Feb. 28, 1939. E. M. ARENTZEN 2,148,673

MACHINE FOR MAKING ZIPPER FASTENERS

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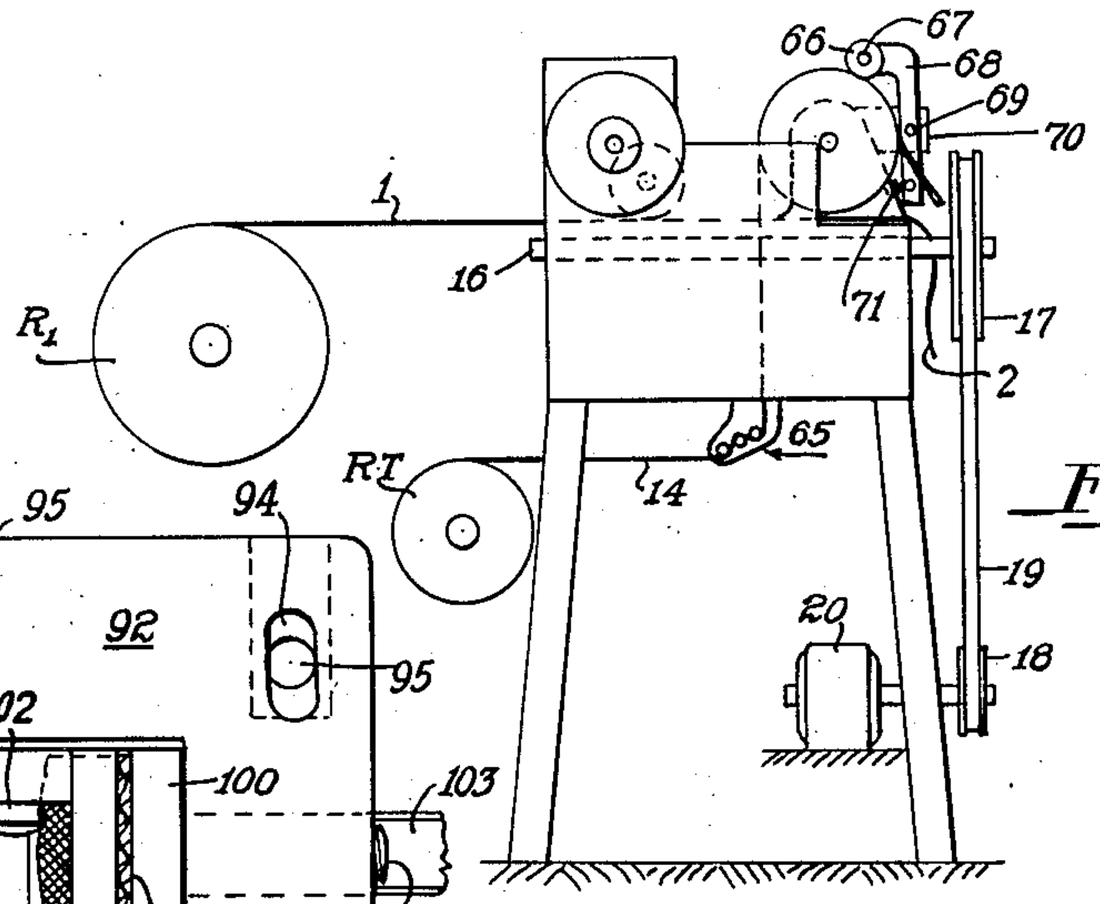

Fig. 1c.

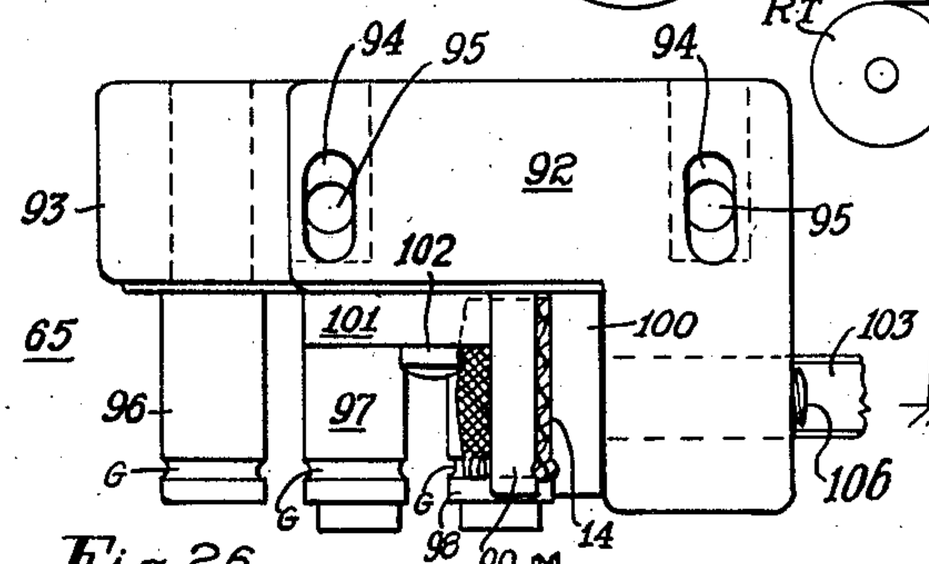

Fig. 2b.

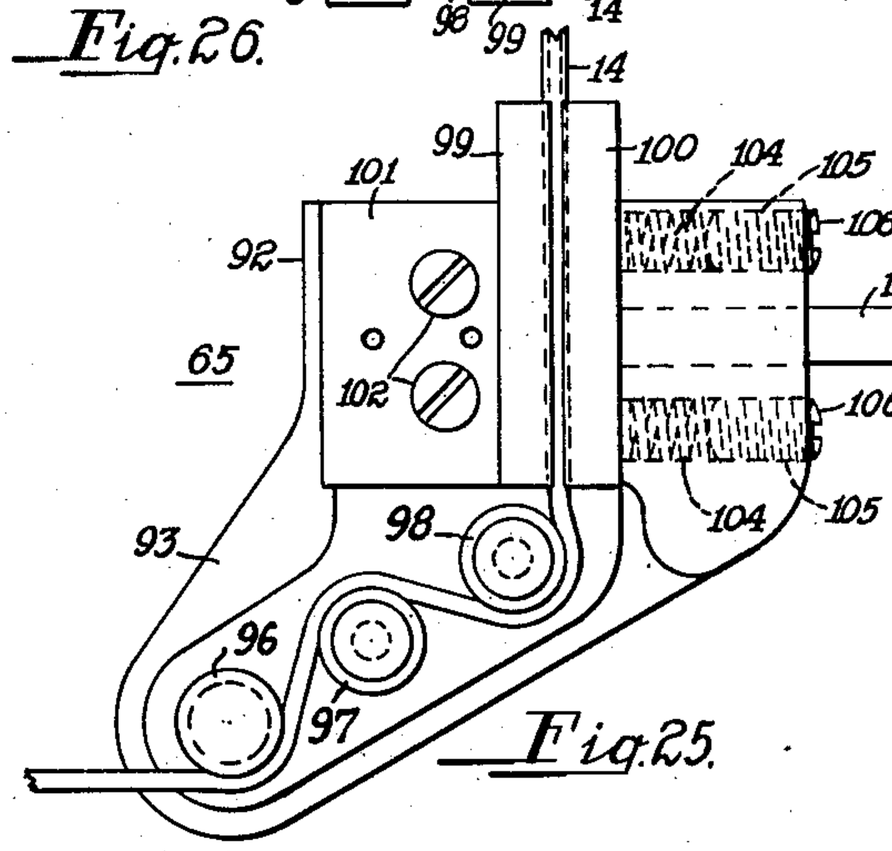

Fig. 2s.

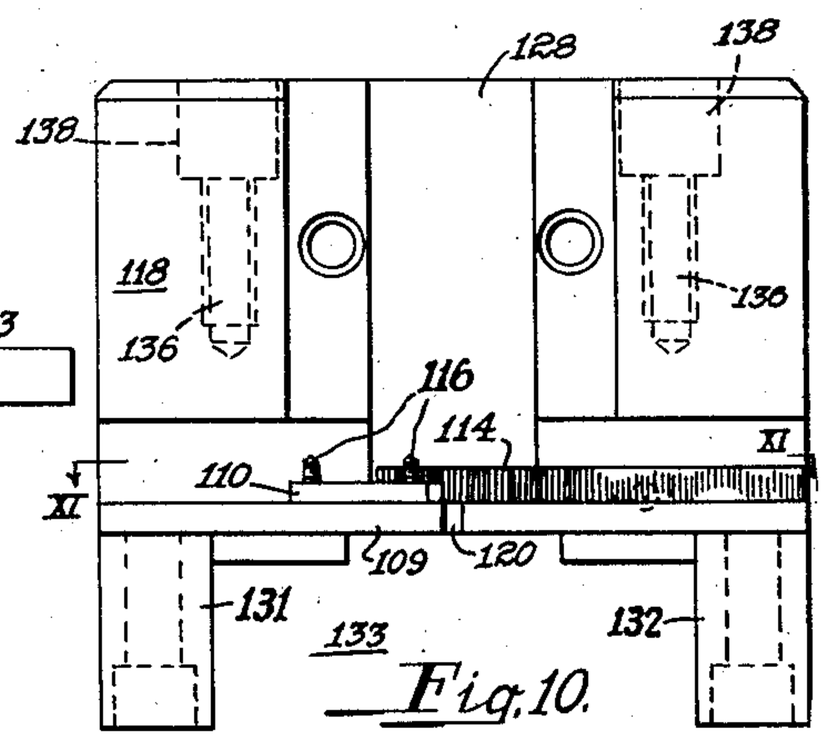

Fig. 10.

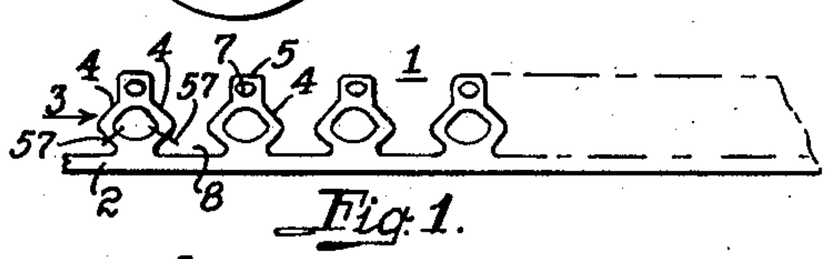

Fig. 1.

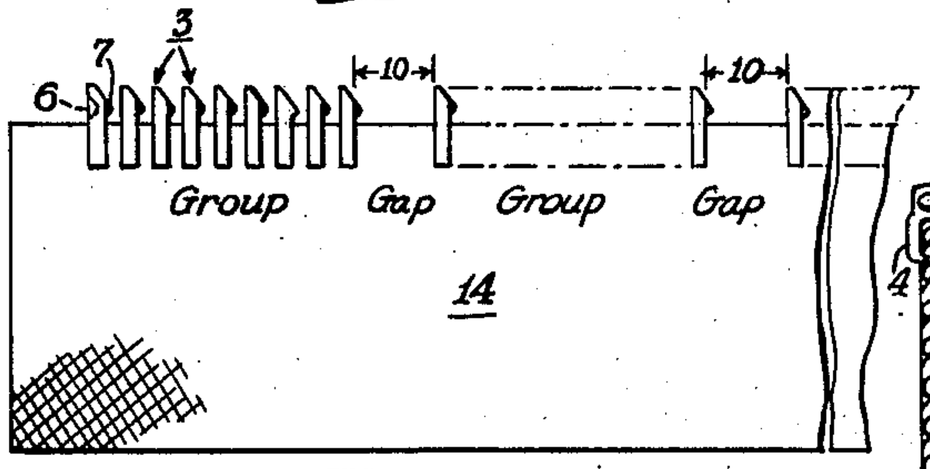

Fig. 1a.

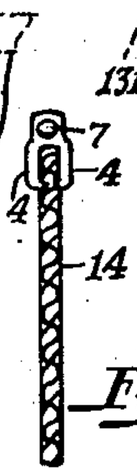

Fig. 1b.

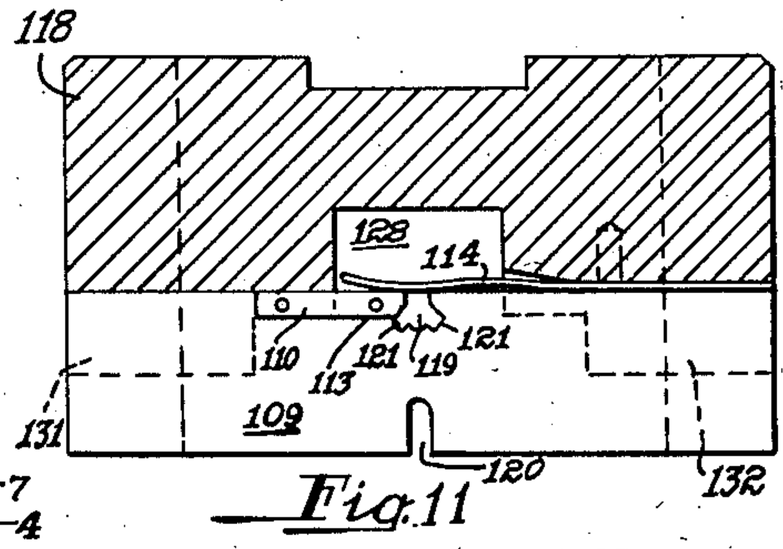

Fig. 11

INVENTOR

Einar M. Arentzen

By Green & McCallister

His Attorneys

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MACHINE FOR MAKING ZIPPER FASTENERS

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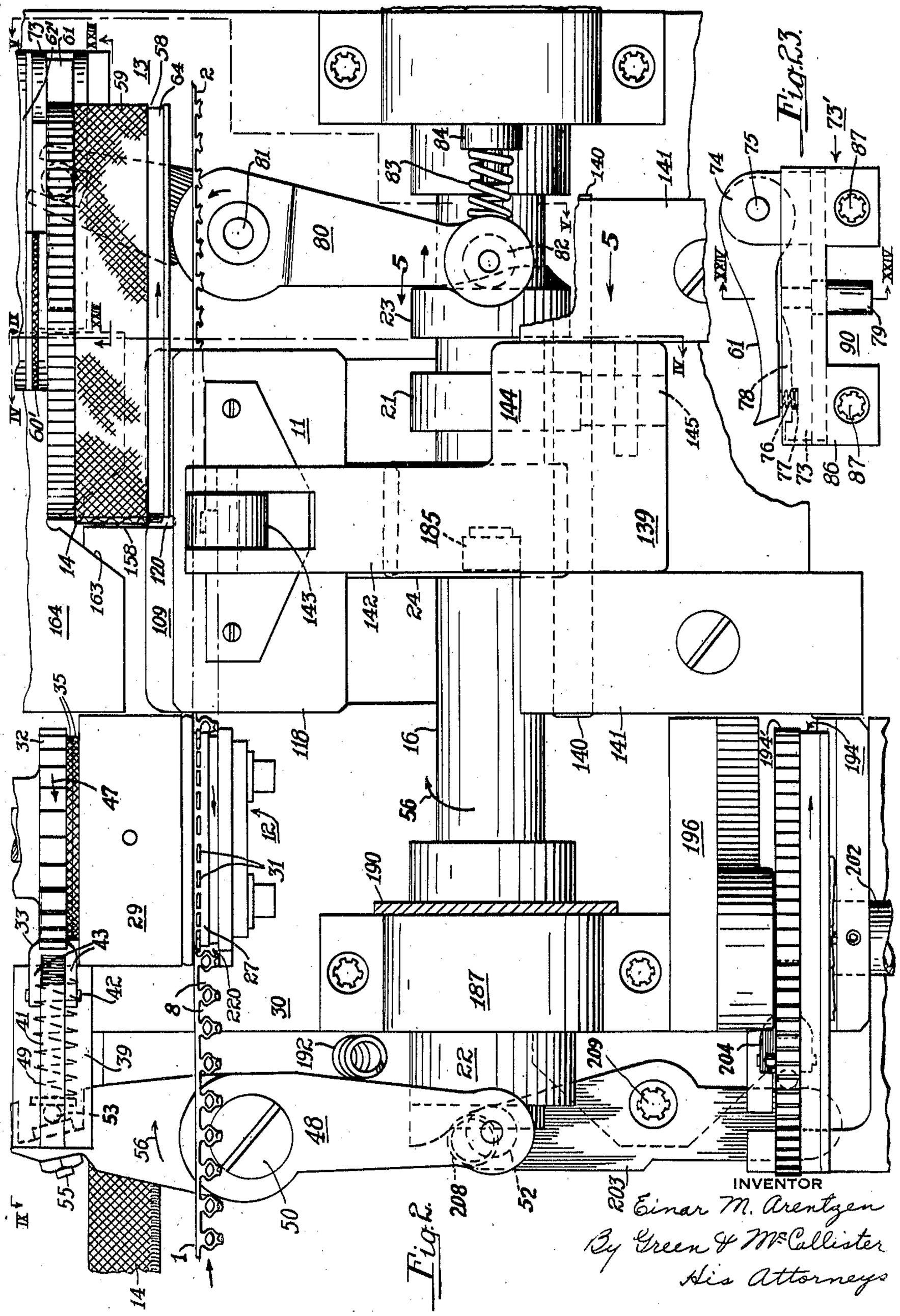

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MACHINE FOR MAKING ZIPPER FASTENERS

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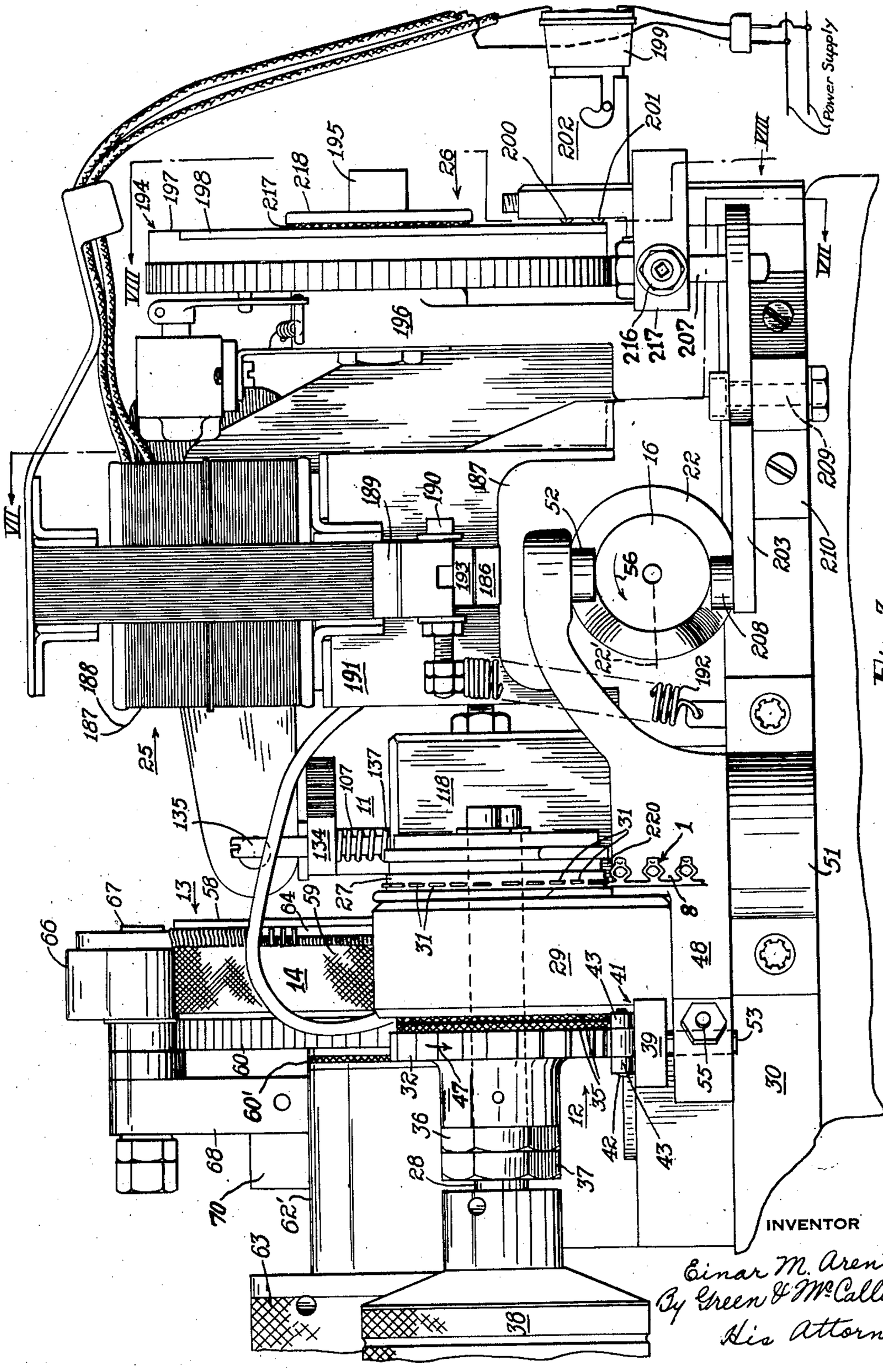

Fig. 3.

INVENTOR

Einar M. Arentzen

By Green & McCallister

His Attorneys

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MACHINE FOR MAKING ZIPPER FASTENERS

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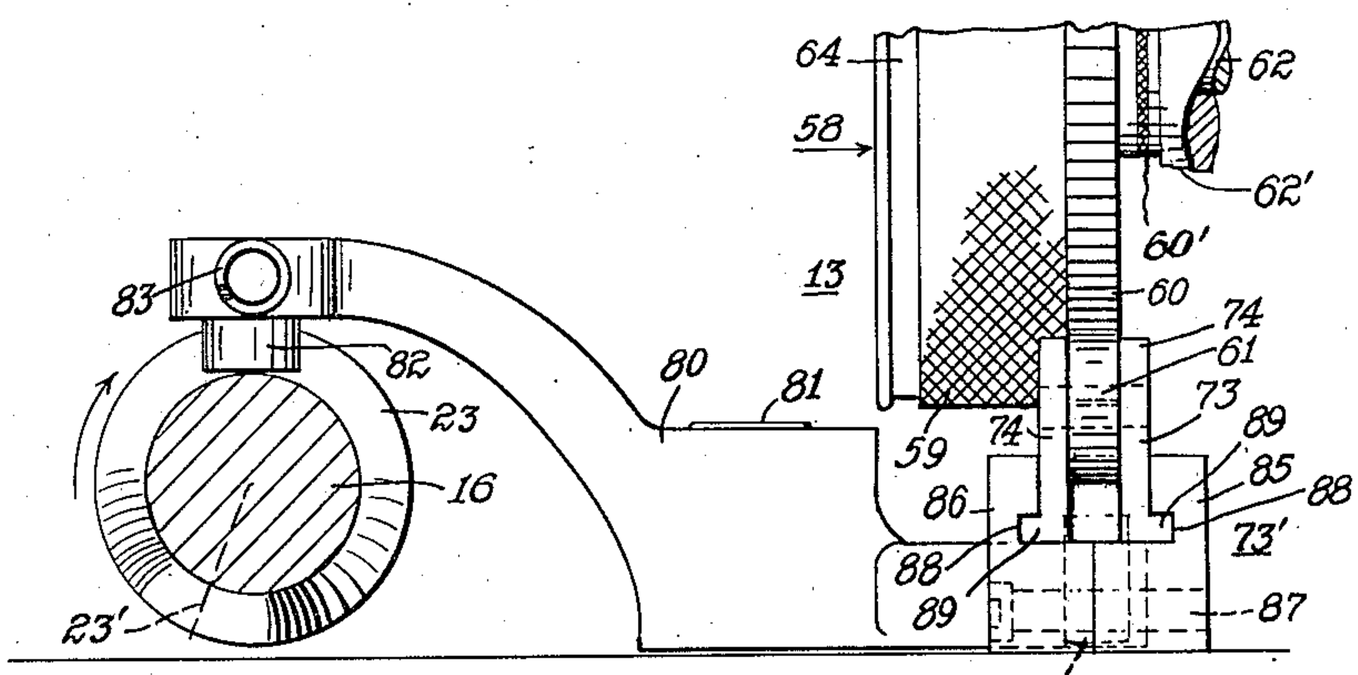

Fig. 5.

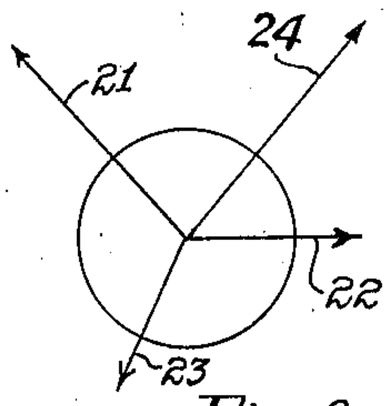

Fig. 6.

Fig. 4.

INVENTOR
Einar M. Arentzen
By
Green & McCallister
His Attorneys

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MACHINE FOR MAKING ZIPPER FASTENERS

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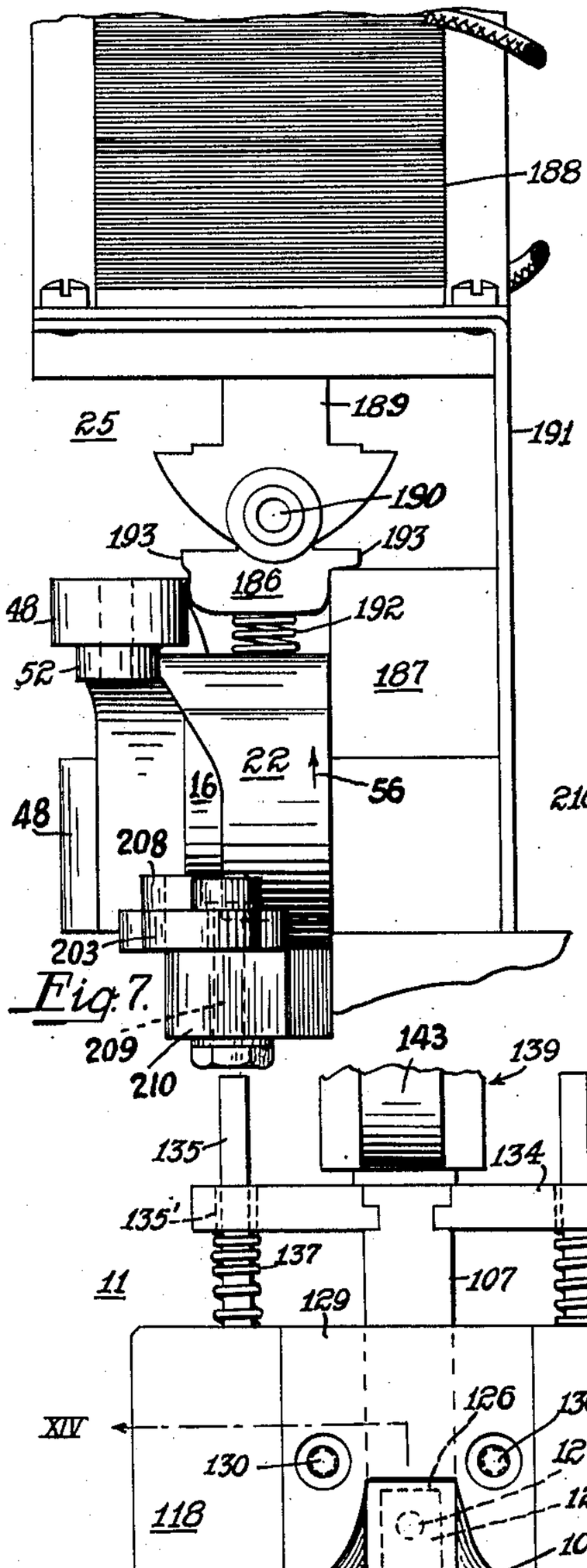

Fig. 7.

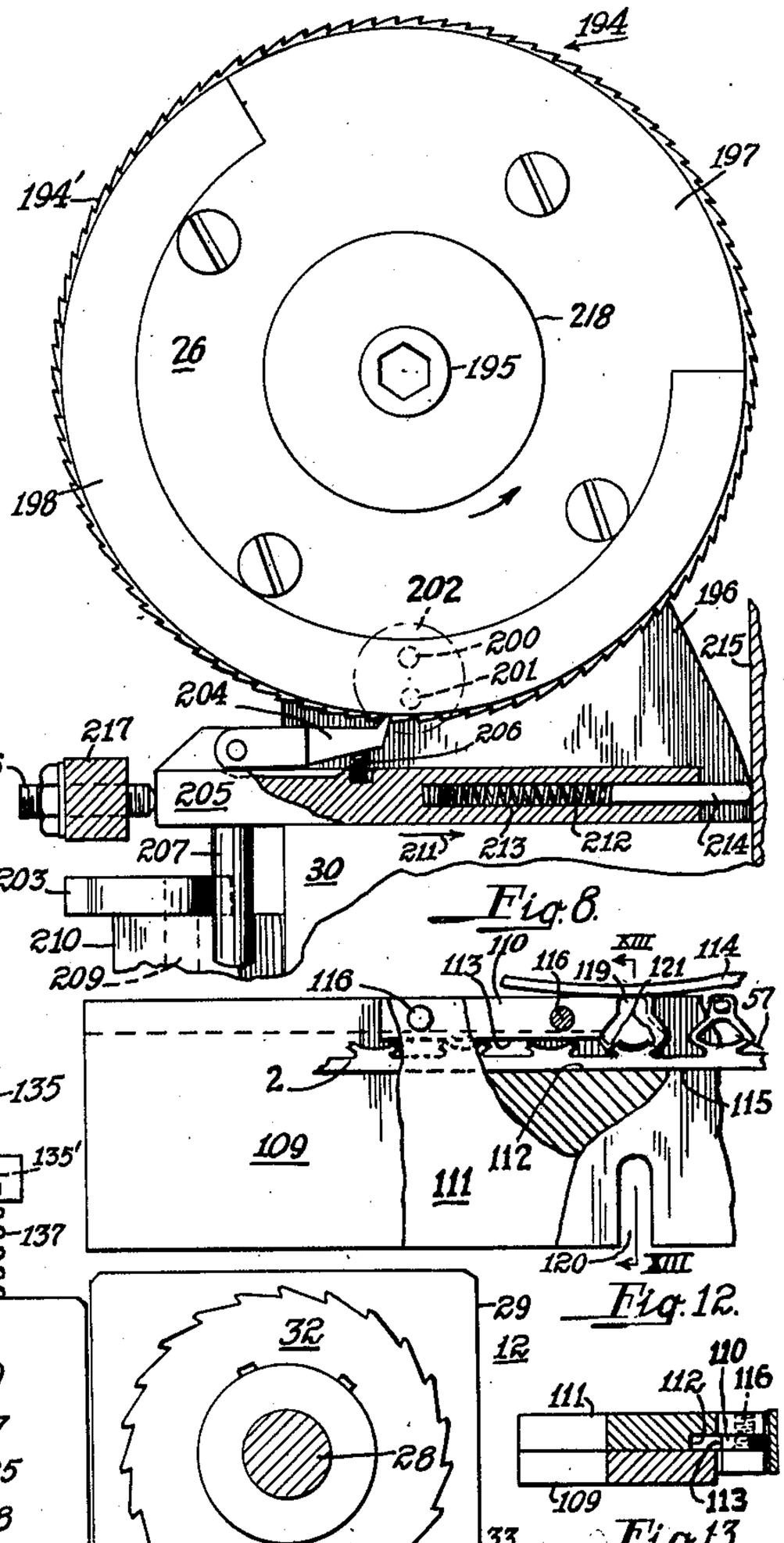

Fig. 8.

Fig. 12.

Fig. 13.

Fig. 9.

Einar M. Arentzen

By Green & McCallister

His Attorneys

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MACHINE FOR MAKING ZIPPER FASTENERS

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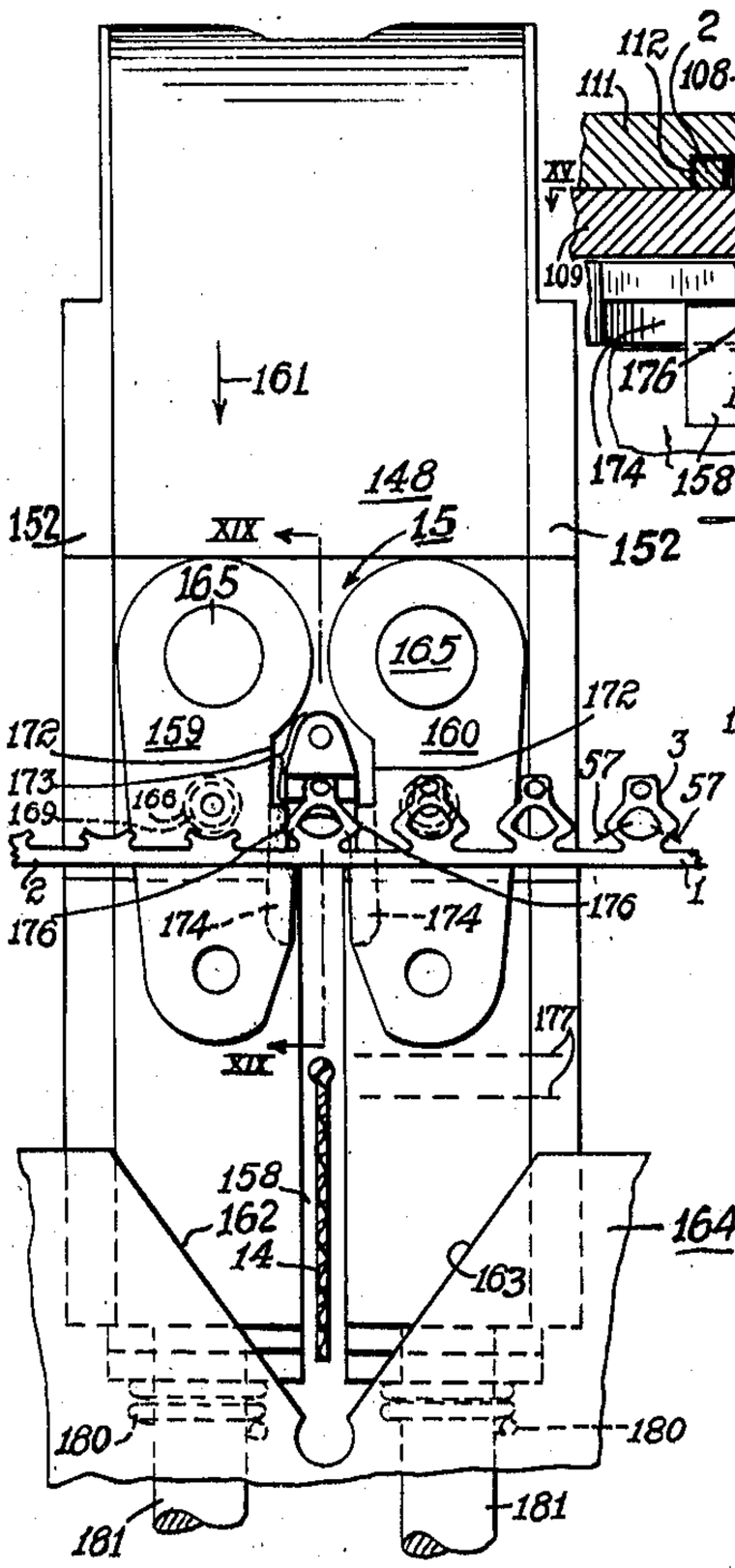

Fig. 16.

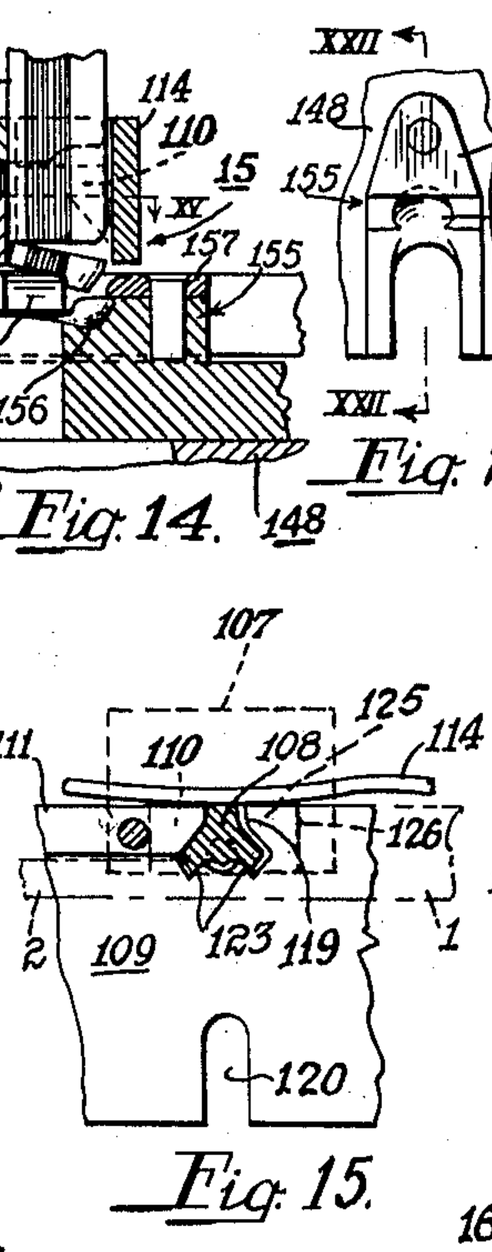

Fig. 15.

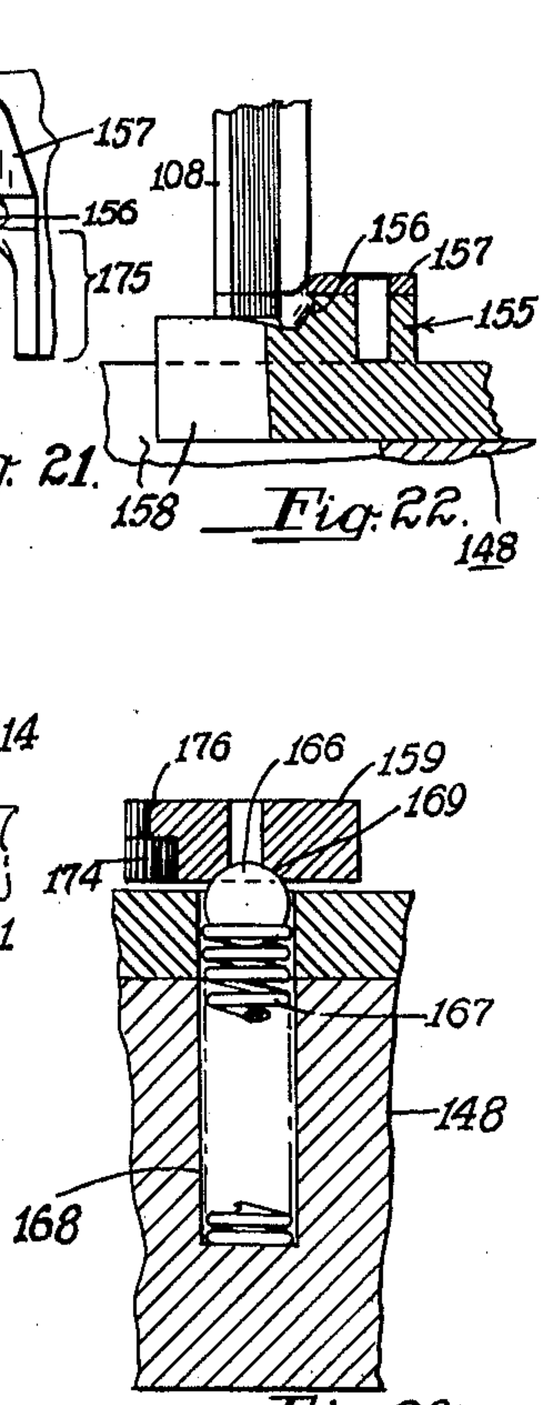

Fig. 20.

Fig. 14.

Fig. 21.

Fig. 22.

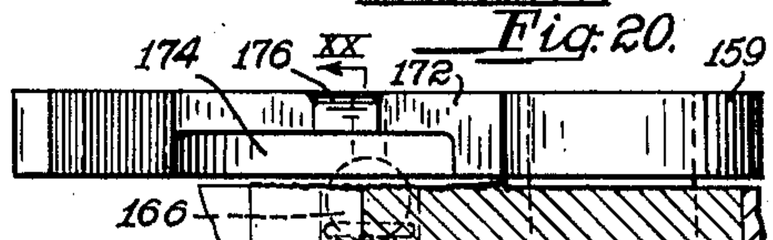

Fig. 19.

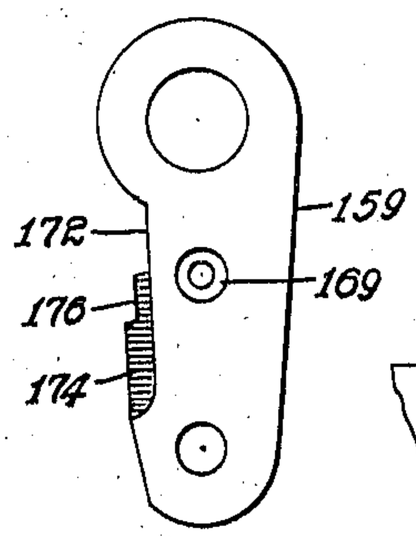

Fig. 18.

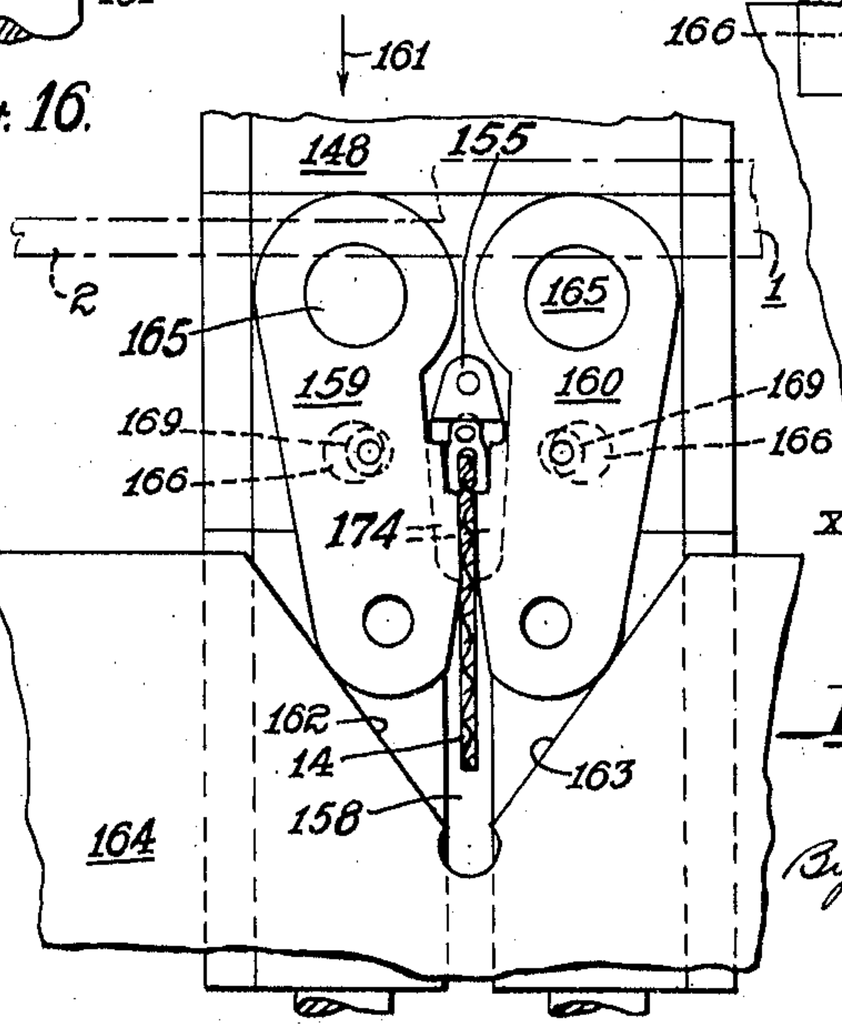

Fig. 17.

INVENTOR

Einar M. Arentzen

By Green & McCallister

His Attorneys

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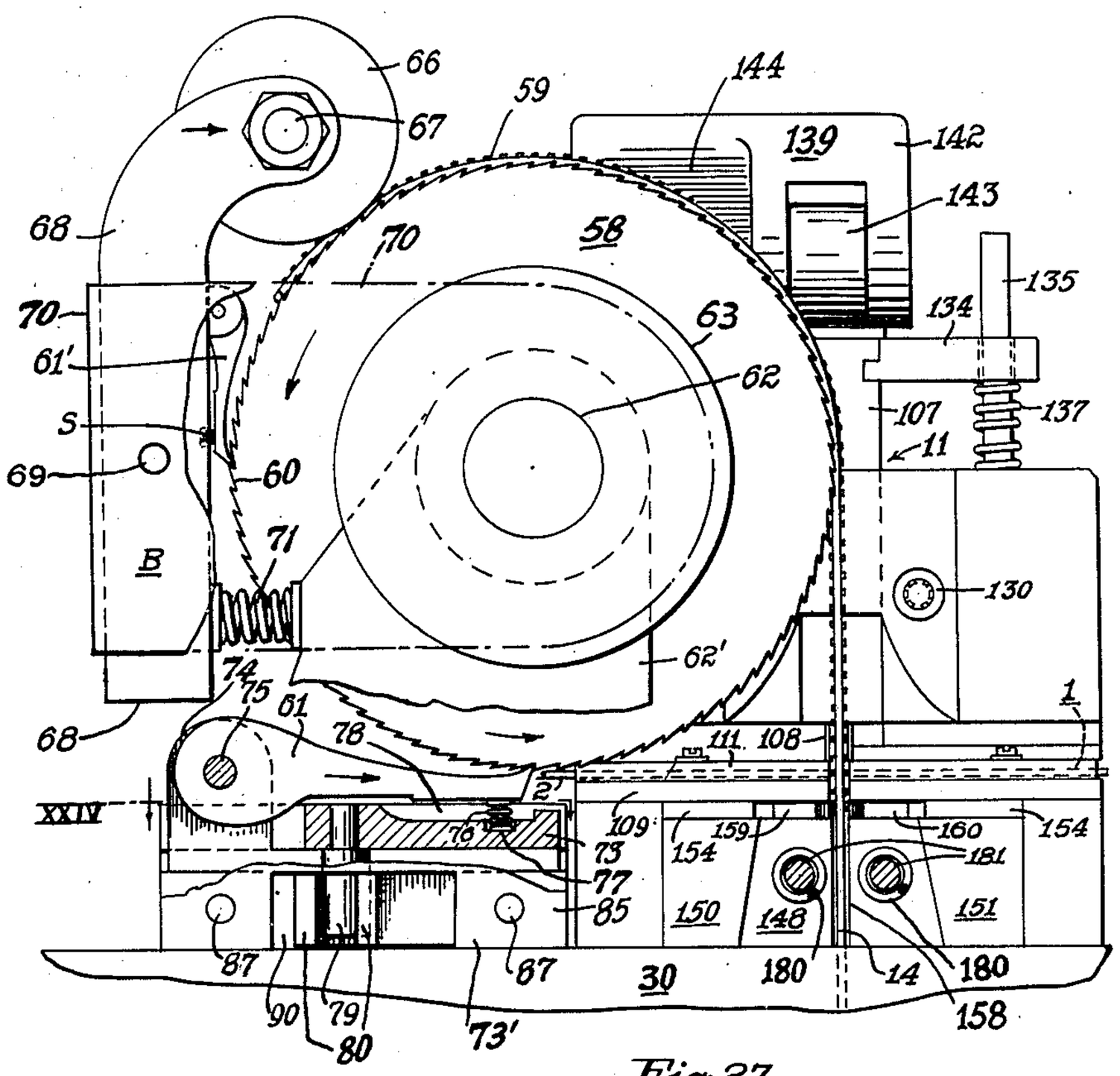

Fig. 27.

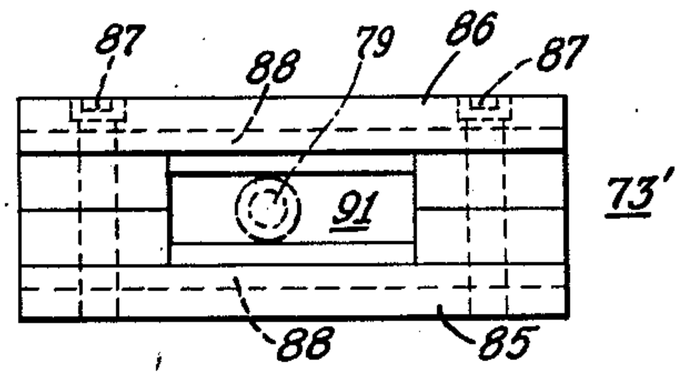

Fig. 24.

INVENTOR
Einar M. Arentzen
By Green & McCallister
His attorneys

Feb. 28, 1939. E. M. ARENTZEN 2,148,673

MACHINE FOR MAKING ZIPPER FASTENERS

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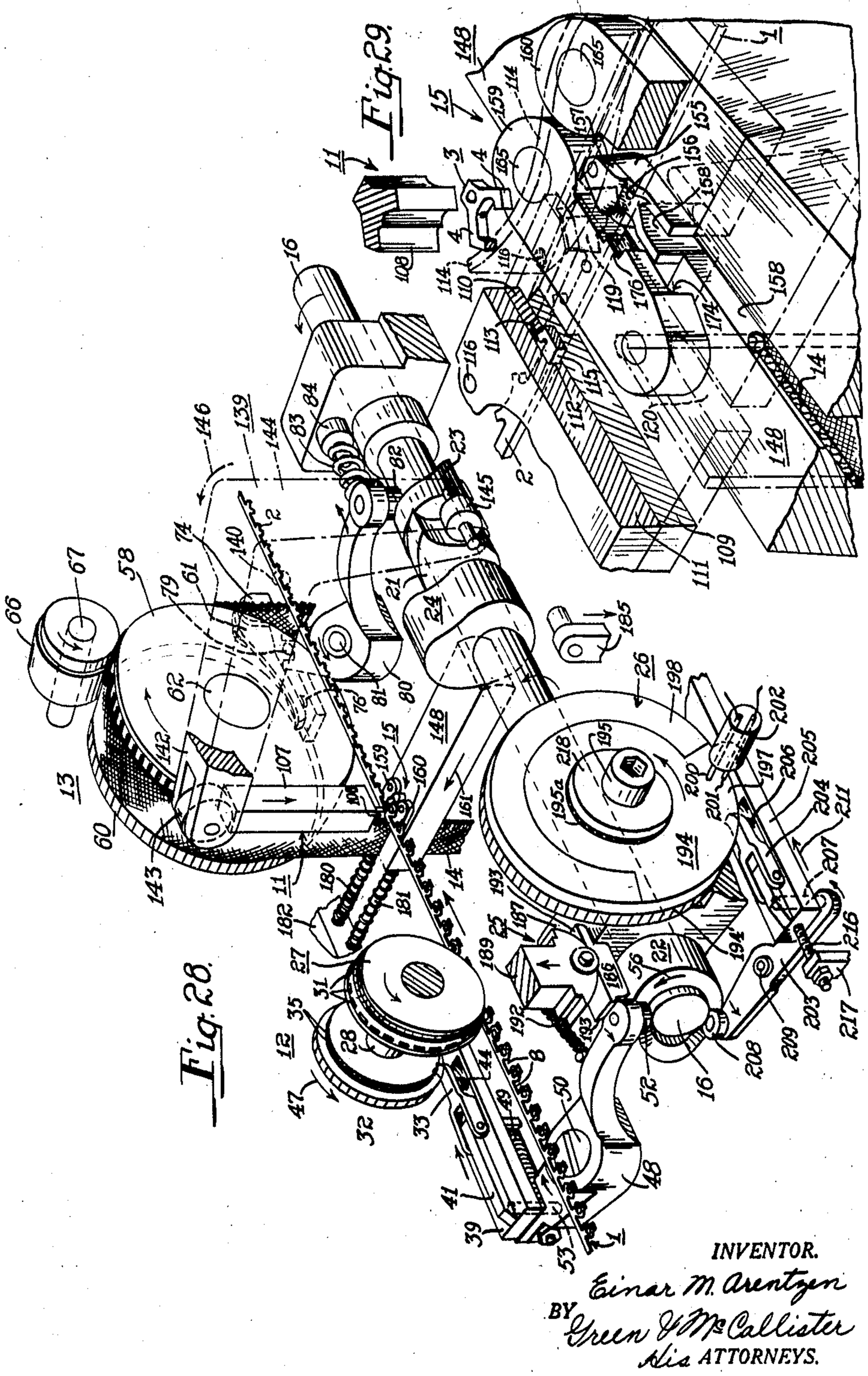

Fig. 28.

Fig. 29.

INVENTOR.
Einar M. Arentzen
BY Green & McCallister
His ATTORNEYS.

Patented Feb. 28, 1939

2,148,673

UNITED STATES PATENT OFFICE

2,148,673

MACHINE FOR MAKING ZIPPER FASTENERS

Einar Martin Arentzen, Franklin, Pa., assignor, by mesne assignments, to Joy Fastener Company, a corporation of Pennsylvania

Application April 17, 1937, Serial No. 137,567

25 Claims. (Cl. 153—1)

This invention relates to improvements in machines for attaching fastener elements to the edge of a flexible tape or carrier for use in making separable fasteners of the type commonly referred to as "zippers," and more particularly to a machine designed for use in connection with a ribbon-like member having fastener elements projecting laterally from an edge or side thereof; each fastener element having tape-gripping jaws at one end and an interlocking head at the other. Such a ribbon-like member having fastener elements projecting laterally therefrom is disclosed in my abandoned application Serial No. 114,605, filed December 7, 1936.

More particularly the invention relates to a machine for severing preformed fastener elements or scoops from a ribbon-like support member and attaching them to the edge of a flexible tape or carrier. The machine involves mechanism for feeding tape or carrier material, mechanism for feeding the ribbon-like support member with its unitarily connected fastener elements, a punch or severing mechanism for severing the elements from the ribbon-like member, mechanism for presenting the severed elements to the edge of the tape and clinching them thereto, and means for causing the aforesaid mechanisms to operate in a predetermined order or timed relationship to each other. The machine also involves apparatus for controlling the feed of the fastener elements so that any predetermined number of fastener elements may be attached to the tape or carrier in the proper spaced relationship, followed by an interruption in the feed of fastener elements and their support member without interrupting the tape feed, and then a resumption of fastener element feed so that a continuous carrier may be made having separated groups of fastener elements; the separation between groups being of a fixed length, say for example, two, three or four inches depending on how much clear tape is required at each end of each group of fastener elements. If these clear tape sections are severed at the middle thereof, individual fasteners or carriers are obtained having a group comprising a predetermined number of fastener elements thereon with one, one and one-half or two inches of clear tape at the ends of the group.

An object of this invention is to produce a machine of the character above set forth that shall be simple in construction, automatic in operation, and capable of being built in such small size that one operator can supervise the operation of four or more machines and be for all practical purposes within reaching distance of all the machines.

Another object of the invention is to produce a machine that shall be so simple in construction and so precise in operation that the carriers or zippers produced on one machine will match or be operative with those produced on any other machine.

A further object of the invention is to produce a machine having an improved feeding device for the fastener elements and an improved mechanism for stitching or securing the fastener elements to the carrier tape.

A still further object of the invention is to produce a machine that will attach the fastener elements to the tape in such a way that the holding power developed by the fastener element jaws will be equal to or greater than the tearing strength of fabric tape, and to provide a mechanism that will act on the tape-gripping jaws in such manner that the jaws will not be fatigued or over-stressed and thereby weakened.

These and other objects, features and advantages of the invention are set forth in, and will be apparent from, the following description taken in conjunction with the accompanying drawings, in which:

Figure 1 is a plan view of a portion of stock strip of fastener elements, i. e., a strip comprising a ribbon-like member having a plurality of fastener elements projecting laterally from one edge thereof; and designed to be fed to the machine embodying the invention, the machine severing the individual elements from the ribbon-like support member and attaching them to the edge of a carrier or tape;

Fig. 1A is a plan view of a stringer or carrier tape to one edge of which groups of fastener elements have been attached, the groups being separated to provide portions of clear tape;

Fig. 1B is a view looking at the ends of the carrier or stringer shown in Fig. 1A;

Fig. 1C is a general organization view, more or less schematic in character, of a machine for severing the fastener elements from the strip shown in Fig. 1 and attaching them to the edge of a tape or carrier to produce the article shown in Fig. 1A;

Fig. 2 is a top plan view, approximately to full scale, of the machine shown in Fig. 1C;

Fig. 3 is an end view of the machine as seen looking from left to right in Fig. 2;

Fig. 4 is a sectional view taken on line IV—IV of Fig. 2;

Fig. 5 is a sectional view taken on line V—V of Fig. 2;

Fig. 6 is a more or less diagrammatic view illustrating the sequence of the cams of the machine which operate and control the timing of the operations of the various mechanisms of the machine shown in Figs. 1 and 2, this view being taken as seen in the direction of the arrows 5—5, Fig. 2 as are seen looking at the end of the drive shaft in Fig. 4;

Fig. 7 is a view in side elevation showing a lock-out mechanism for controlling the feed of the stock strip shown in Fig. 1 and is taken on line VII—VII of Fig. 3;

Fig. 8 is a view in side elevation, partially in section, of a device for controlling the lock-out mechanism shown in Fig. 7 and is taken on line VIII—VIII of Fig. 3;

Fig. 9 is a partial view of the front of the machine showing the punch or severing mechanism assembly and a mechanism for feeding the stock strip shown in Fig. 1;

Fig. 10 is a view in front elevation of the die punch block forming part of the mechanism shown in Fig. 9;

Fig. 11 is a view in section taken on line XI—XI of Fig. 10;

Fig. 12 is a view of the die plate embodying the punch mechanism shown in Fig. 9, this view being taken on a plane corresponding to line XII—XII of Fig. 9, and showing other details of construction having to do with the control of the feed of the stock strip;

Fig. 13 is a sectional view taken on line XIII—XIII of Fig. 12 showing the die plate and the stripper plate of the punch mechanism;

Fig. 14 is a partial view in section taken on line XIV—XIV of Fig. 9;

Fig. 15 is a view similar to the view of Fig. 12 but is taken on line XV—XV of Fig. 14 showing the punch in section;

Fig. 16 is an enlarged top plan view of a mechanism which receives the fastener elements as they are severed by the punch mechanism and places these elements with the jaws thereof astride the edge of the carrier tape and clinches them thereto;

Fig. 17 is a view similar to Fig. 16 showing the mechanism in the position required to clinch the jaws of the fastener elements to the carrier tape;

Fig. 18 is a bottom view of an element embodied in the mechanism shown in Figs. 16 and 17;

Fig. 19 is a view in section taken on line XIX—XIX of Fig. 16;

Fig. 20 is a view in section on line XX—XX of Fig. 19;

Fig. 21 is an enlarged top plan view of an element having a nest or pocket into which the fastener elements are deposited by the punch after severing such elements from the stock strip support ribbon;

Fig. 22 is a view in section taken on line XXII—XXII of Fig. 21 showing the punch in its lowermost position with a fastener element deposited within the nest;

Fig. 23 is a view in side elevation of a pawl embodied in the stock strip feeding mechanism shown in Fig. 2;

Fig. 24 is a plan view of the guide for the pawl support block shown in Fig. 23;

Fig. 25 is a side view of the lower tape guide and tightening device employed in a machine as illustrated in Fig. 1C;

Fig. 26 is a top plan view of the guide shown in Fig. 25;

Fig. 27 is a partial view in side elevation, and partly in section, showing a modified form of control for the tape feed wheel;

Fig. 28 is a perspective view showing the principal operating parts of the machine; and

Fig. 29 is an enlarged perspective view of certain of the parts shown in Figure 28.

Throughout the drawings and the specification like reference characters indicate like parts.

In Fig. 1 of the drawings, there is illustrated a portion or section of a stock strip 1 comprising a band or ribbon-like support member 2 having a plurality of preformed spaced fastener elements 3 formed unitarily with one edge or side of the support member and projecting laterally therefrom. Each of the fastener elements includes spaced portions 4 which when severed from the ribbon-like member form tape gripping jaws, and an interlocking head 5; the head having on one side a recess 6 and on the opposite side a projection 7. Stock strip material 1 may be made on a special machine and coiled and fed from the coil to the machine disclosed herein, as stated in my aforementioned application, or the stock strip may be produced on a forming machine operating synchronously with the machine herein disclosed.

The stock strip shown in Fig. 1 is formed with a series of precisely spaced feed notches or openings 8 that cooperate with the feeding mechanism of the machine to allow accurate and precise feeding thereof to the severing punch or cut-off mechanism. As stock strip 1 is fed to the machine, fastener elements 3 are severed one by one from the ribbon-like member 2 and attached to the edge of a tape to form a zipper element or member, as shown in Figs. 2 and 3.

The machine includes a device for so controlling the feed of stock strip 1 that spaced groups of elements may be attached to a continuous tape; the space 10 between groups and the number of elements to a group being accurately and precisely controllable by this device.

The machine herein disclosed comprises a punch or severing mechanism 11; a mechanism 12 for feeding the stock strip 1 to the severing mechanism; a mechanism 13 for feeding tape 14; a mechanism 15 (Figs. 4, 14, 28 and 29) for receiving fastener elements 3 from the punch or cut-off mechanism after they have been severed from the band or ribbon-like support member 2 and transferring and attaching them to the tape, and a drive shaft 16 connected by pulleys 17, 18 and belt 19 to a driving motor 20. A series of cams 21, 22, 23 and 24 are mounted on shaft 16 for operating the respective mechanisms 11, 12, 13 and 15 in a fixed predetermined order or timed relationship.

The mechanism also includes mechanism 25 (Figs. 3, 7 and 28) for stopping the stock strip feeding mechanism and a control mechanism 26 for operating the feed control mechanism. Control mechanism 26 is operated by cam 22 on the shaft 16 and is designed to control precisely the number of fastener elements in a group that are attached to the tape and the length of clear tape or gap between groups (see Fig. 1A). By omitting the control device, the number of elements attached without an intervening gap would be indeterminate and controllable manually at will. In either case, the spacing between adjacent elements 3 would be the same, as the spacing is determined by the amount of tape fed in the interim

between the attachment of consecutive elements to the tape.

Stock strip feeding mechanism

The mechanism for feeding the stock strip shown in Fig. 1, (this strip may be fed from a reel R1) comprises a wheel **27** (Figs. 2, 3, 9 and 28) mounted fast on a spindle **28** journalled in a pedestal **29** secured to a bed plate **30**. The wheel **27** is provided on its periphery or circumference with a plurality of evenly spaced projections or sprocket-like teeth **31**, shaped to register with and fit into openings or notches **8** in the stock strip, and to advance the stock strip into the machine as the wheel turns, much the same as a sprocket chain is driven by a sprocket wheel. The stock strip feed mechanism also includes a ratchet wheel **32** secured fast to spindle **28**, the ratchet wheel and feed wheel being on opposite sides of pedestal **29**, and a pawl **33** for turning the ratchet wheel, spindle and feed wheel step-by-step with an intermittent motion.

In order that the feed wheel **31** shall stop immediately at the end of the feed stroke of pawl **33**, a brake is provided which imposes a high friction drag on the spindle. This brake may, as illustrated, comprise discs **35** of fiber or other suitable material placed between ratchet wheel **32** and pedestal **29**. The friction developed is a result of the pressure imposed on the fiber discs **35** by the ratchet wheel **32**, and this pressure can be obtained by tightening nut **36** which is threaded on the spindle, until the desired pressure is obtained. A lock nut **37** holds the adjustment thus made. A hand wheel **38** is also attached to spindle **28** whereby the stock strip feeding mechanism may be operated manually at times when it is necessary to thread stock strip **1** into feeding engagement with the sprocket teeth of feed wheel **27**.

Pawl **33** is mounted on a block **39** disposed between a shoulder **40** on pedestal **29** and bed plate **30**. The upper face of the block **39** is provided with an upwardly projecting rib **41** to the forward end of which the fixed end of pawl **33** is pivotally secured by a pin **42**. The fixed end of pawl **33** is provided with spaced lugs **43** that straddle rib **41**; pin **42** passing through the rib and the lugs. The forward end of the pawl is sharpened to a point so that it will work smoothly with the teeth on the ratchet wheel **32**. Pawl **33** is urged upwardly into engagement with the teeth of ratchet wheel **32** by a spring **44** nested in a socket **45** in block **39**. To provide operating clearance between pawl **33** and block **39**, the block is recessed as at **46**.

Pawl **33** is actuated through its feed or working stroke, i. e., in a direction to turn ratchet wheel **32** in the direction of arrow **47**, by a lever **48** disposed for operation by cam **22**, and is returned after completing its working stroke by a spring **49**. Lever **48** is pivotally mounted at about its mid-point on a pin **50** carried by a bracket **51** secured to the bed plate **30**. One end of lever **48** carries roller **52** that engages cam **22**, and the other end is slotted to receive a pin **53** carried by the pawl support block **39**. Spring **49** is a compression spring and is, therefore, conveniently mounted between lever **48** and bed plate **30**. The slot in the end of lever **48** in which pin **53** is received is made wider than the diameter of the pin in order that adjustment in the stroke, i. e., the working stroke of pawl **33**, may be accomplished. This adjustment may be obtained by providing a screw **55** the head of which may be moved towards or away from the pin, thereby varying the working clearance between the head of the screw and the pin to allow for the proper adjustment in the working stroke of the pawl.

Each time lever **48** is actuated by the cam **22** in the direction indicated by arrow **56** (see Figs. 2 and 28), ratchet wheel **32** and feed wheel **27** are advanced together one tooth, whereby the stock strip is advanced far enough to position an element **3** in the cut-off die or punch **11**, i. e., the element is so positioned that jaws **4—4** of the fastener element are severed at points indicated at **57—57** (Figs. 1, 12, 16 and 29).

Tape feeding mechanism

The tape feeding mechanism (shown in Figs. 2, 3, 5, 27 and 28) comprises a wheel **58** having a knurled surface **59** and a plurality of ratchet teeth **60** at the periphery of one side thereof, and a pawl **61** (Figs. 23 and 27) disposed to engage the ratchet teeth. Wheel **58** is secured to a spindle **62** journaled in a pedestal **62'** secured to bed plate **30**. The spindle also carries a hand wheel **63** whereby the tape feed wheel may be turned manually for adjustment purposes. A groove **64** (Figs. 2 and 5) is formed in wheel **58** on a side opposite from the ratchet teeth and this is wide enough to accommodate the fastener elements after they have been secured to the same, as the tape moves over the knurled surface. This groove tends to guide the tape and to hold it in the position required to properly secure the fastener elements to the tape.

In order to provide sufficient tension in the portion of the tape between wheel **58** and a lower tape tightener and guide **65**, (Fig. 25) and also to provide the friction necessary to feed the tape, a roller **66** (Figs. 3, 27 and 28) is provided which is so mounted that it bears firmly against the tape, squeezing the tape tightly against the knurled surface of wheel **58**. Roller **66** is preferably made of yieldable material, such as rubber, or of metal provided with a yieldable tire of rubber, for example, and is mounted on a bearing pin **67** secured to a lever **68** (Figs. 1C, 3 and 27). Lever **68** is fulcrumed at a point between its ends on a pin **69** secured to a bracket **70**, and this lever is urged counterclockwise, as seen in Fig. 1C, by a compression spring **71** disposed between the lower end of the lever and pedestal **62'**. The tension of this spring is adjusted until roller **66** bears with the required pressure on tape **14** as it passes over the wheel **58**.

Pawl **61** is carried on a sliding block **73** mounted in a guide **73'** secured to the bed plate **30** (Figs. 2, 3, 5, 27 and 28). The rear end of the block is formed with spaced upwardly extending lugs **74** between which the rear end of pawl **61** is positioned and wherein it is pivotally secured by a through pin **75**. The forward end of the pawl rests on a compression spring **76** nested in a socket **77** in block **73**. This spring urges the point of the pawl into engagement with the ratchet teeth **60**. A portion of block **73** is recessed at **78** to provide operating clearance for the pawl.

A pin **79** which depends from the lower face of sliding block **73** is engaged by a forked lever **80** disposed to reciprocate the block and pawl carried thereby to effect a tooth-by-tooth advance of feed wheel **58**. Lever **80** is fulcrumed near its forked end on a pin **81** secured to the bed of the machine and carries a roller **82** at its opposite end which engages cam **23**. A compression spring **83** mounted between the roller end of lever **80** and an abutment **84** holds the roller in engage-

ment with the cam 23, thereby causing the lever to oscillate with the throw of the cam and to reciprocate pawl 61 for the purpose above described.

In order to prevent turning of wheel 58, either because of the pull exerted thereon by the tension in tape 14 or because of the sliding friction between pawl 61 and ratchet teeth 60, a friction drag is imposed. This drag may comprise discs 60' of fiber or other suitable material positioned on spindle 62 between wheel 58 and pedestal 62'. By drawing wheel 58 up tightly against discs 60' the necessary friction is obtained to cause the wheel to stop and remain stationary at all times except when turned by pawl 61 or by the manual turning of hand-wheel 63.

In Fig. 27 a different arrangement is illustrated to obtain precise and uniform feed of the tape. In this arrangement the friction discs 60' are omitted and a pawl 61' is provided which prevents back travel of the tape feed wheel. Pawl 61' is pivotally supported on a bracket B and is yieldingly urged into engagement with the ratchet teeth 60 by means of a spring S. With this arrangement a high degree tension is imposed on tape 14 so that when wheel 58 is advanced slightly more than one tooth by pawl 61, the stretch of the tape will turn the wheel in the opposite direction until pawl 61' solidly engages a tooth 60. Thus, exact and precise feeding of the tape as well as exact, precise and uniform spacing of elements 3 on the tape are obtained.

Guide 73' comprises two side members 85 and 86 (Figs. 5, 23, 24 and 27) secured together with bolts 87 and provided with a dove-tailed slot 88 in which the flanges 89 of block 73 are slidably disposed. The side members are cut out as at 90 (Fig. 27) to receive the forked end of lever 80 and slotted longitudinally to provide a way 91 for pin 79. The throw of cam 23 is so designed that when said pawl 61 is moved through its working stroke the tape will be advanced a distance equal to the spacing between elements 3.

Lower tape guide and tightener

The lower tape guide and tightener 65 is illustrated in detail in Figs. 25 and 26, and comprises a block having an upper portion 92 of substantially L-shape in transverse section and a lower angularly disposed portion 93. The upper portion is provided with elongated openings or slots 94 for the reception of bolts 95 whereby the guide and tightener may be adjustably secured to the under side of the bed plate of the machine. The tape passes from a reel RT through a series of rollers 96, 97 and 98 mounted on portion 93 of the block and upwardly between jaws 99 and 100 which yieldingly grip the tape. The rollers have grooves G at their outer ends to receive the beaded edge of tape 14.

As may be seen in Fig. 25, the tape passes under roller 96 over roller 97 and under roller 98 into the space between jaws 99 and 100. These jaws are grooved, as shown, to accommodate the beaded edge of the tape 14. Jaw 99 is provided with a flange 101 that is secured with screws 102 to portion 92 of the block. Jaw 100 is movably mounted on a stem 103 that passes through the portion 92 of the block and this jaw is urged against the tape by means of springs 104 disposed in the sockets 105. The tension of these compression springs is adjusted by means of screws 106 threaded into the sockets. By means of the elongated slots 94 in the upper face of the block, the guide and tightener may be adjusted to the proper position. When the tape passes out of jaws 99–100 it moves vertically upward over the knurled surface of wheel 58, as previously pointed out.

Cut off die or severing mechanism

The cut off die or severing mechanism (Figs. 4, 9, 12, 14, 15, 22, 27, 28 and 29) comprises a plunger 107 to the lower end of which a punch 108 is secured, a die-plate 109, a stop 110 secured to the plate to prevent overfeed of stock strip 1, and a stripper plate 111 positioned above the die-plate and the stop. In order to guide the stock strip accurately into the cut off die, the stripper plate is formed with a shoulder 112 which, together with edge 113 of stop 110 form a channel that guides the ribbon-like support member 2 of the stock strip through the machine after fastener elements or scoops 3 have been severed therefrom. Also, a spring 114 is utilized to cause edge 115 of support member 2 to bear against shoulder 112 of the stripper plate, (Fig. 12) thereby insuring accurate lateral positioning of fastener elements 3 with respect to the die punch as they are brought into abutment with stop 110.

The stripper plate, stop and die-plate are secured together in proper relationship by screws 116 (Figs. 12, 13 and 29) and these elements are secured as a unit by screws 117 to a die block 118 (Figs. 4 and 9).

Die-plate 109 is formed with an opening 119 having a shape corresponding in general outline to the shape of the fastener element 3 and a slot 120 at the opposite edge through which the tape passes in its travel from the lower tape guide and tightener 65 to the tape feed wheel 58. Opening 119 is provided with cutting edges 121 disposed at such an angle that the jaws 4—4 of the fastener elements will be severed along lines 57—57 indicated in Fig. 1 and as shown by the cut edges on support member 2 in Figs. 11 and 12.

Punch 108 (Fig. 15) is of the same general shape in transverse section as die opening 119 and is provided with cutting edges 123 that cooperate with cutting edges 121 (Figs. 11 and 12) in the die plate. The upper end 125 of the punch is enlarged and somewhat rectangular in section and this portion is received in a socket 126 in the lower end of plunger 107 (Fig. 9) and secured thereto by means of a screw 127.

Die block 118 is formed with a vertical groove 128 in which plunger 107 is guided (Figs. 10 and 11). The plunger is held in the guide slot by means of a plate 129 (Fig. 9) which is secured to the block by means of screws 130 (Fig. 9). At the sides of groove 128, the block is milled out to allow plate 129 to be set into the block with its outer face substantially flush with the outer face of the block.

The front face of block 118 is slotted horizontally to provide bearing surfaces 131 and 132 for die-plate 109, and the lower face of the block is milled out to provide a way 133 to accommodate the fastener element transfer and clinching mechanism 15.

The upper end of die plunger 107 is secured to a cross head 134 (Fig. 9) which is guided by pins 135 extending through holes 135' in the opposite ends of the cross head. Pins 135 are threaded into the die block, the blocks being drilled and tapped at 136 (Fig. 10) for that purpose. The die plunger is urged upward by means of springs 137 disposed about pins 135 and between the cross head and the block, and the lower ends of these springs are nested in sockets 138 formed in the block, and concentric with the holes 136.

Die plunger 107 is moved downward through its working or fastener element cut-off stroke by means of a bell crank 139 (Figs. 2, 4 and 28) which is mounted on a pin 140 supported in brackets 141 secured to the bed of the machine. The end of arm 142 of the crank carries a roller 143 that bears on the upper end of the die plunger, and the end of arm 144 carries a roller 145 that is engaged by cam 21. The cam turns lever 139 in the direction of arrow 146 to actuate the die punch through its cut-off or working stroke and is returned by springs 137. The extent of the return of the die plunger and bell crank may be limited by means of a stop 147 secured to the die block.

Fastener element receiving, transferring and attaching mechanism

Mechanism 15 comprises a slide 148 (Figs. 4, 9, 27, 28 and 29) mounted for sliding movement in a groove 149 in bed plate 30 and the way 133 (Fig. 10) of die block 118 and is guided between blocks 150 and 151 (Fig. 9). Blocks 150 and 151 and the sides 152 of the sliding block are oppositely inclined, as shown, to form a dove-tailed joint to prevent slide 148 from moving vertically and to maintain it in a fixed path of movement as it is moved back and forth by cam 24. Shims or spacers 154 may be utilized to hold blocks 150–151 in such position as to provide a neat sliding fit for slide 148.

Slide 148 (Figs. 14, 16, 21, 22 and 29) is formed with a boss 155 in which a recess 156 is formed to accommodate the projection 7 of a fastener element 3, and on top of this boss a small plate 157 is secured. One end of plate 157 slightly overhangs the back edge of recess 156 so that when a fastener element has been cut off and deposited with the interlocking head portion thereof in the recess, the element cannot be pulled out of the recess when the die punch is withdrawn. The action involved in so depositing a fastener element 3 that its head portion is received in the recess and with the end of the head under plate 157 will be described subsequently herein.

Slide 148 is provided with a slot 158 extending from its forward end to a point adjacent recess 156 in boss 155 (Figs. 9, 14, 22, 27 and 29) to provide a way for tape 14. Tape 14 passes upwardly through this slot with the beaded edge thereof presented to the inner end of the slot.

On each side of boss 155 fingers 159 and 160 are mounted (Figs. 16, 17, 18, 19, 20 and 29). These fingers serve a three-fold purpose; first, they coact with plate 157 to hold a fastener element 3 in place after it has been severed from the stock strip and to prevent such severed element from being withdrawn by the die punch; second, these fingers hold the fastener element securely in place as the slide moves in the direction indicated by arrow 161 in Figs. 16 and 17; and third, they squeeze jaws 4—4 of the elements to the beaded edge of the tape.

Fingers 159 and 160 are actuated to clinch the jaws 4—4 to the tape by cam surfaces 162 and 163 formed in a plate 164 (Figs. 16 and 17) rigidly secured to the front of the bed plate 30 of the machine. The rear ends of fingers 159 and 160 are pivotally secured to slide 148 by means of pins 165—165. Each finger is urged to the position shown in Fig. 16 by a ball 166 which rests on the upper end of a spring 167 disposed in a socket 168 formed in slide 148 (see Fig. 20). Each finger is provided with a concave or spheroidal recess 169 shaped to fit the contour of its cooperating ball 166. Springs 167 urge the balls 166 into the recesses 169 of the respective fingers, thereby tending to yieldingly hold the fingers in a fixed position.

If a force is applied to either or both fingers 159 and 160 to turn them to either side of the position shown in Fig. 16, balls 166 are depressed, compressing springs 167; therefore, when the applied force is released, the balls being urged upwardly by the springs tend to seat themselves fully in the recesses, thereby returning the fingers to their normal position as shown in Fig. 16.

The inner edges of fingers 159 and 160 are notched as at 172 to clear the sides of portion 173 (Fig. 16) of boss 155 when the fingers are turned to the position shown in Fig. 17. Also, the inner bottom edges thereof are undercut at 174 to clear and overlap the sides of portions 175 (Fig. 21) of boss 155. The portions of fingers 159 and 160 that engage the jaws 4 of the fastener elements 3 are notched at 176 and the vertical faces of these notched portions are so rounded or curved, as shown, that when the die punch is pushing a fastener element toward the top of boss 155, jaws 4 will on contacting these rounded faces cause the fingers to separate sufficiently to allow the elements to be deposited firmly on top of the boss with the upper surfaces of the fastener element horizontal and with the projection of its head portion positioned within recess 156. When the element is so deposited, fingers 159 and 160 return to their normal positions and partially overlap the ends of these fastener jaws and yieldingly grip them thereby holding the elements positively in position. When slide 148 is moved towards plate 164 in which cam surfaces 162 and 163 are formed, the fastener element 3 carried between fingers 159 and 160 is placed with its jaws 4 astride the beaded edge of the tape.

The tape is brought up through slot 158 with the beaded edge offset inwardly from the position shown in Fig. 17 so that the crotch, i. e., the surface at the junction of the jaws of the fastener elements, will be pressed firmly against the beaded edge before jaws 4 are squeezed together, as shown in Fig. 17.

The tape is held taut with such a degree of tension between feed wheel 58 and the lower tape guide 65, that, when the jaws 4 of a fastener element 3 are squeezed together, such element 3 will extend outwardly and at right angles to the edge of the tape and so that when a series of elements are attached to the tape the outer ends of the interlocking heads of the elements will all lie in a straight line, or, in other words, be equidistant from the beaded edge of the tape.

The approximate amount by which the beaded edge of the tape is displaced, when an element is placed with its jaws astride the same, is indicated by the space between dotted lines 177, Fig. 16.

As the slide 148 moves in the direction of arrow 161, the rounded ends of fingers 159 and 160 engage cam surfaces 162 and 163 whereby these fingers are turned gradually towards the tape. At the beginning of this turning movement, pressure is applied at the outer ends of jaws 4 of the fastener elements, causing them to bend towards the tape. The closer fingers 159 and 160 are brought together by cam surfaces 162 and 163, the greater will be the grip between the fastener elements and the tape, but at the same time the area of contact between jaws 4 of the fastener element and the inner sides of the fingers 159 and 160 is increased and at the finish of the

squeezing action the squeezing pressure is applied along substantially the full length of jaws 4.

This action of fingers 159 and 160 on jaws 4 of an element is one that prevents over-stressing of the metal as the squeezing force is gradually applied and gradually distributed over an ever increasing area. By applying such a squeezing force, the full length of the jaws is effective in gripping the tape and, since the metal is not over-stressed, the jaws do not open up and release their grip after the squeezing pressure is removed. Actual tests have demonstrated that fastener elements applied to a tape in the manner above described cannot be pulled off the tape as the tape will tear before sufficient force can be applied to cause the grip of the jaws to yield. Since the jaws grip the tape over a wide area, the threads of the tape are not weakened and tests have shown that a greater load can be put on the fastener elements without causing the tape to tear, than can be put on fastener elements attached to tapes in accordance with prior art methods and machines.

Slide 148 is moved forwardly in the direction of the arrow by cam 24 (Figs. 4 and 16) and is returned by springs 180 that are compressed during this forward movement. Springs 180 of the coil type are disposed about guide rods 181 threaded into the front end of the slide, one on each side of slot 158. The outer ends of rods 181 extend through suitable guide openings in a thrust plate 182 which is rigidly secured to the bed plate 30 of the machine.

In order that the die opening 119 and the nest or repository formed by fingers 159 and 160 and the recess 156 in boss 155 may be kept clean and free of metal and other particles, means are provided for subjecting this repository to a blast of air of sufficient velocity to blow such particles out of the same. This means comprises a tube 183 (Fig. 4) having an orifice disposed adjacent die opening 119 in the die-plate. The tube is connected to a valve 184 the stem 185 of which is actuated by cam 24. The valve is connected to a source of supply of compressed air (not shown). Each time slide 148 is returned to the position shown in Fig. 16, at which time the die punch is in its uppermost position, valve stem 185 is depressed allowing a blast of air to be directed into the die-plate and the repository as above stated.

Stock strip feed control and group control mechanism

Zipper fasteners as produced commercially are usually made to specified lengths; that is, each stringer contains a predetermined number of fastener elements and a specified length of clear tape at each end of the group of fastener elements, the length of clear tape at each end usually being about one and one-half inches. The machine herein illustrated is so designed that fastener elements 3 may be applied without interposing any gap of clear tape between any group of elements, or the elements may be attached to the tape in groups, each group containing any predetermined number of elements with a gap or clear space of any predetermined length between groups as shown in Fig. 1. To accomplish grouping of elements 3 the feed of stock strip 1 may be stopped, without stopping the feed of tape 14, when a group of elements containing the desired number has been attached to the tape, until a length of clear tape equal to, say, three inches, has been fed through the machine. When this length of clear tape has been fed, the feed of stock strip is resumed and when another group of fastener elements has been attached, the feed of the stock strip is stopped again without stopping the tape feed, and so forth. In this manner a continuous stringer or carrier having a series of spaced groups of elements 3 attached to the edge of the tape is obtained. To obtain individual zipper elements, the clear tape portions are cut in the middle thereof whereby a clear tape portion of one and one-half inches in length is provided at each end of the group of fastener elements of the zipper element.

The feed of the stock strip may be stopped, in the case of the machine herein shown, by holding the strip feed lever 48 out of operative engagement with cam 22. This may be accomplished by causing a plunger or block 186 to be inserted between shaft bearing 187 and the roller end of lever 48 as shown in Figs. 7 and 28. When this block is in the position shown in Figs. 7 and 28, the strip feed mechanism is locked, i. e., this mechanism is rendered inactive and the feed of strip is arrested. When the feed of strip is to resumed, block 186 is raised out of locking position to allow roller 52 of lever 48 to follow the contour of cam 22 and thereby cause the strip feed mechanism to resume its feed operations. Means are provided comprising a solenoid 188 having a core 189 connected at one end by a pin 190 to block 186 for controlling the position of the block. The solenoid is supported by a bracket 191 secured to the housing of bearing 187.

When the solenoid is energized the core is pulled up thereby lifting block 186 out of the path of lever 48. The position of the lowermost face of block 186, when elevated, is shown in Fig. 3. So long as the solenoid is energized the stock strip is fed to the severing die of the machine. When the solenoid is deenergized, core 189 is pulled downward by spring 192 to locking position as shown in Figs. 7 and 28 the moment the feed lever 48 is at the end of its feeding movement.

In order to limit the downward movement of core 189, block 186 is provided with wings 193 which when block 186 is in locking position rests on the top of bearing 187 and the top of the end of lever 48 above roller 52. By limiting this downward movement, positive attraction of the core by the solenoid each time the solenoid is energized, as assured.

The energization of solenoid 188 and, therefore, the control of the stock strip feed mechanism is governed by control mechanism or device 26 (Figs. 3, 8 and 28). Device 26 comprises a wheel 194 rotatably mounted on a pin 195 in a bracket 196 secured to the bed plate of the machine. A plate 197 of insulating material is secured to one face of the wheel. Plate 197 is formed with a segmental recess in which a segment of a metallic strip 198 is secured. A plug 199 having spaced contact pins 200 and 201 is mounted in a socket 202 with the contact pins disposed line and line on the vertical diameter of wheel 194 and in contact with the wheel face. The contact pins are in series circuit with the solenoid 188 so that as long as these contact pins engage metallic segment 198, the solenoid is energized, but when the metallic segment passes out of contact therewith, the solenoid is deenergized.

Wheel 194 is provided with ratchet teeth 194' around its periphery and the number of teeth employed determines the number of fastener elements that will be attached, in a group, to the tape and the length of gap between groups. Thus, if, for example, for a given spacing be-

tween individual fastener elements and a given thickness of the fastener elements, ten such elements are to be applied per inch of tape and if the length of a group is to be seven inches and the length of gap is to be three inches, then 100 ratchet teeth would be employed. If the length of segment 198 is equal to the circumferential length embraced by seventy teeth and wheel 194 is advanced one tooth each time a fastener element is attached to the tape 14, then it follows that when 70 elements have been attached, segment 198 will be out of contact with contact points 200—201 causing the energization of solenoid 188 and stopping the feed of the stock strip. Solenoid 188 will remain deenergized and the feed of the strip will be stopped until wheel 194 has been advanced 30 teeth (3 inches) at which time the leading end of segment 198 again makes contact with contact points 200 and 201 at which time the solenoid is reenergized allowing the strip feed mechanism to resume its feeding operations.

In order to supply the trade with stringers having groups of fastener elements of different specified lengths, a wheel 194 will be used which has the required number of ratchet teeth around its periphery. For example, if the number of fastener elements per inch of tape as stated above is taken as a standard, the number of teeth required to produce a fastener stringer having thirty fastener elements per group with a three inch gap between groups would be sixty; a four inch or forty element group with a three inch gap would require seventy teeth; a five inch or fifty element group with the same gap would require eighty teeth, a ten inch or one hundred element group with the same length of gap would require one hundred thirty teeth, etc.

In order that wheel 194 may be advanced one tooth each time a fastener element is attached to the tape, a lever 203 operated by cam 22, the same cam that operates the stock strip feed mechanism, and a pawl 204 operated by lever 203 are provided. Pawl 204 is pivotally mounted at its rear end on a sliding block 205 disposed under wheel 194 and guided in a slot formed in the base of bracket 196. Pawl 204 is urged into engagement with the ratchet teeth by a compression spring 206 mounted between block 205 and the free end of the pawl. The rear end of block 205 overhangs the bed plate 30 and is provided with a depending pin 207 positioned to be engaged by one end of lever 203. The other end of this lever carries a roller 208 that follows the contour of cam 22. Lever 203 is pivotally mounted at about its mid point on a pin 209 carried by a bracket 210 secured to the bed plate 30. Block 205 is moved in the direction of arrow 211 (Figs. 8 and 28) by lever 203 and is returned by means of a compression spring 212 mounted in a socket 213 at the forward end of the block. This spring works against a pin 214 that extends into the socket but whose outer end bears against a rigid abutment 215.

To insure that wheel 194 will only be advanced one tooth at a time regardless of the number of ratchet teeth per inch employed, provision is made for adjusting the working stroke of pawl 204. It will be apparent that the greater the number of teeth the shorter the working stroke must be, or, conversely, the fewer the teeth per inch the longer the stroke must be. The length of the working stroke may conveniently be adjusted by limiting the return strcke of block 205 and this may be done by employing an adjustable stop such as a screw 216 mounted for example in a rigid bracket 217. Screw 216 is threaded through the bracket with the end thereof in position to engage the rear end of block 205.

For a given number of teeth on wheel 194 stop 216 is adjusted manually until pawl 204 will advance the wheel just one tooth on its working stroke. To prevent the drag of pawl 204 from turning wheel 194 on its return stroke and also to prevent overtravel of the wheel on the working stroke of the pawl, a friction drag is imposed on the wheel. The friction drag may comprise one or more fiber discs 195*a*, or a disc of any suitable material, on pin 195 between the outer face of wheel 194 and a thrust plate 218 which is drawn up tightly to provide the pressure required to develop the necessary friction between the wheel and disc.

As may be seen by reference to Fig. 3, rollers 52 and 208 of levers 48 and 203 are with respect to cam 22 disposed 180° apart and, therefore, assuming that shaft 16 is turning in the direction of the arrow 56, the stock strip feed lever 48 will always be at the end of its return oscillation before lever 203 is oscillated in the direction to advance wheel 194 one tooth.

Cams

The cams employed for operating the various mechanisms of the machine above described are all mounted on shaft 16 which is driven by motor 20.

Cams 21 and 24 are of the side type, that is, the throw of the cam is perpendicular to the axis of rotation of the shaft, whereas cams 22 and 23 are of the radial type, that is, the throw of these cams is parallel to the shaft. Fig. 6 illustrates diagrammatically the relative location of the high points of all of the cams. The angle between vectors 21′ (Fig. 4), 22′ (Fig. 3) 23′ (Fig. 5) and 24′ (Fig. 4) which represents the high points of cams 21, 22, 23 and 24, depict approximately the angular relationship between the cams and the order in which they operate mechanisms 11, 12, 13 and 15, respectively.

With the cams in the position indicated by the vectors in Fig. 6 and in the views in which these cams are illustrated, it will be seen that the die punch 108 has just been actuated through its working stroke and returned to its elevated position and that cam 24 is beginning to move the transfer slide block 148 to the point where an element will be placed astride the edge of the tape and clinched thereto.

The shape of the cams employed to actuate tape strip feed and the group control device are substantially identical and include a long dwell with a rise and fall which are approximately symmetrical. The high points of the cams embrace a relatively small angle so that the working and return strokes of the pawls actuated by these cams are relatively close together. Cam 21 that operates the die punch has a very rapid rise and a very rapid fall in order to allow very quick action of the punch.

The shape of cam 24 that operates slide block 148 also has a rapid rise with a dwell so designed that the end of the slide block will contact the cam both on its rising portion and on its dwell portion. The shape is such that the working stroke of slide 148 and its return stroke are rapid enough to clinch the element to the tape and to return to the position in which it receives an element from the die punch by the time the die punch is in position to be actuated by cam 21.

While the shape of these cams may be modified

to obtain required motions, it has been found that the cam shapes employed are satisfactory for the purposes intended and that the shapes as illustrated will give the desired motions herein described.

Operation of machine

In order to put the machine herein illustrated in operation, a reel of stock strip material and a reel of tape are provided. The tape is threaded through the lower tape guide and tensioning device **65**, shown in Figs. 25 and 26, upwardly through the slot in slide block **148** and over feed wheel **58**. Roller **66** is placed on the tape and the spring tension adjusted so that the tension in the take between the feed wheel and the lower tape guide will be that required. The tension should be such that when a fastener element is clinched to the beaded edge of the tape, the element will be at right angles to the tape. The lower tape guide should also be so adjusted that the friction jaws will grip the tape firmly enough to prevent slipping of the tape when the transfer mechanism presses a fastener element against the edge thereof. The displacement indicated in Figs. 16 and 17 caused by the pressure of a fastener element against the edge of the tape should come from the natural stretch of the material and not from slippage of tape through either the lower tape guide and tensioning device or between the feed wheel and the tension roller **66**.

The stock strip **1** is next threaded into the machine. This is accomplished by inserting the free end of the strip through or into channel **220** (Figs. 2 and 3) under the toothed wheel **27**. By turning hand wheel **38** back and forth and pushing on the stock strip until a tooth on the feed wheel enters a feed notch **8** so that by turning the wheel by hand in the direction of feed, the stock strip will be fed into the guide channel formed between stripper plate **111** (Fig. 9) and spring **114** (Figs. 11 and 29). Wheel **38** is turned until the end element abuts against the end of stop **110**. Having threaded the stock strip into the machine, wheel **194** is turned until contact pins **200**, **201** are midway between the ends of segments **198**. Thus when the machine is started the proper tension will be set up in tape **14** by the time the attachment of elements **3** to the tape begins. When these adjustments have been made, it will be observed that the die punch will be in its elevated position so that when motor **20** is started the die punch will come down and sever a fastener element from the stock strip. The die punch will then immediately rise to its uppermost position, at which time cam **24** will actuate slide **148** forwardly, carrying with it the severed fastener element, place it astride the beaded edge of the tape, clinch it thereto, and then return to a position in which the respository thereof will be in position to receive the next fastener element when severed from the stock strip.

As soon as the slide block **148** has been returned, cam **23** advances the tape feed wheel **58** one tooth following which cam **22** advances the stock strip feed wheel one tooth, following which the punch comes down and severs an element and places it in mechanism **15** by which it is transferred to a position to be clinched to the tape. In the meantime, wheel **194** is turned one tooth before the stock strip feed wheel advances another element **3** into the cut-off die. Therefore, each time a fastener element is fed to the die mechanism and severed from the stock strip, device **26** is turned one tooth so that an actual count of the number of elements attached to the tape is made. When wheel **194** has been rotated a distance corresponding to the circumferential length of the contact segment, the feed of the stock strip material is stopped while the feed of tape continues, so that the desired gap between groups of elements is obtained. As soon as this gap reaches the required length the feed of the stock strip begins again.

As will be observed by inspection of Figs. 12, 14 and 22, the stock strip moves into the die mechanism until its leading edge strikes the end of stop **110**. Also as it enters into the guide channel formed between the stripper plate and the die plate, spring **114** pushes on the end of the interlocking head portion of the fastener element so that such element is positively centered with respect to the die cutting edges. When the die comes down and severs a fastener element from the stock strip, the head of the fastener element tends to drop down ahead of the jaw and of said element and the element therefore assumes an angular position as shown in Fig. 14, which allows the head to pass under the ledge or shoulder formed by plate **157** and to allow the projection on the underside of the head to enter recess **156**. As the die punch continues toward the end of its stroke, it pushes the fastener element downwardly. When the ends of the jaws of the fastener element strike the rounded surfaces on fingers **159** and **160**, the pressure of the punch on the fastener element causes these fingers to separate sufficiently to allow the fastener element to come to rest in a horizontal position on boss **155** as shown in Fig. 22.

As soon as element **3** is in this position, fingers **159** and **160** are moved toward each other and slightly overlap the jaws of the fastener element. Since the outer end of the head of the fastener element is overlapped by plate **157**, the die punch, when it is withdrawn from the repository and from the opening in the die plate, will not withdraw the severed element from the repository, nor will the element be shifted out of position therein.

With the machine as herein illustrated stringers of fasteners may be made which will match with those made on any other machine of the same make. The spacing of fastener elements on the tape is precise and constant and cannot be otherwise, also the thickness of the fastener elements cannot vary. Since the die punch merely severs a small portion of the fastener elements (the fastener elements being preformed), before the same are delivered to the die mechanism, wear on the die will in no wise affect the shape or size of zipper elements.

What I claim as new and desire to secure by Letters Patent is:

1. The combination with a punch for severing fastener elements from a strip, of means for receiving said elements one at a time from the punch including spaced members adapted to yieldably grip the jaws of the fastener element deposited therein by the punch, means for shifting said receiving means to place the elements with the jaws thereof astride the edge of a flexible tape, and means for moving said movable members toward each other to squeeze the element jaws into gripping relation with said tape.

2. In a machine for severing from a stock strip preformed fastener elements each having an interlocking head and spaced tape gripping jaws and attaching the same to the edge of a

flexible tape, the combination with a cut-off die for severing one fastener element at a time from said strip, a toothed member engageable with said strip for feeding the same beneath said cut-off die, means for receiving each element when severed by said die and which includes yieldingly mounted relatively movable members, means for feeding tape with an edge thereof presented to the jaws of the fastener element within said receiving means, means for moving said fastener element receiving means in a direction to position the fastener element jaws astride the edge of said tape and means for actuating said movable members to force the fastener element jaws into gripping contact with said tape.

3. In a machine for successively severing individual preformed fastener elements from a stock strip and attaching the same to the edge of a flexible tape, a cut-off die, a rotatable member having teeth engageable with said stock strip for advancing the same into said cut-off die, means for receiving each element severed by said die and which includes spaced pivoted members, a fastener element support between said members and spring actuated means for yieldingly retaining said members in normal position where portions of the same overhang said support, means for feeding a flexible tape with an edge thereof in line with said support, means for moving said element receiving means toward said tape and means for forcing said movable members toward one another whereby the jaws of the fastener elements are attached to said tape.

4. In a machine for severing fastener elements from a stock strip and securing the same to a flexible tape, a die punch, means for feeding the stock strip to said punch, a receptor for the fastener elements severed from said stock strip by said punch and including movable members having portions thereof adapted to overlie parts of the fastener element within the receptor, means for feeding flexible tape with an edge thereof presented to the receptor, means for moving said receptor toward said tape so that the jaws of the fastener element therein are caused to straddle the edge of said tape and means operating while the receptor is moving toward said tape to actuate said movable members to force the fastener element jaws into clamping engagement with said tape.

5. In a machine of the character described, a die punch, means for feeding a stock strip to the die punch, a receptor for the fastener elements severed from the stock strip by the die punch; said receptor being adapted to receive one element at a time and which includes movable members adapted to compress the jaws of the fastener element together; means for feeding tape with an edge thereof presented to the receptor, means for moving the receptor toward said tape to position the fastener element therein so that its jaws straddle the edge of the tape and means adapted to engage said movable members while the receptor is moving toward the tape to move the fastener element jaws into clamping engagement with the tape.

6. In a machine for severing from a stock strip preformed fastener elements each having an interlocking head at one end and tape gripping jaws at its other end and for attaching such elements to the edge of a tape, a cut-off die for severing one fastener element at a time from said stock strip, toothed rotatable means for meshing with said stock strip for feeding said strip to said die, means for feeding tape with an edge thereof in line with the jaws of a fastener element when in said die, means for receiving the fastener elements as they are severed by said die and which includes pivotally mounted members adapted to engage the fastener element jaws, means for moving said fastener element receiving means in a direction to position the fastener element jaws astride the edge of said tape and stationary means for forcing said movable members toward each other to clamp said jaws onto the tape.

7. The combination with a punch for severing fastener elements from a stock strip, of means for receiving said fastener elements one at a time from the punch and including pivotally mounted members adapted to grip the jaws of the fastener element deposited therein by the punch, means for reciprocating said receiving means to place the fastener element jaws astride the edge of a flexible tape and stationary means for causing said movable members to approach one another to move the fastener element jaws into gripping contact with said tape.

8. In a machine for securing fastener elements to a flexible tape, a punch, a support mounted for reciprocation beneath said punch and having a slotted end, means for feeding a stock strip across said support below said punch, means for feeding a flexible tape through the slot of said support, means for operating said punch to sever fastener elements from said stock strip, means carried by said support for receiving such severed fastener elements and which includes pivotally mounted spaced members for yieldingly gripping the fastener element jaws, means for reciprocating said support to place the fastener element jaws astride the edge of said tape and means for swinging said spaced members toward one another to cause the fastener element jaws to grip said tape.

9. In a machine for securing fastener elements to a flexible tape, a punch, a support mounted for reciprocation beneath said punch and having a slotted end, means for feeding a stock strip across said support below said punch, means for feeding a flexible tape through said slot, means for operating said punch to sever fastener elements from said stock strip, means carried by said support for receiving such severed fastener elements and which includes pivotally mounted spaced members for yieldingly gripping the fastener element jaws and a fastener element supported between said spaced member and having a depression for receiving the projection on the fastener element head, means for reciprocating said support to place the fastener element jaws astride the edge of said tape and means for swinging said spaced members toward one another to cause the fastener element jaws to grip said tape.

10. In a machine for securing fastener elements to a flexible tape, a punch, a support mounted for reciprocation beneath said punch and having a bifurcated end, means for feeding a stock strip across said support below said punch, means for feeding a flexible tape through the bifurcated end of said support, means for operating said punch to sever fastener elements from said stock strip, means carried by said support for receiving such severed fastener elements and which includes pivotally mounted spaced members for yieldingly gripping the fastener element jaws and a fastener element support between said spaced members and which is provided with means for overlying part of the head end of the fastener element, means for reciprocating said support to place the fastener element jaws astride the edge of said

tape and means for swinging said spaced members toward one another to cause the fastener element jaws to grip said tape.

11. In a machine for securing slide fastener elements to a flexible tape, the combination with a reciprocating punch for severing preformed fastener elements from the ribbon-like support portion of a stock strip, of rotatable means adapted to mesh with such a stock strip for feeding the same beneath said punch, means for feeding a flexible tape perpendicularly to the path of travel of said stock strip, a support mounted for reciprocation beneath said punch and across the path of travel of said strip and having one end thereof slotted to straddle said flexible tape, means carried by said support for receiving each element as it is severed by the punch and including spaced members for yieldingly gripping the jaw portions of the fastener element, means for reciprocating said support to place the fastener element jaws astride the edge of said tape and means in the path of travel of said support for causing said movable members to force the jaws of said element into gripping contact with said tape.

12. In a machine for securing fastener elements to a flexible tape, a punch, means for feeding past said punch a stock strip composed of preformed fastener elements and a ribbon-like support to which said elements are connected, means for operating said punch in synchronism with the strip feeding means to sever each fastener element from said support as said element lines up with said punch, means for receiving each fastener element as it is severed from said support by said punch and which comprises a support for the fastener element, pivotally mounted fingers located on opposite sides of said support, spring means tending to yieldingly hold said fingers in normal position wherein portions thereof overhang the jaw portions of the fastener element supported on said support and means for swinging said fingers into position to move the fastener element jaws into gripping engagement with said tape.

13. In a machine for making slide fastener stringers, a punch for severing fastener elements from a stock strip and positioning the same on a support member located therebeneath, a slotted slide carrying said support and mounted for reciprocation, a pair of pivoted fingers between which said support member is located and which have portions adapted when the fingers are in normal position to overhang parts of a fastener element positioned therebetween, means for yieldingly holding said fingers in normal position, means for feeding flexible tape through the slot in said slide, means for reciprocating said slide and means operating during the movement of said slide toward said flexible tape to cause said fingers to force the jaws of the fastener element carried on said support member to grip said tape.

14. In a machine for making slide fastener stringers, a punch for severing preformed fastener elements from a stock strip which includes a ribbon-like support portion with regularly spaced fastener elements extending from one edge of the same, means for advancing such a stock strip through the machine and beneath said punch, a receptor for receiving each fastener element as it is severed by the punch from the stock strip and which comprises a support for the fastener element, pivoted fingers on opposite sides of said support with parts thereof overhanging portions of said support when said fingers are in normal position and means for yieldingly holding said fingers in normal position, a reciprocating support for said receptor having an end slot aligned with the fastener element support, means for feeding flexible tape through said slot with one edge thereof aligned with the center line of said support and means operating during reciprocation of said support toward said tape to move said fingers toward one another whereby the fastener element jaws are caused to grip said tape; said fingers being adapted to be moved to uncover said support by the fastener element as it is followed in its downward travel by the punch.

15. In a machine for severing fastener elements from a stock strip and securing the same to a flexible tape, means for feeding stock strip step by step, a punch for severing fastener elements from said strip, means for receiving each element as the same is severed by said punch and which means includes spaced members adapted to yieldingly grip the jaws of the fastener element deposited therebetween by the punch, means for feeding a flexible tape step by step, means for shifting said receiving means to place the fastener elements with the jaws thereof astride the edge of said tape and means for moving said movable members to cause said jaws to grip said tape.

16. A machine according to claim 15 in which the receiving means for the elements severed by the punch, in addition to the spaced members, is provided with a fastener element support located between said members and which has a depression therein for accommodating the projection on the head end of the fastener element and a roof-like portion beneath which the outer end of the head portion of such element slides as the element moves to position on such support.

17. A machine according to claim 15, in which the stock strip feeding means, the punch, the means for feeding the flexible tape and the means for shifting the fastener element receiving means are actuated by synchronously operated cams.

18. A machine according to claim 15, in which means are provided for periodically interrupting the feed of stock strip without interrupting the feed of the flexible tape.

19. A machine according to claim 15, in which means are provided for holding the flexible tape under tension at the point where the fastener elements are attached thereto.

20. A machine according to claim 15, in which the flexible tape feeding means includes a wheel over which the tape runs, means for pressing the tape against said wheel, a pawl and ratchet for advancing the wheel and means for preventing overtravel and over back travel of the wheel during and after the feed strokes of the pawl and ratchet.

21. A machine according to claim 15, in which the tape feeding means comprises a wheel over which the tape runs, means for pressing the tape against the wheel, means for subjecting the tape to a relatively high tension as it is fed by said wheel, a series of ratchet teeth and a pawl for advancing said tape one tooth per stroke of the pawl to determine the spacing between elements attached to the tape, means for moving said pawl through a stroke greater than necessary to advance said wheel one tooth; the tension in said tape being sufficient to cause the wheel to turn in the opposite direction, and a fixed pawl for engaging said teeth to lock the wheel in a position corresponding to the spacing required between elements.

22. In a machine for severing from a stock

strip preformed fastener elements each having an interlocking head at one end and tape gripping jaws at the other end and for attaching said elements to the edge of a flexible tape, the combination comprising a punch, means for feeding stock strip step-by-step to successively position the fastener elements thereon beneath said punch, means for operating said punch to sever the fastener elements from said strip, means for receiving and holding each fastener element as it is severed from said strip, means for feeding a flexible tape step-by-step with the edge thereof in line with the jaws of the fastener elements severed from said strip, means for moving said fastener element holding means in a direction to position the jaws of the fastener element astride said tape, and means for actuating said holding means while said holding means are moving to squeeze said fastener element jaws into clamping engagement with said tape.

23. A machine according to claim 22, in which means are provided for positively holding each fastener element on the strip in proper position to be acted upon by the punch.

24. A machine according to claim 22, in which means are provided for cleaning the receiving and holding means between delivery of successive fastener elements thereto.

25. A machine according to claim 22, in which means are provided for periodically interrupting the feed of stock strip without interrupting the feed of the flexible tape.

EINAR MARTIN ARENTZEN.