rides on said pin and being directed downwardly towards the tape by a suitable conformation on said trigger surface portion coacting with said pin to correspondingly impel said one fastener element onto the tape as said slide bar is moved by a tooth of said toothed disc.

4. Mechanism for positioning fastener elements

upon a moving tape comprising a magazine containing a row of elements arranged one above the other for successive feeding to the tape, means for individually impelling said elements into position on the tape including a trigger member having a finger and mechanism for moving the finger of said trigger over the bottom one of said fastener elements and against the element towards the tape until the fastener element straddles the tape in readiness for clamping thereon; said mechanism comprising a slide bar member pivotally carrying said trigger member, means for reciprocating said slide bar and trigger towards and away from said magazine including a rotatable toothed disc; a fixed pin arranged to press on a surface portion of said trigger as the trigger is reciprocated, a spring for mechanically biasing said pivoted trigger member against said pin, the finger of said trigger being moved into said magazine over said one fastener element as said trigger surface portion rides on said pin and being directed downwardly towards the tape by a suitable conformation on said trigger surface portion coacting with said pin to correspondingly impel said one fastener element onto the tape as said slide bar is moved by a tooth of said toothed disc; and means for cyclically arresting the fastener positioning action of said mechanism comprising a device for holding the reciprocated members against motivation by said toothed disc and said finger in engagement with said magazine to prevent feeding of said fastener elements.

5. Mechanism for positioning fastener elements upon a moving tape comprising a magazine containing a row of elements arranged one above the other for successive feeding to the tape, means for individually impelling said elements into position on the tape including a trigger member having a finger and mechanism for moving the finger of said trigger over the bottom one of said fastener elements and against the element towards the tape until the fastener element straddles the tape in readiness for clamping thereon; said mechanism comprising a slide bar member pivotally carrying said trigger member, means for reciprocating said slide bar and trigger towards and away from said magazine including a rotatable toothed disc; a fixed pin arranged to press on a surface portion of said trigger as the trigger is reciprocated, a spring for mechanically biasing said pivoted trigger member against said pin, the finger of said trigger being moved into said magazine over said one fastener element as said trigger surface portion rides on said pin and being directed downwardly towards the tape by a suitable conformation on said trigger surface portion coacting with said pin to correspondingly impel said one fastener element onto the tape as said slide bar is moved by a tooth of said toothed disc; and means for cyclically arresting the fastener positioning action of said mechanism comprising a device for holding the reciprocated members against motivation by said toothed disc and said finger in engagement with said magazine to prevent feeding of said fastener elements, said device having a portion for abutting against an end of said slide bar and a projecting rod for actuating said portion; and means synchronously operated with said impelling mechanism for successively clamping each straddled fastener element onto the moving tape.

6. Mechanism for positioning fastener elements upon a moving tape comprising a magazine containing a row of elements for successive feeding to the tape, means for individually impelling said elements into position on the tape including a trigger member and mechanism for moving said trigger over one of said fastener elements and against the element towards the tape until the fastener element straddles the tape in readiness for clamping thereon; said mechanism comprising a slide bar member pivotally carrying said trigger member, means for reciprocating said slide bar towards and away from said magazine; and means for cyclically arresting the fastener positioning action of said mechanism comprising a device for holding the reciprocated members against motivation when the trigger member is in engagement with said magazine and below the row of elements therein to prevent further feeding of the elements, said device having a portion for abutting against an end of said slide bar and a projecting rod for actuating said portion; and means synchronously operated with said impelling mechanism for successively clamping each straddled fastener element onto the moving tape.

7. Mechanism for positioning fastener elements upon a moving tape comprising a magazine containing a row of elements for successive feeding to the tape, means for individually impelling said elements into position on the tape including a trigger member and mechanism for moving said trigger over one of said fastener elements and against the element towards the tape until the fastener element straddles the tape in readiness for clamping thereon; said mechanism comprising a slide bar member pivotally carrying said trigger member, means for reciprocating said slide bar towards and away from said magazine; and means for cyclically arresting the fastener positioning action of said mechanism comprising a device for holding the reciprocated members against motivation when the trigger member is in engagement with said magazine and below the row of elements therein to prevent further feeding of the elements, said device having a portion for abutting against an end of said slide bar, and means for controlling said abutting portion into arresting position, whereby blank regions of predetermined width and spacing are provided on said tape; and means synchronously operated with said impelling mechanism for successively clamping each straddled fastener element onto the moving tape.

8. Mechanism for positioning fastener elements upon a moving tape comprising a magazine containing a row of elements for successive feeding to the tape, means for individually impelling said elements into position on the tape including a trigger member having a finger and mechanism for moving the finger of said trigger over the fastener element adjacent said tape and against the element towards the tape until the fastener element straddles the tape in readiness for clamping thereon; said mechanism comprising a slide bar member pivotally carrying said trigger member, means for reciprocating said slide bar and trigger towards and away from said magazine including a rotatable toothed disc, a unit secured to said slide bar successively coactable with the teeth of said disc for moving said slide bar and trigger towards said magazine; and means for cyclically arresting the fastener positioning action of said mechanism comprising a device for holding said slide bar and trigger against motivation by said toothed disc and said finger in engagement with said magazine to prevent feeding of said fastener elements, said

device having a portion for abutting against an end of said slide bar.

9. Mechanism for positioning fastener elements upon a moving tape comprising a magazine containing a row of elements for successive feeding to the tape, means for individually impelling said elements into position on the tape including a trigger member having a finger and mechanism for moving the finger of said trigger over the fastener element adjacent said tape and against the element towards the tape until the fastener element straddles the tape in readiness for clamping thereon; said mechanism comprising a slide bar member pivotally carrying said trigger member, means for reciprocating said slide bar and trigger towards and away from said magazine including a rotatable toothed disc, a unit secured to said slide bar successively coactable with the teeth of said disc for moving said slide bar and trigger towards said magazine; and means for cyclically arresting the fastener positioning action of said mechanism comprising a device for holding said slide bar and trigger against motivation by said toothed disc and said finger in engagement with said magazine to prevent feeding of said fastener elements, said device having a portion for abutting against an end of said slide bar and a projecting rod for actuating said portion, and means for controlling said abutting portion into arresting position including cammed surface operable at a predetermined cyclic speed and coactable with said projecting rod, whereby blank regions of pre-determined width and spacing are provided on said tape.

10. Mechanism for positioning fastener elements upon a moving tape comprising a magazine containing a row of elements for successive feeding to the tape, means for individually impelling said elements into position on the tape including a trigger member having a finger and mechanism for moving the finger of said trigger over the fastener element adjacent said tape and against the element towards the tape until the fastener element straddles the tape in readiness for clamping thereon; said mechanism comprising a slide bar member pivotally carrying said trigger member, means for reciprocating said slide bar and trigger towards and away from said magazine including a rotatable toothed disc, a unit secured to said slide bar successively coactable with the teeth of said disc for moving said slide bar and trigger towards said magazine; and means for cyclically arresting the fastener positioning action of said mechanism comprising a device for holding said slide bar and trigger against motivation by said toothed disc and said finger in engagement with said magazine to prevent feeding of said fastener elements, said device having a portion for abutting against an end of said slide bar and a projecting rod for actuating said portion, and means for controlling said abutting portion into arresting position including a belt having a pre-determined projecting section operable at a pre-determined cyclic speed and coactable with said projecting rod, said projecting rod containing a roller for riding on said belt, whereby blank regions of predetermined width and spacing are provided on said tape; and means synchronously operated with said impelling mechanism for successively clamping each straddled fastener element onto the moving tape.

11. Mechanism for positioning fastener elements upon a moving tape comprising a magazine containing a row of elements for successive feeding to the tape, means for individually impelling said elements into position on the tape including a trigger having a finger, and mechanism for moving the finger of said trigger over the fastener element adjacent said tape and against the element toward the tape until the fastener element straddles the tape in readiness for clamping thereon; said mechanism comprising a longitudinally movable slide bar pivotally carrying said trigger, a guide member for engaging and vertically displacing the finger of said trigger during a portion of the longitudinal movement of said trigger, means for reciprocating said slide bar and trigger towards and away from said magazine, including a rotatable toothed disk, the respective teeth of which, as the same rotates, successively displace the slide bar and the trigger carried thereby towards the magazine, and spring means for maintaining the trigger in one position as the slide bar is moved towards the magazine and for raising the trigger from its displaced position to said first named position as the slide bar is retracted from said magazine.

12. Mechanism for positioning fastener elements upon a moving tape comprising a magazine containing a row of elements for successive feeding to the tape, means for individually impelling said elements into position on the tape including a trigger having a finger and mechanism for moving the finger of said trigger over the fastener element adjacent said tape and against the element towards the tape until the fastener element straddles the tape in readiness for clamping thereon; said mechanism comprising a longitudinally movable slide bar pivotally carrying said trigger, a guide member for engaging and vertically displacing the finger of said trigger during a portion of the longitudinal movement of said trigger, means for reciprocating said slide bar and trigger towards and away from said magazine including a rotatable toothed disk, a unit secured to said slide bar, successively coactable with the teeth of said disk for moving said slide bar and trigger towards said magazine, and spring means respectively attached to the slide bar and trigger for retracting the slide bar after movement thereof by the teeth of said disk, and for retracting the trigger after its displacement by the guide member.

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