

[54] **METHOD AND MACHINE FOR ASSEMBLING SLIDE FASTENERS OF SEPARABLE TYPE**

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 [22] Filed: March 2, 1971
 [21] Appl. No.: 120,278
 [30] Foreign Application Priority Data

March 14, 1970 Japan45/21219
 March 14, 1970 Japan45/21220
 March 14, 1970 Japan45/21221
 March 14, 1970 Japan45/21222
 March 14, 1970 Japan45/21223

[52] U.S. Cl.29/408, 29/207.5 SL, 29/207.5 ST
 [51] Int. Cl.B23p 11/00, B23p 19/04
 [58] Field of Search.....29/408, 207.5 R, 207.5 SL, 29/207.5 ST

[56] **References Cited**

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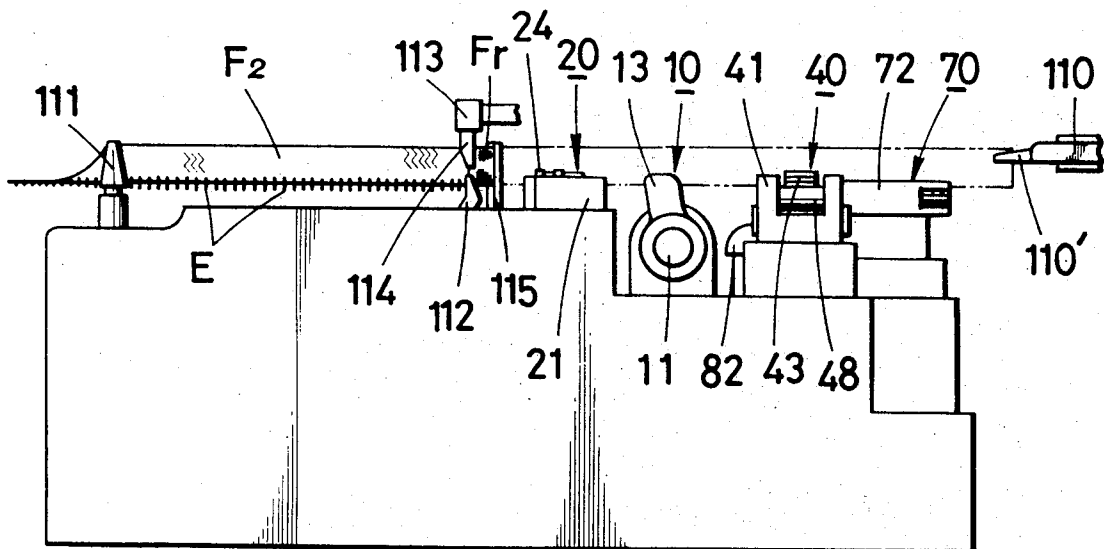
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Primary Examiner—Thomas H. Eager
 Attorney—Bucknam and Archer

[57] **ABSTRACT**

A method and apparatus for assembling separable type slide fasteners whereby two separated fastener stringers are advanced by grippers along parallel paths and during such advancement, both stringers are cut by scissor devices, one stringer is threaded through a slider presented by a movable holder and receives a box and pin component applied by a clamping means, and the other stringer receives a pin component applied by a preclamping device and then secured and punched to finished form by another clamping device.

17 Claims, 25 Drawing Figures



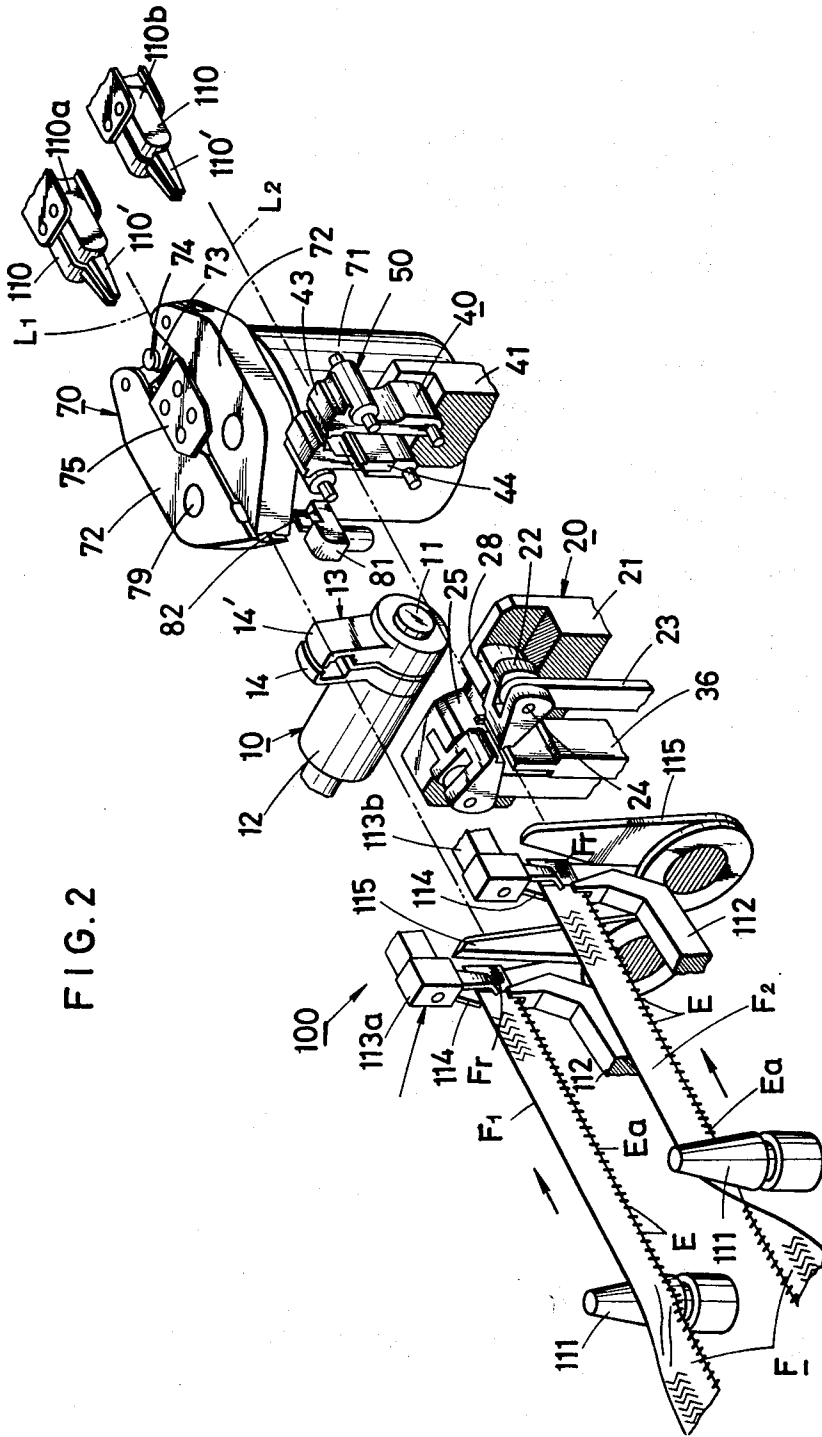


FIG. 2

FIG. 3

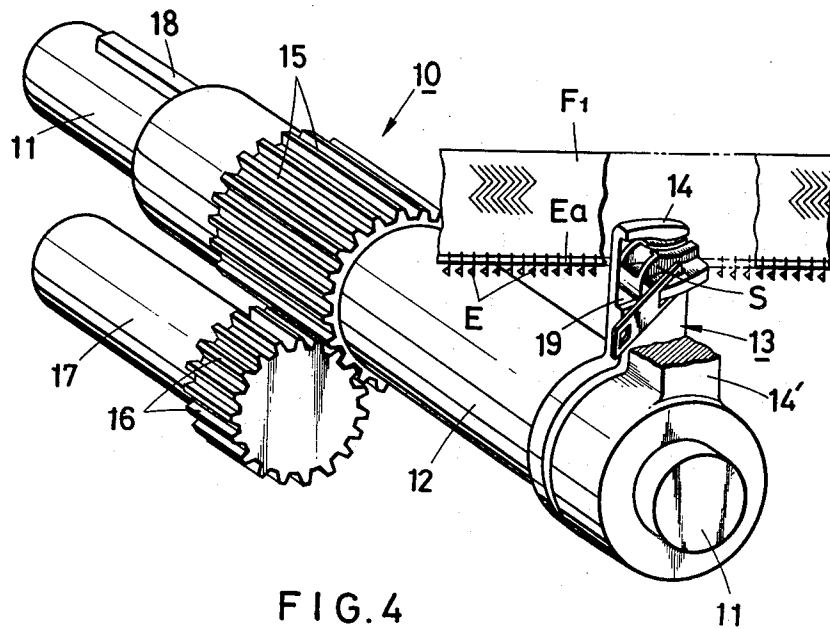


FIG. 4

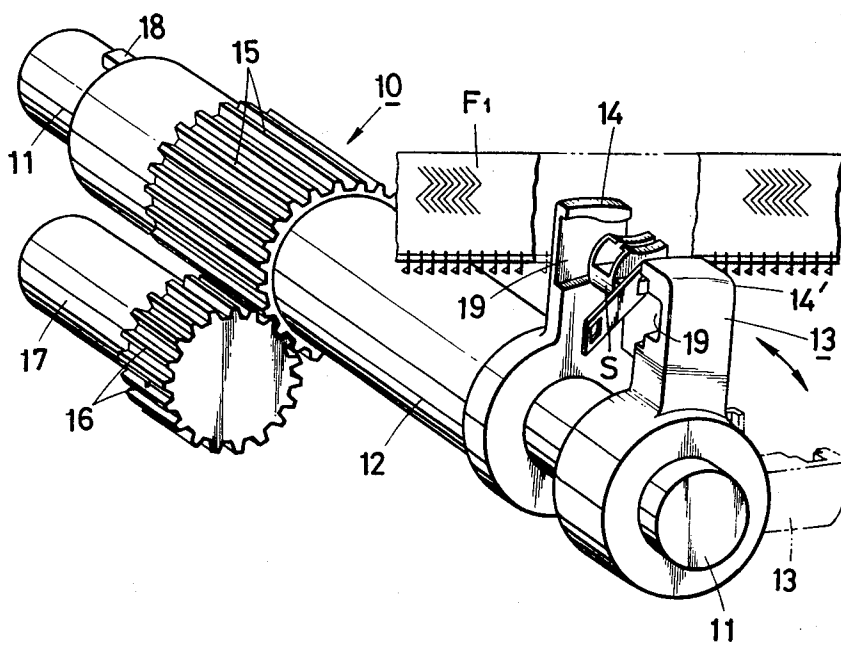


FIG. 6

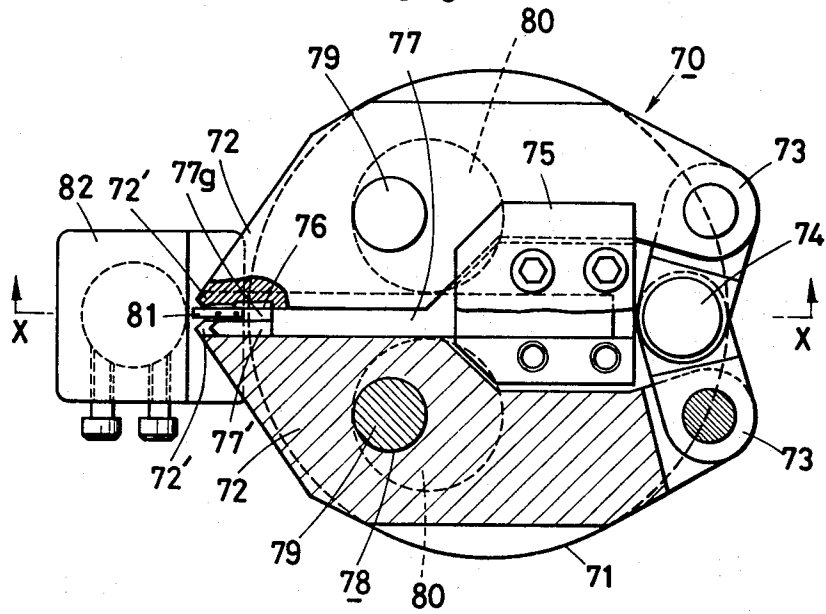
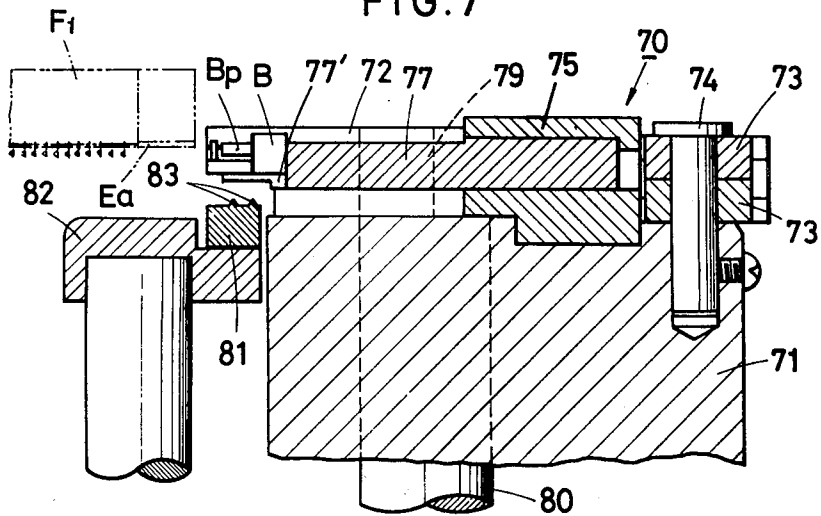


FIG. 7



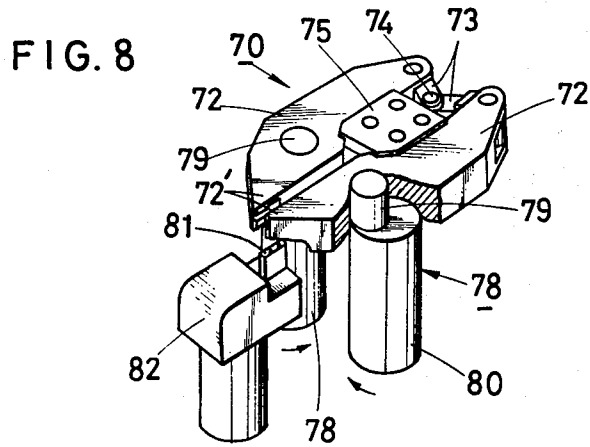


FIG. 9

FIG. 10

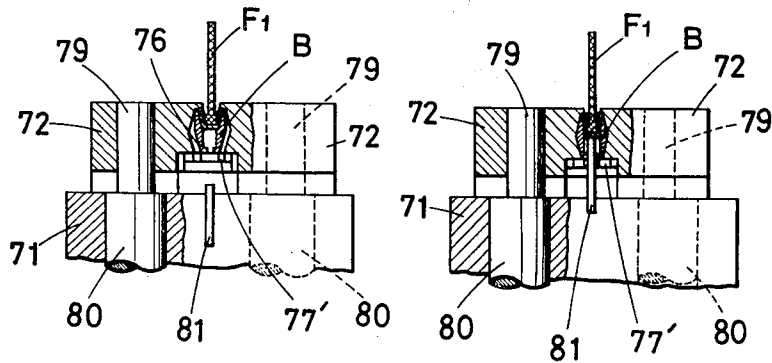


FIG. 11

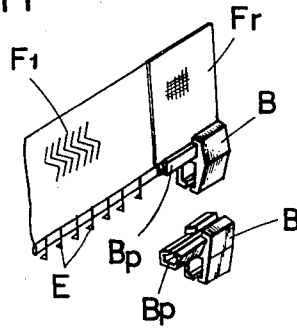


FIG. 12

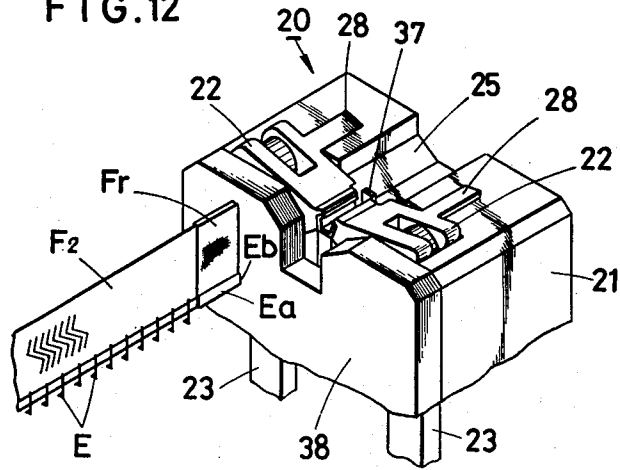


FIG. 13

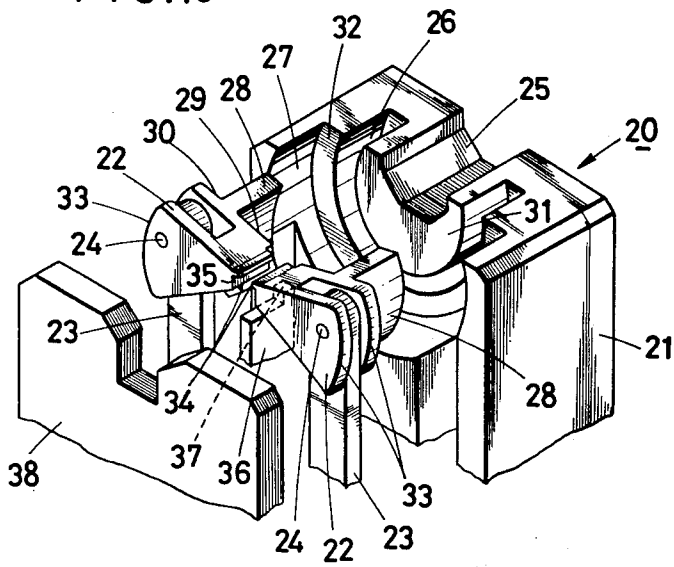


FIG.14

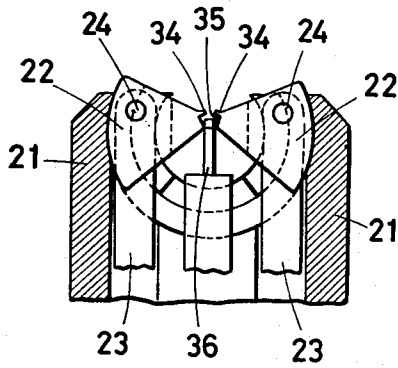


FIG.16

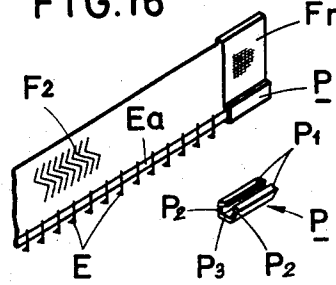


FIG.15a

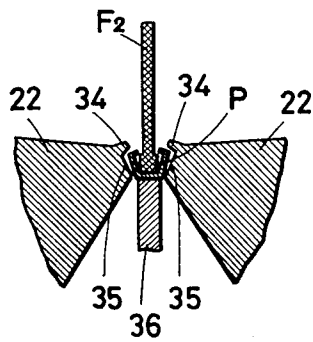


FIG.15b

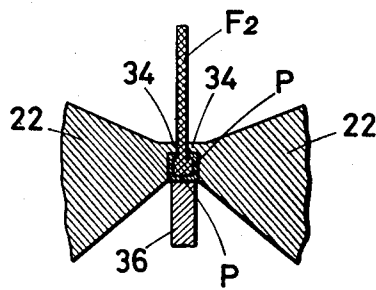


FIG.17

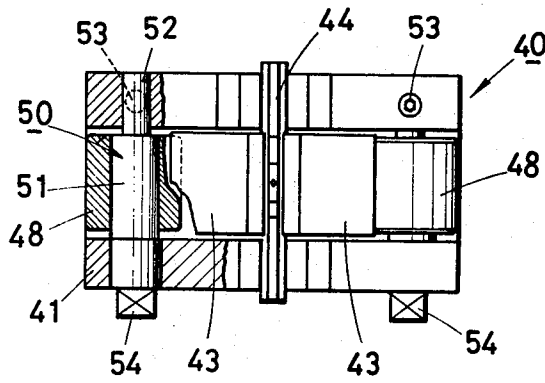


FIG.18

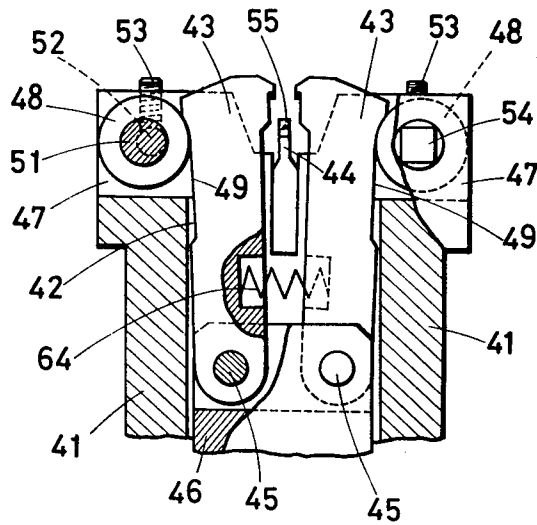


FIG.19

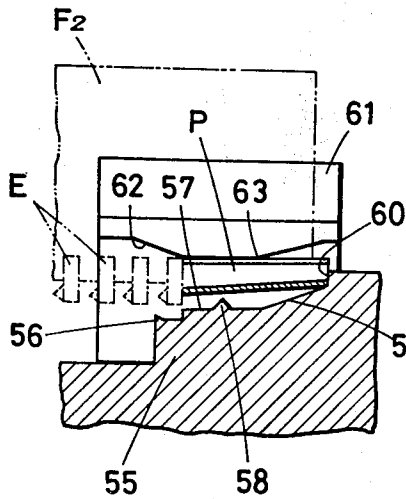


FIG.20

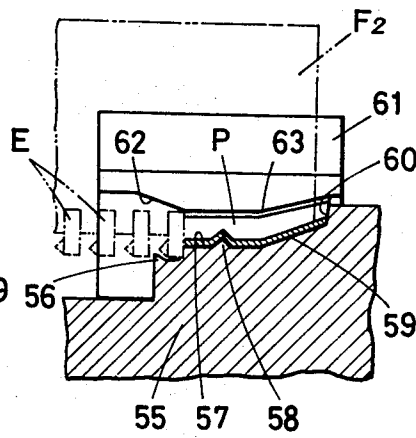


FIG.21

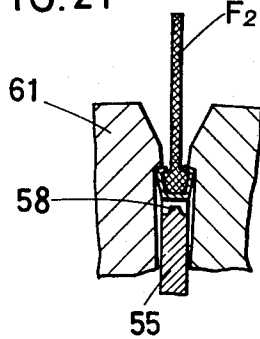


FIG.22

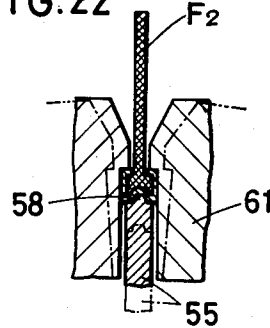


FIG.23a

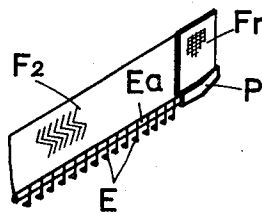
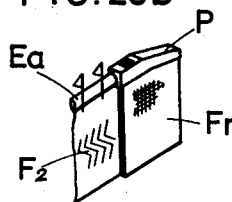


FIG.23b



METHOD AND MACHINE FOR ASSEMBLING SLIDE FASTENERS OF SEPARABLE TYPE

BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates to a method and apparatus for assembling slide fasteners, and has particular reference to such method and apparatus which are employed for finishing a slide fastener chain of the separable type consisting of a pair of continuous length stringer tapes having alternate element-containing and element-free sections.

More specifically, the invention is directed to the application of sliders and separable end stop members to a fastener chain. Usually, the separable end stop members comprise a box attached to one end of one stringer, conveniently referred to as the bottom end, and a pin engageable in the box and attached to the bottom end of the other stringer. The two stringers are connected by moving the slider along the fastening elements on one stringer into abutment with the box and threading the pin on the other stringer through the slider and into the box, whereupon the separated stringers are brought into coupling engagement by moving the slider back away from the box towards the other or top end of the fastener.

It is to this type of fastener that the present invention is generally applied.

The greater part of the operation for finishing slide fasteners with the various fastener fittings has been heretofore performed manually, which necessarily involved a number of finishing steps including cutting fastener stringers to a desired unit product length, separating the two connected stringers, threading a box through one stringer, rivetting the same thereon, clamping a pin on the other stringer, threading a slider through the box carrying stringer, and coupling the two stringers together. Such manual operating procedures in conventional practice are literally time-consuming. Moreover, difficulties have been experienced in attaining uniformity in the quality of the finished fasteners.

Whereas, it is the primary object of the present invention to eliminate the foregoing disadvantages of the conventional manual procedures for assembling a slide fastener.

It is another object of the invention to provide a novel method for assembling a slide fastener of the separable type in an automatic cycle of operation and hence with a maximum of speed and accuracy.

It is a further object of the invention to provide a novel machine which can best carry the said method into practice.

It is still another, more specific object of the invention to provide a novel combination of useful means for finishing a separable fastener in a continuous cycle of operation.

These and other objects and features of the invention will be better understood from the following description taken in connection with the accompanying drawings which illustrate a specific form of the machine embodying the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a side elevation of the machine according to the invention, showing its main operating components;

FIG. 2 is a perspective view of the fastener assembling machine according to the invention utilized to explain the general aspects of operation of its essential operating components;

FIG. 3 is a perspective view of a slider applying mechanism forming one important aspect of the assembling machine of the invention;

FIG. 4 is a view similar to FIG. 3 but showing the mechanism as in position for releasing the slider;

FIG. 5 is a partially sectional side view of part of the slider applying mechanism showing the manner in which the slider is threaded through a fastener stringer;

FIG. 6 is a partially sectional plan view of a box applying mechanism;

FIG. 7 is a cross-sectional view taken on the line X—X of FIG. 6;

FIG. 8 is an exploded perspective view of the box applying mechanism;

FIG. 9 is a cross-sectional view of part of the box applying mechanism prior to clamping operation;

FIG. 10 is a view similar to FIG. 9 but showing the mechanism as in operative position;

FIG. 11 is a perspective view of a portion of the finished fastener stringer, and also shows a box component to be applied thereon;

FIG. 12 is a perspective view of a pin pre-clamping mechanism forming another important aspect of the machine of the invention;

FIG. 13 is an exploded perspective view of the pre-clamping mechanism;

FIG. 14 is a partially sectional from elevation of the pre-clamping mechanism showing the hammers and punch in operative position;

FIGS. 15a and 15b are fragmentary sectional views utilized to explain the pre-clamping operation;

FIG. 16 is a perspective view of a portion of the finished fastener stringer, and also shows a pin component to be pre-clamped thereon;

FIG. 17 is a partially sectional plan view of a pin applying mechanism forming another important aspect of the machine of the invention;

FIG. 18 is a partially sectional front elevation of the mechanism of FIG. 17;

FIG. 19 is a sectional side view on enlarged scale of a forming punch head and its associated forming die showing a pin component inserted therebetween;

FIG. 20 is a view similar to FIG. 19 but showing the punch head and die as in operative position;

FIG. 21 is a fragmentary sectional view of the punch head and coating dies corresponding to FIG. 19;

FIG. 22 is a similar view but corresponding to FIG. 20; and

FIGS. 23a and 23b are perspective views showing a portion of the fastener stringer on which a pin component has been clamped and punched into position.

DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

Like reference numerals refer to like and corresponding parts throughout the various figures of the drawing and the arrow marks indicate the direction of movement of the moving components of the machine.

Briefly stated, the important concept of the present invention resides in a series of operation which comprises separating the two interengageable stringers of a

continuous length fastener chain having element-free sections at predetermined intervals; maintain the stringers in successive movement along parallel lines of path; threading a slider through one of said stringers; applying the box component to said one stringer; applying a pin component to the other stringer; drawing the thus assembled two stringers simultaneously until an element-free section of the fastener chain, spanning between the preceding and ensuing stringers, arrives at a predetermined point in the path of the chain; and cutting each of the preceding assembled stringers across said element-free section. More specifically, the method according to the invention comprises separating the two interengageable stringers of a continuous length fastener chain and orienting the plane of each stringer into vertical disposition with its element-carrying edge down; maintaining the thus oriented stringers in successive movement along horizontal parallel lines of path; stopping the stringers at a starting operation point at which a mechanical cycle of operation commences; advancing a first stringer to a slider applying station for threading a slider through said first stringer; further advancing said first stringer to a box applying station for clamping and punching a box component thereto; advancing a second stringer to a pin applying station for clamping and punching a pin component thereto; drawing the thus assembled first and second stringers simultaneously by a distance corresponding to a desired product fastener length and determined by the arrival at said starting operation point of a leading element on each ensuing stringer; and cutting the preceding assembled stringers at a point afterward of and adjacent to said starting operation point in response to the arrival thereof of said leading element, whereupon the mechanical cycle is repeated:

The various phases of the foregoing mechanical cycle that will be later discussed in greater detail are shared by the important components of the machine generally shown in FIG. 2, which components are interrelated and synchronized in operation as hereafter described. However, it is not the intention of the present inventor to disclose any details of the power system which drives the operating components of the machine, or the electrical/mechanical units which control the timing of the various operating components in the mechanical cycle. They are conventional and hence not illustrated.

The fastener chain F carrying rows of interlocking elements E, which may be endless or of any desired length, is first separated by any suitable separating means (not shown) into two opposed stringers F_1 , F_2 on entry to the machine. The separated stringers are oriented each in the direction of its movement by a guide post of a conical form 111 so that each stringer assumes vertical disposition with its element-carrying edge E_a down as shown in FIG. 2. The thus oriented stringers F_1 , F_2 , move in parallel with each other and along the respective horizontal lines of path L_1 , L_2 until they are stopped at a starting operation point at which the leading element on each stringer is brought into abutting engagement with a stop member 112, whereupon the automatic mechanical cycle of operation commences in accordance with the invention. This movement of the stringers is effected by an advancing means consisting of a pair of reciprocating grippers 113 each

having downwardly extending pinching clips 114 to pinch and hold the stringer, these grippers being arranged to reciprocate a predetermined distance along the respective horizontal lines of path L_1 , L_2 and being hereafter referred to as first grippers. The stop member 112 may be of any design and for example, may be arranged to move into the path of each stringer and engage astride of the element-free edge of the reinforced part Fr of the stringer and retract away from the stringer path upon contact with the leading element in the stringer. The stop member 112 is adapted to hold the stringers F_1 , F_2 in predetermined stopped position for cutting the same by means of cutters later described transversely along the reinforced part Fr of the stringer upon completion of each cycle of assembling operation.

There are provided a pair of coating cutters or scissors 115 which are vertically movable into and away from the horizontal lines of path L_1 , L_2 of the respective stringers and connected to a suitable drive (not shown) for operation in response to the activation of the stop member 112.

Designated at 110 are a pair of second reciprocating grippers each having horizontally extending clips 110' for holding therebetween a leading end portion of stringer and adapted to draw the finished length of stringer out of the machine.

The main parts applying units according to the invention are itemized and described below in detail.

Slider Applying Unit

As shown in FIGS. 3 through 5, inclusive, this unit is comprised of a slider holder 10 comprising a core shaft 11 having one end pivotally connected to a machine frame (not shown), a cylindrical sleeve 12 mounted thereon, a slider retaining member 13 consisting of two substantially identical lugs 14, 14', one projecting from the sleeve 12 and the other from the shaft 11, a driven spur gear 15 fixedly mounted on the sleeve 12, and a drive spur gear 16 connected via drive shaft 17 to a suitable drive source (not shown). The core shaft 11 has a sliding key 18 attached thereto and axially extending in a key groove (not shown) formed in the sleeve 12, which key is adapted to allow the shaft 11 to move axially relative to the sleeve 12 and to rotate with this sleeve as the latter is driven by the spur gears 15, 16. The slider retaining member 13 has a recess or nest 19 formed therein, more specifically in the respective lugs 14, 14' constituting the retaining member. The nest 19 is configured, as shown, to match the contour of a slider body so as to receive the slider S snugly therein.

With this construction, the slider holder 10 functions to receive the slider S from a suitable delivery chute (not shown), releasably retain the slider in the nest 19 and transfer the slider onto the fastener chain F. When receiving the slider S from the chute, the slider holder 10 rotates clockwise out of the path L_1 of fastener chain F and into the horizontal position indicated in phantom outline in FIGS. 4 and 5. The holder 10 carrying a slider rotates counter-clockwise into alignment with the path L_1 and assumes a suitable angular position with respect to advancing stringer F_1 as better shown in FIG. 5. In this position, the slider holder 10 stands by for stringer F_1 to thread the slider S

therethrough, for which purpose a clearance is provided between the opposed upper end surfaces of the retaining part 13 to clear the passage of the stringer. Immediately after threading the slider S through stringer F₁, the shaft 11 makes forward axial movement to cause the opposed lugs 14, 14' to move apart thereby releasing the slider S and leaving the same on the stringer F₁. The holder 10 then repeats the clockwise movement for receiving another slider from the delivery chute.

Box Applying Unit

This device generally is designated at 70 in FIGS. 6 through 10, inclusive, is employed for clamping the box component B having an extended part of box pin Bp into position on the first stringer F₁. The box clasper 70 comprises a supporting drum 71, a pair of clamping arms 72 having their one ends interconnected by a pair of links 73 pivotally mounted on a common support pin 74 secured to the drum 71, and a guide block 75 for suppressing the tendency of the arms 72 displacing upwardly during the clamping operation. The opposed other ends of the arms 72 are tapered off as at 72' to provide wide entrance of the stringer therethrough into the operating zone of the unit 70. The said other ends are further recessed as at 76 for snugly receiving the box B therein. Radially extending from and supported by the guide block 75 is a box holder 77 for abutment with the forward end of the box B and thereon and provided with a forked end forming a gap 77g therein for allowing the passage of a vertically movable punch head 81. The clamping arms 72 are movably supported on a rotative eccentric shaft 78, more specifically on a smaller diameter shaft 79 eccentrically extending from a larger diameter shaft 80 connected to a drive source (not shown). Rotation of the eccentric shaft 78 causes the opposed clamping arms 72 to move toward each other so as to clamp the box B to the first stringer F₁, in which instance the opposed arms are allowed to approach uniformly in face-to-face relation because the links 73 rotate about the support pin 74 in response to the rotation of the eccentric shaft 78. This permits the box B to be clamped uniformly into position on the stringer F₁. The punch head 81 is carried on a vertically movable punch holder 82, which punch head is provided with a plurality of ridges 83 with which to wedge the extended pin part Bp of the box B securely into the element-carrying edge Ea of the stringer F₁. It is to be noted that the box clasper 70 as a whole is arranged to move into and away from the path L₁ of the first stringer F₁.

Pin Pre-Clamping Unit

The pre-clamping device generally designated at 20 in FIGS. 12 through 15b, inclusive, is employed according to the invention for clamping a separable pin component P to the second stringer F₂ just hard enough to ensure accurate retention at the element-carrying edge Ea of the reinforced tape portion Fr, so that the pin P is finally anchored in place, without shifting out of position, by the punching operation later described. The pin component P is conventional, and consists of upper walls P₁, side walls P₂ and a bottom wall P₃. The pre-clasper 20 comprises a rectangular block 21, coating butterfly-like hammers 22 and a pair of verti-

cally movable link arms 23 to which the hammers are pivotally connected as at 24. The rectangular block 21 is provided centrally with a recess 25, a first arcuate groove 26 underlying the recess 25 and a second arcuate groove 27 slightly greater in radius than the first groove 26 and concentric therewith. Each of the butterfly hammers 22 has a horizontally projecting guide 28 which is arcuately shaped to match the contour of the first arcuate groove and movably disposed therein. With hammer guides 28 fully inserted in the first groove 26, the inner side walls 20 and the outer side walls 30 of the hammers 22 contiguous to the guides 28 are held respectively in abutment with the lands 31 and 32, while the periphery 33 of each hammer is guided along the second arcuate groove 27. The coating hammers 22 having identical protuberances 34 extending from the hammer heads 35 and disposed to engage with and disengage from each other as the hammers 22 make arcuate movement along the guide groove 26, 27. These protuberances 34 are adapted to suppress the upper walls P₁ of the pin component P when pressed by the hammers so as to let these walls wedge into the reinforced tape Fr substantially at right angles to the plane of the fastener, as shown in FIG. 15b, while the heads 35 of the hammers ram against the side walls P₂ of the pin. Designated at 36 is a seat member having a stop 37 and positioned centrally between the heads 35 for supporting abutment with the bottom wall P₃ of the pin P. With advancement of the fastener chain, the forward terminal end Eb of the reinforced tape of the second stringer F₂ on the pre-clamping 20 is brought into abutment with the stop 37 and held in position for application of a pin thereon. The pin P is thus applied to the stringer F₂ by pressure exerted by the coating hammers 22 rotating in the opposite directions. Designated at 38 is a front cover removably attached to the block 21. It is to be noted that the hammer heads 35 in their non-pressing position are tilted outwardly so as to align with the non-clamped side walls of the pin, assuring the application of pressure of the hammers uniformly over the side walls of the pin. It is to be understood that the unit 20 as a whole is arranged to move into and away from the path L₂ of the second stringer F₂.

Pin Applying Unit

The unit 40 generally shown in FIGS. 17 through 22, inclusive, is employed for clamping and punching the pin component P, that has been pre-clamped to the element-carrying edge Ea of the second stringer F₂, into final form on the stringer F₂. The pin clamp/punch device 40 comprises a rectangular block 41 having a rectangular internal chamber 42, pivotally disposed coating forming dies 43 journaled in the chamber 42 and a forming punch 44 secured to and extending vertically from a center portion of the block and positioned centrally between the dies 43. The rectangular block 41 is vertically movable with respect to the forming dies 43 that are pivoted as at 45 to a die holder 46. There are provided a pair of recesses 47 in the opposite upper edges of the rectangular block 41 for holding a pair of rolls 48 rotatably for abutting engagement with the outer guide surfaces 49 of the respective dies 43. These surfaces 49 of the dies are flared upwardly to permit the separated dies to meet together as the rolls

48 moves radially and rotatively up along the flared guide surfaces 49 with ascending movement of the block 41. Each roll 48 is rotatably mounted on an eccentric shaft 50 consisting of a larger diameter center portion 51 for mounting thereon the roll 48 and a smaller diameter end portion 52 extending eccentrically with respect to the center portion 51 and removably connected by a set-screw 53 to the block 41. The other end 54 of the shaft 50 extending outwardly of the block has a square cross section to facilitate the turning of this shaft with a tool such as a wrench. It will be appreciated that the eccentric shaft 50 serves the purpose of adjusting the operating gap of the dies 43 depending upon the size of the pin P and the thickness of the fastener stringer F₂. The vertically movable forming punch 44 has a punch head 55 of the cross-sectional configuration shown in FIGS. 19 and 20, from which it will be seen that the punch head 55 has a recessed edge 56 configured to match the contour of the fastener element E, shaping surfaces including a flat land 57, a ridge 58, and an upgrade hill 59 to impart these surface characteristics to the bottom wall P₃ of the pin P, and an abutting top end 60 for abutment with the die 43. The die head portion 61 for contact with the upper walls P₁ of the pin P is also shown in FIGS. 19 and 20 as having a recessed part 62 to avoid contact with the elements E during the clamping and punching operation and a dog-leg contact surface 63 to impart this surface contour to the upper walls P₁ of the pin. This clamping and punching arrangement according to the invention facilitates smooth threading of the pin P through the slider S and through the box component B and ensures rigid attachment of the pin to the stringer F₂, eliminating the tendency of the pin to become displaced or disengaged from the stringer in repeated use. Designated at 64 in FIG. 18 is a compression coil spring normally urging apart the coacting dies 43 and returning the same to normal position upon completion of each cycle of the clamping and punching operation. The unit 40 is also arranged to be movable into and away from the path L₂ of the second stringer F₂.

Having described the construction and arrangements of the important components of the machine embodying the invention, the operation thereof will now be discussed in connection with the preferred embodiment generally depicted in FIG. 2.

The two separated stringers F₁, F₂ of the slide fastener chain F advance in parallel along their respective horizontal lines of path L₁, L₂ to a starting operation point at which the leading one of the fastener elements E on each stringer is brought into abutting engagement with the stop member 112, whereupon the mechanical cycle of operation commences in accordance with the invention. The first phase of the cycle thus begins with activation of the stop member 112 in contact with the leading element on the stringer, whereupon the stop member 112 holds the reinforced part Fr of the stringer in steady position for cutting by the cutters 115 disposed movably into and away from the path of travel of the fastener chain. Simultaneous with the action of the stop member 112, the first grippers 113a, 113b operate to grip the reinforced parts Fr of first and second stringers F₁, F₂, this operation being conveniently referred to as a second phase of the cycle. The two parallel cutters 115 operate simultaneously to

sever the two stringers F₁, F₂, this cutting operation being third phase of the cycle. The first reciprocating grippers 113 hold the respective stringers close at the leading ends thereof which have been just cut and advance the same along the respective horizontal lines of path L₁, L₂, which constitutes a fourth phase of the cycle. This is followed by the fifth phase in which the first stringer F₁ is threaded through a slider S releasably retained in the slider applying unit 10 on standby in the path L₁. The stringer F₁ having thus received the slider S from the unit 10 is further advanced by the first gripper 113a until it reaches the box applying unit 70 also on standby in the path L₁ where a box component B is applied to the stringer F₁, which constitutes a sixth phase of the cycle. The seventh phase designates the pre-clamping operation in which the second stringer F₂ is advanced by the first gripper 113b along its path L₂ to the pre-clamping unit 20 where a pin component P is applied in correct position on an edge of the reinforced part Fr under relatively low clamping pressure. The eighth phase of the cycle then follows in which the second stringer F₂ is further advanced by the gripper 113b onto the pin applying unit 40 where the pre-clamped pin P on the stringer F₂ is clamped and punched firmly into final form. The ninth phase follows in which the two opposed stringers F₁, F₂ which have been assembled with the respective fastener fittings are gripped at their leading ends by the second grippers 110a, 110b simultaneously as the first grippers 113a, 113b release the same. In the tenth phase, the first grippers 113a, 113b return to starting position adjacent to the stop member 112, while the second grippers 110a, 110b retract in the opposite direction, drawing the two assembled fastener stringers simultaneously out of the machine until a leading element on each ensuing stringer unit of the chain is brought into contact with the stop member 112. At this time point, the mechanical cycle is repeated. The various phases of the mechanical cycle that have been described should be understood as only illustrative.

The described operation and the machine to carry this operation into practice are simple and reliable. And, as compared to the manual assembling operation in conventional practice, the rate of assembly is increased manifold.

As will be appreciated by the artisan, the use of the terms horizontal and vertical in connection with the orientation of the stringers F₁, F₂ is not intended to imply any specific orientation with respect to the local direction of gravity, but rather such terms are used to provide a convenient descriptive frame of reference, horizontal being the orientation of the stringers F₁, F₂ before turning by posts 111 and vertical being the orientation of stringers F₁, F₂ thereafter as shown in FIG. 2.

While the invention has been described as to its preferred embodiment, it will be understood that various modifications and changes may be made in the specific form and construction herein disclosed, without departing from the scope of the appended claims. As for an example, in the case where the extended pin part Bp is supplied separately from the box part B of the box component, a device similar to the pre-clamping unit 20 may be provided on the line of path L₁ so as to clamp the extended pin part Bp into

position on the first stringer F_1 prior to application of the box part B. It will also readily occur to one skilled in the art that while the various parts applying units of the machine have been illustrated as movable into and away from the path of the slide fastener chain, they may be designed to be stationary provided that their associated parts supplying units (not illustrated) are capable of delivering the fastener parts to the respective parts applying units held in stationary position and in alignment with the path of the chain.

What is claimed is:

1. In the manufacture of slide fasteners from a fastener claim consisting of a pair of continuous length stringer tapes having alternate element-containing and element-free sections, the method of assembling a slide fastener which comprises separating the two stringers and maintaining them in successive movement along parallel lines of path; threading a slider through the one of said stringers; applying a box component to said one stringer; applying a pin component to the other stringer; drawing the thus assembled two stringers simultaneously until an element-free section of the fastener chain spanning between the preceding and ensuing stringers arrives at a predetermined point in the path of the chain; and cutting each of the preceding assembled stringers across said element-free section.

2. In the manufacture of slide fasteners from a fastener chain consisting of a pair of continuous length stringer tapes having alternate element-containing and element-free sections, the method of assembling the fastener with sliders and box and pin components which comprises: separating the two stringers and orienting the plane of each stringer into vertical disposition with its element-carrying edge down; maintaining the thus oriented stringers in successive movement along horizontal parallel lines of path; stopping the stringers at a starting operation point at which a mechanical cycle of operation commences; advancing a first stringer along its horizontal path of travel to a slider applying station for threading a slider through said first stringer; advancing said first stringer along said path to a box applying station for clamping and punching a box component thereto; advancing a second stringer along its horizontal path of travel to a pin applying station for clamping and punching a pin component thereto; drawing the thus assembled first and second stringers simultaneously by a distance corresponding to a desired product fastener length and determined by the arrival at said starting operation point of a leading element on each ensuing stringer; and cutting the preceding assembled stringers at a point afterward of and adjacent to said starting operation point in response to the arrival thereof of said leading element, thus repeating the mechanical cycle.

3. In the manufacture of slide fasteners from a fastener chain consisting of a pair of continuous length stringer tapes having alternate element-containing and element-free sections, the method of assembling the fastener with sliders and box and pin components which comprises: separating the two stringers and orienting the plane of each stringer into vertical disposition with its element-carrying edge down; maintaining the thus oriented stringers in successive movement along horizontal parallel lines of path; stopping the stringers at a starting operation point at which a

mechanical cycle of operation commences; advancing a first stringer along its horizontal path of travel to a slider applying station for threading a slider through said first stringer; further advancing said first stringer along said path to a box applying station for clamping and punching a box component thereto; advancing a second stringer along its horizontal path of travel to a pre-clamping station for pre-clamping a pin component into position thereon; further advancing said second stringer to a pin applying station for clamping and punching the pre-clamped pin component thereto; drawing the thus assembled first and second stringers simultaneously by a distance corresponding to a desired product fastener length and determined by the arrival at said starting operation point of a leading element on each ensuing stringer; and cutting the preceding assembled stringers at a point afterward of and adjacent to said starting operation point in response to the arrival thereof of said leading element, thus repeating the mechanical cycle.

4. In the manufacture of slide fasteners from a fastener chain consisting of a pair of continuous length stringer tapes having alternate element-containing and element-free sections, the machine for assembling the fastener chain with sliders, box and pin components which comprises: a means for orienting the plane of the fastener chain to rise vertically with its element-carrying edge down; a means for stopping the travel of the fastener chain when in contact with a leading element thereon at a starting operation point at which a mechanical cycle of operation commences; a pair of coaxial cutters adjacent to said operation point for severing the element-free sections of two opposed stringers in response to the activation of said stopping means; a pair of first advancing means for advancing the first and second stringers in the respective horizontal lines of path of travel; a slider applying means rotatable into and away from a first horizontal line of path of the first stringer for releasably retaining a slider and threading the same through the advancing first stringer; a box applying means movable into and away from said first line of path for applying a box to said first stringer; a pin applying means movable into and away from said second horizontal line of path for clamping and punching a pin into position on the second stringer; and a pair of second advancing means reciprocally disposed respectively in said parallel lines of path of the respective stringers for drawing the assembled stringers out of the machine.

5. The machine as defined in claim 4 wherein said orienting means is a conically shaped guide post.

6. The machine as defined in claim 4 wherein said stopping means is movable into and away from each of said horizontal lines of path of the stringers for abutting engagement with the leading element on the stringer.

7. The machine as defined in claim 4 wherein said pin applying means includes a pre-clamping means for pre-clamping a pin component into position on the second stringer prior to final clamping and punching.

8. A slider applying unit comprising a support frame member, a core shaft having one end rotatably mounted thereon, a cylindrical sleeve mounted on said shaft, a slider retaining member consisting of two identical lugs, one projecting from said sleeve and the other from said core shaft, a drive spur gear, a driven

spur gear in meshing engagement therewith and fixedly mounted on said sleeve, and a sliding key attached to the periphery of said core shaft for allowing the axial movement thereof relative to said sleeve to move said two identical lugs toward and away from each other.

9. The unit according to claim 7 wherein said retaining member is provided with a nest for releasably retaining a slider therein.

10. A box applying unit comprising a supporting drum, a pair of clamping arms having their one ends interconnected by a pair of links pivotally mounted on a common shaft secured to said drum, a guide block for suppressing the tendency of said arms displacing upwardly during the box clamping operation, a box holder supported by and radially extending from said block for holding a box component in position thereon, a rotative eccentric shaft consisting of a larger diameter section and a smaller diameter section eccentrically extending therefrom, said eccentric shaft supporting said clamping arms movably thereon, and a punch disposed for vertical movement between the other opposed ends of said clamping arms.

11. The unit as defined in claim 10 wherein said opposed ends of the clamping arms are tapered off to provide wide entrance for advancing the stringer therethrough.

12. The unit as defined in claim 10 wherein said punch has a plurality of ridges with which to wedge a box component into position on the stringer.

13. A pin applying unit comprising a vertically movable rectangular block having a rectangular internal

chamber, pivotally disposed coating forming dies journaled in said chamber, a forming punch secured to and extending vertically from said block and positioned centrally between said dies, said dies having upwardly flared guide outer surfaces, a rotative eccentric shaft supported on said block, a pair of rotating members rotatably mounted on said eccentric shaft and disposed for abutting engagement with said flared guide outer surfaces, and a compression coil spring normally urging apart said coating dies.

14. The unit as defined in claim 13 wherein said forming punch has a deformed head surface characteristic.

15. A pin pre-clamping unit comprising a rectangular block provided with an arcuate groove therein, opposed coating hammers for pressing the side walls of a pin component into position on a fastener stringer and disposed for arcuate movement in opposite directions in and along said arcuate groove, a vertically movable link arm carrying said hammers pivotally thereon, and a seat member positioned centrally between said opposed coating hammers for supporting abutment with the bottom wall of the pin.

16. The unit as defined in claim 15 wherein said hammers are provided with heads tilted outwardly to align with non-clamped side walls of the pin.

17. The machine according to claim 4 which further includes a means movable into and away from said first line of path for applying a box pin separately from a box component to said first stringer.

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