

Jan. 2, 1940.

M. KIESSLING ET AL

2,185,769

SEPARABLE FASTENER ATTACHMENT MACHINE

Original Filed Aug. 17, 1935

5 Sheets-Sheet 1

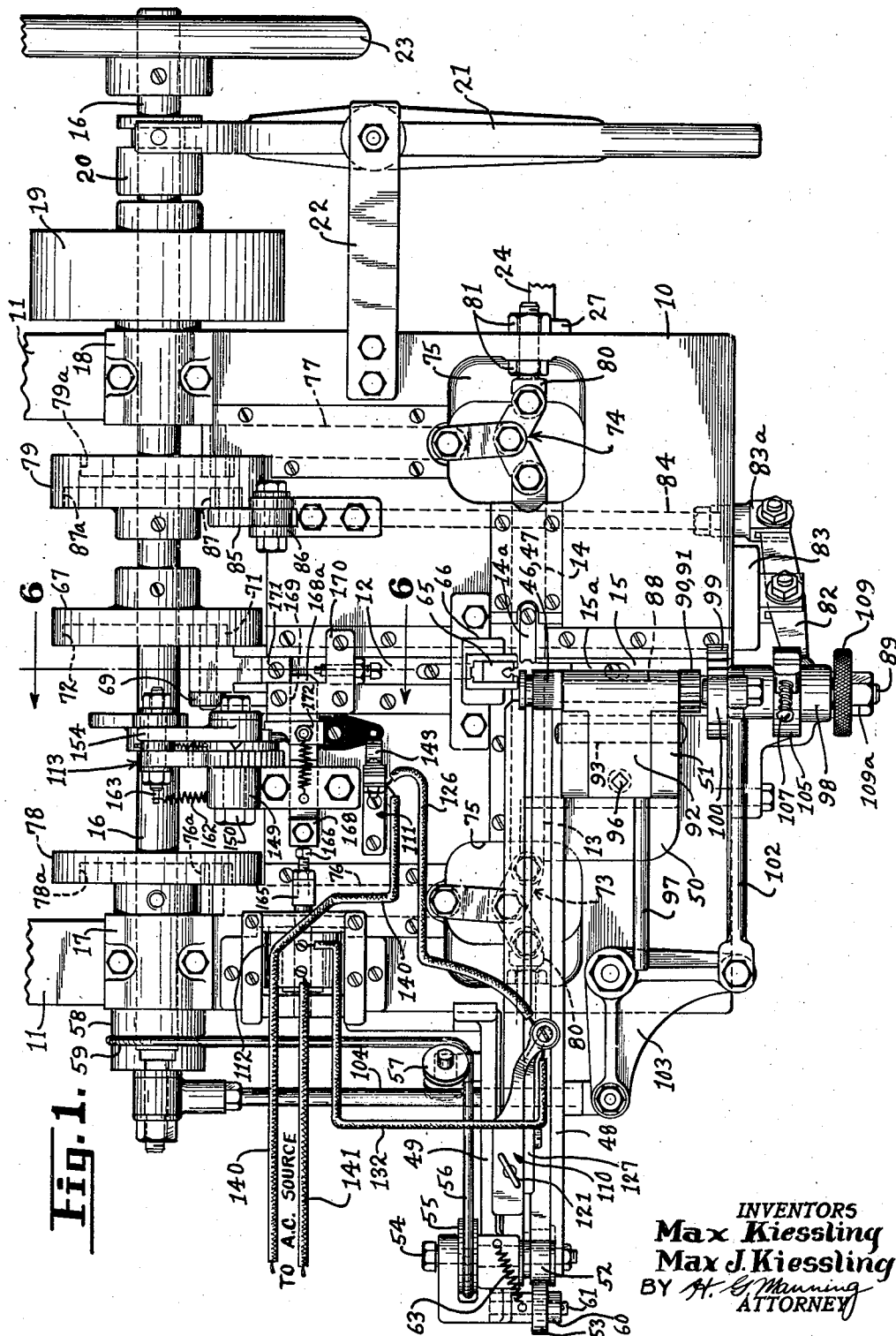


Fig. 1.

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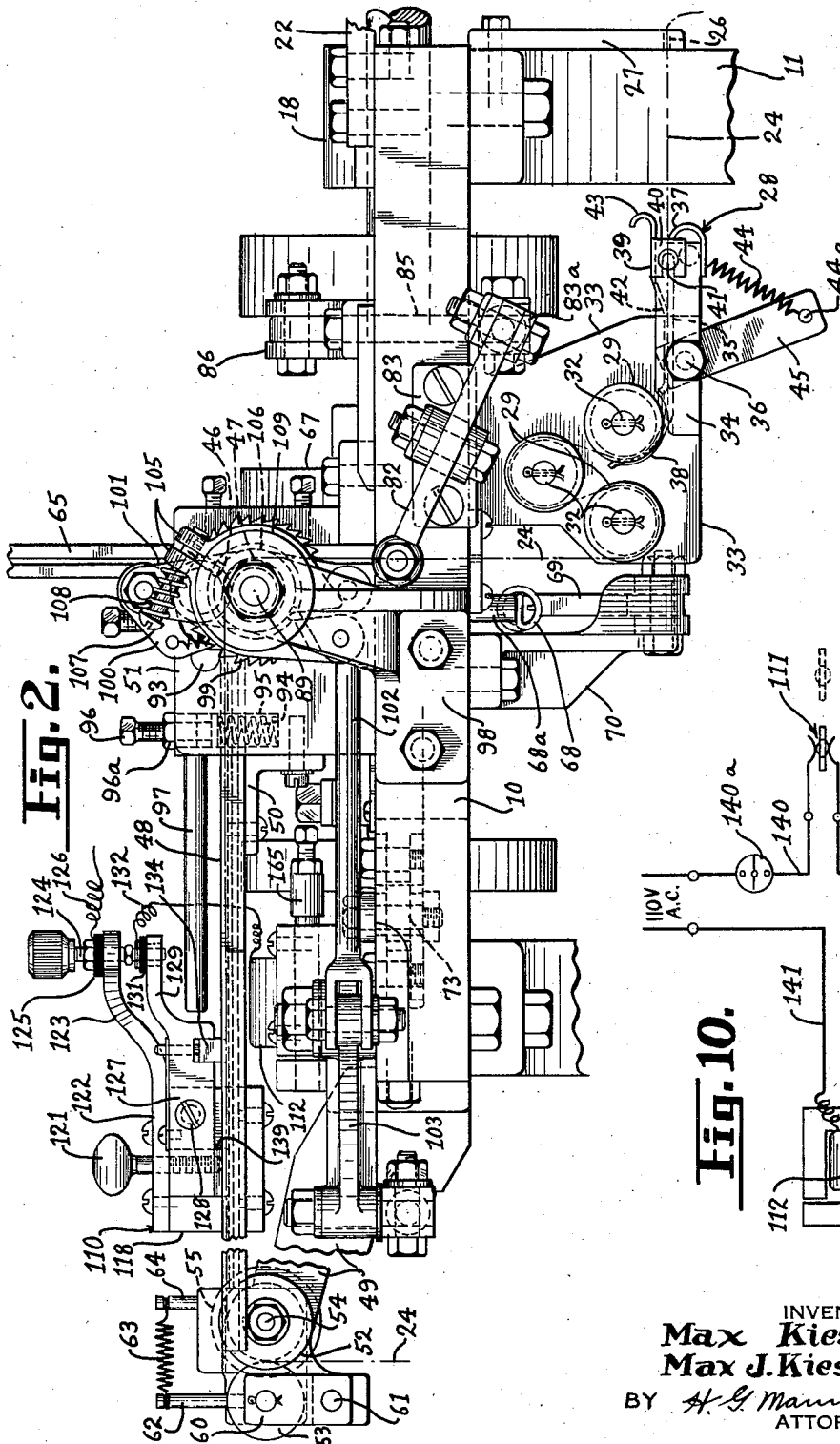
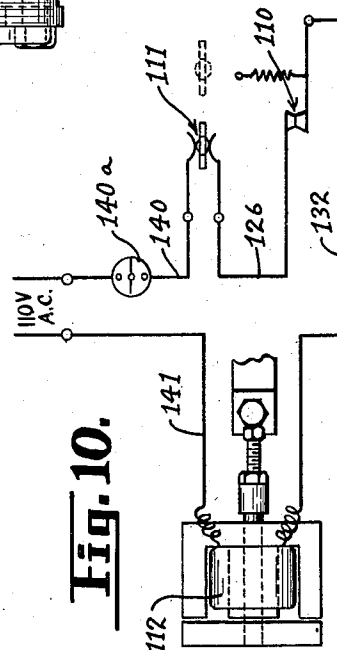
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5 Sheets-Sheet 2



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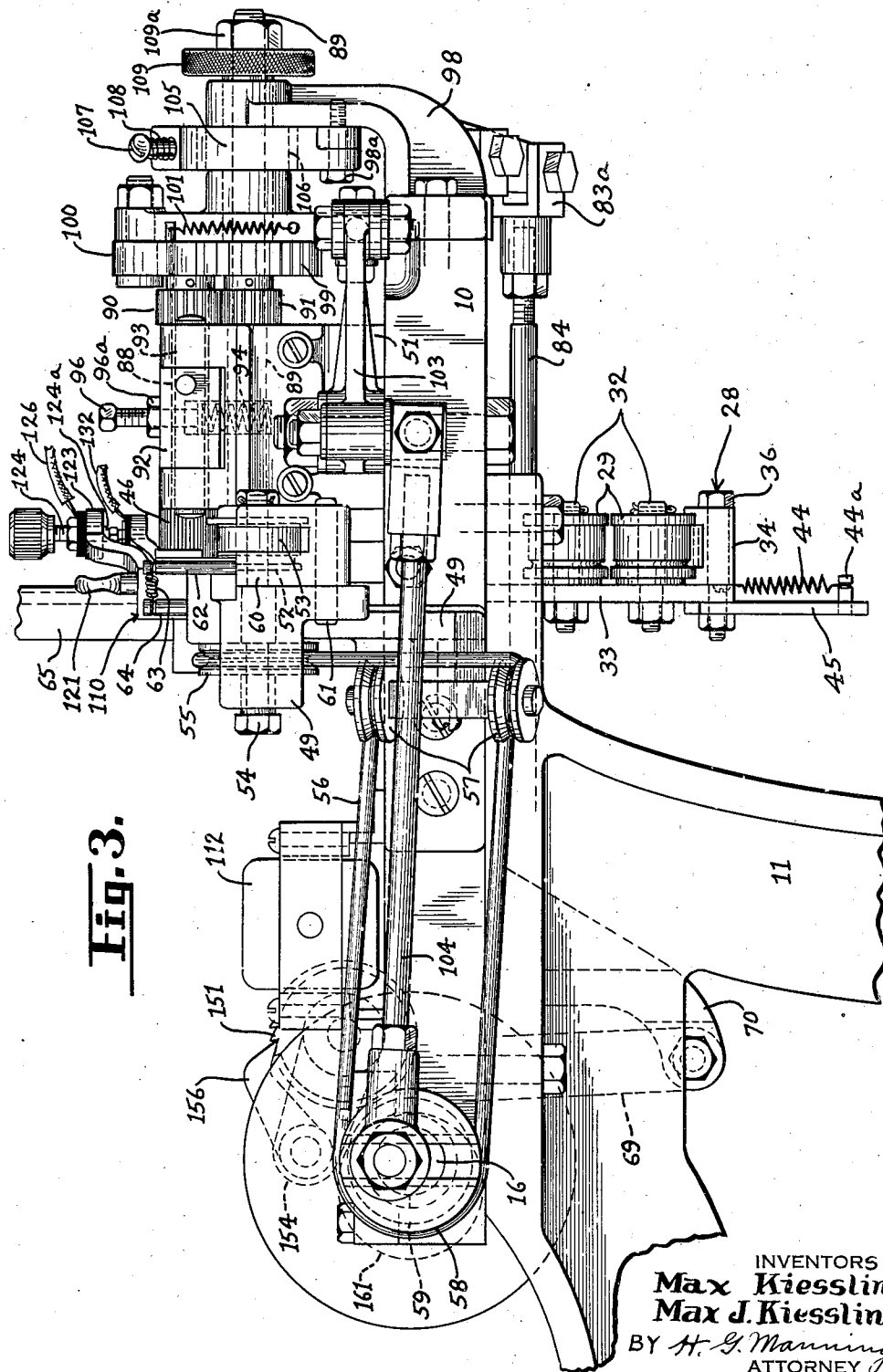
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Fig. 4.

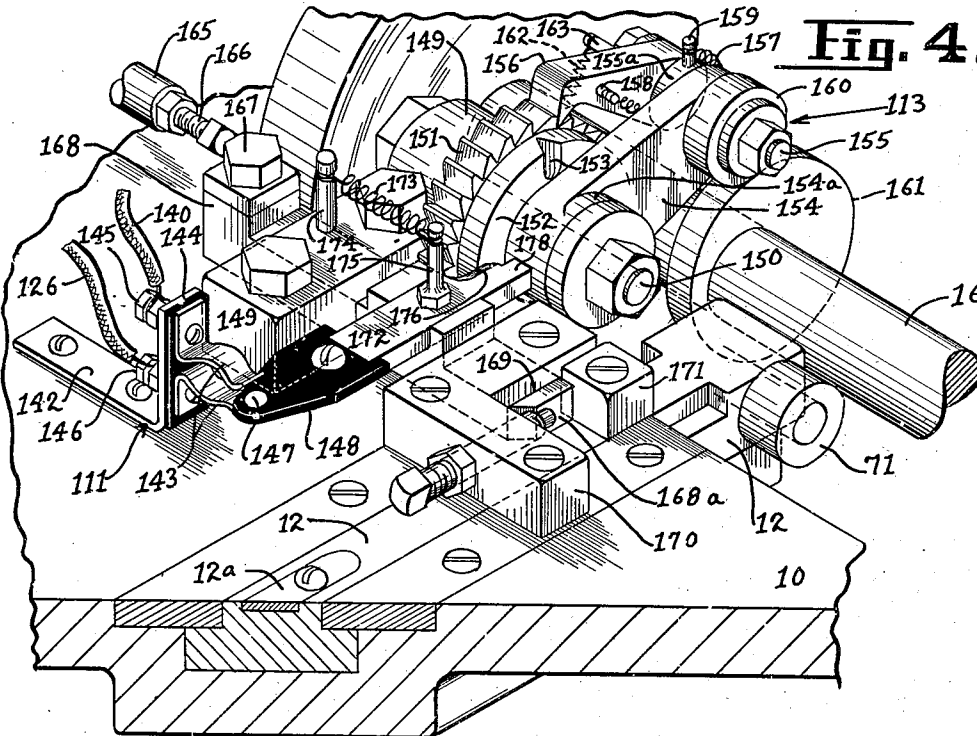
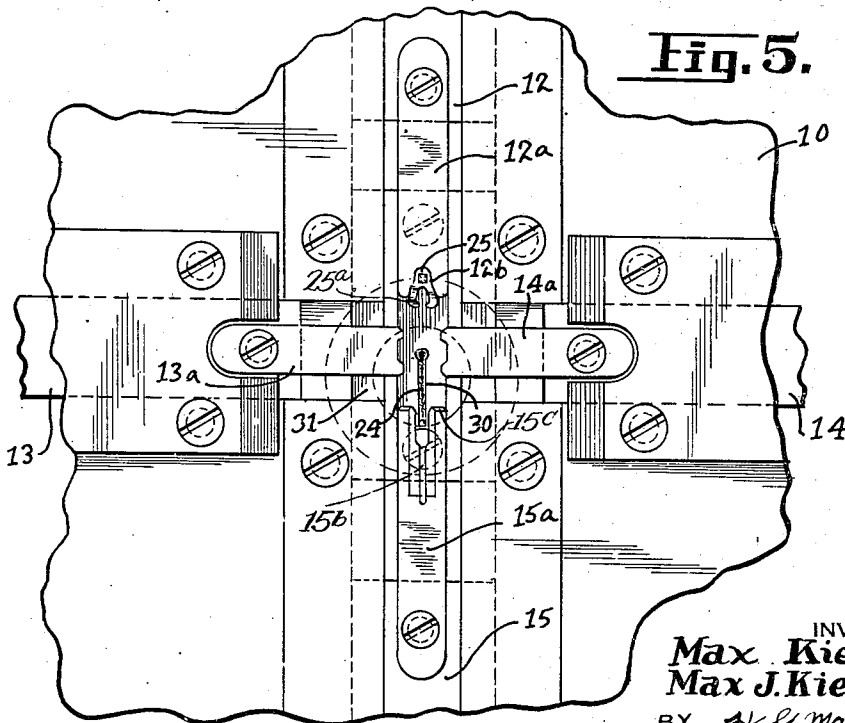


Fig. 5.



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5 Sheets-Sheet 5

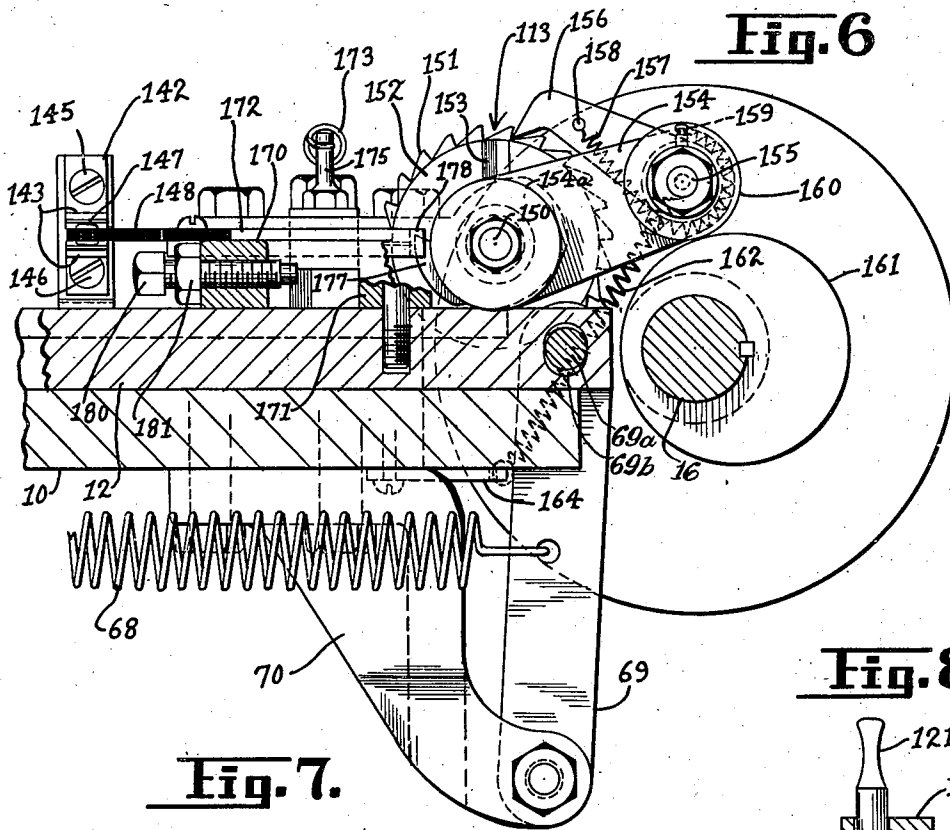


Fig. 7.

Fig. 8.

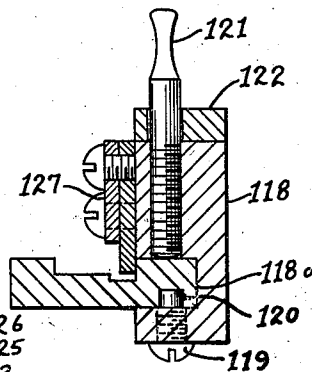
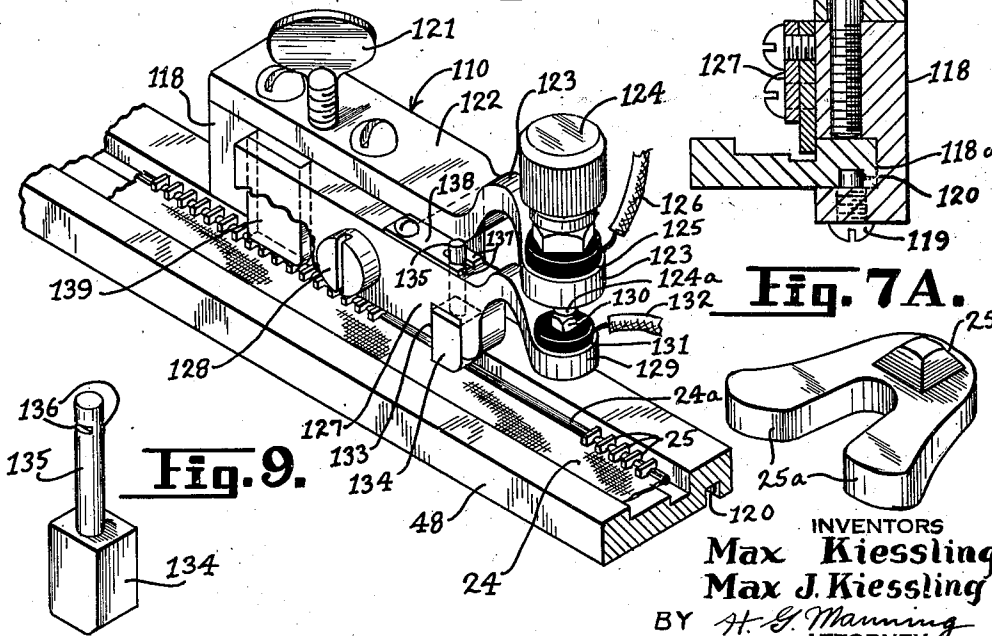


Fig. 7A.



UNITED STATES PATENT OFFICE

2,185,769

SEPARABLE FASTENER ATTACHMENT
MACHINEMax Kiessling and Max J. Kiessling, Waterbury,
Conn.Application August 17, 1935, Serial No. 36,692
Renewed September 9, 1939

30 Claims. (Cl. 153—1)

This invention relates to a machine for attaching a series of aligned rows of separable slide fastener elements upon a continuous strip of tape or "stringer," and is an improvement upon the invention disclosed in the United States Patent 1,971,158 of August 21, 1934, entitled "Separable fastener attachment machine."

One object of this invention is to provide a mechanism which will operate a "four-slide" machine from a single driven rotating shaft by means of linkage and cam mechanism instead of employing the customary four angularly arranged shafts driven by gears.

A further object is to provide a machine of the above nature having means for adjusting the length of each row of fastener elements by electrical devices which are adapted to cooperate with the mechanical elements of the machine.

Further objects of this invention are to provide an improved means for operating the element fastening slides; to provide an improved tensioning device acting upon the tape to which the fastener elements are to be attached; and to enable the feeding, forming, and attaching mechanisms to operate coordinately at a greater speed than was previously possible with a resulting increase in output, and a material saving in the cost of production.

A further object is to provide a machine of the above nature which will be relatively simple in construction, inexpensive to manufacture, easy to install and manipulate, economical of space and material, and very efficient and durable in use.

With these and other objects in view there has been illustrated on the accompanying drawings one form in which the invention may be conveniently embodied in practice.

In the drawings:

Fig. 1 represents a plan view of the machine.

Fig. 2 is a front elevation of the main working section of the machine.

Fig. 3 is a right end view of the same.

Fig. 4 is a detailed perspective view of the intermittently operated ratchet timing mechanism for controlling the size of the spaces between the successive rows of fastener elements.

Fig. 5 is a plan view of the working ends of the four cooperating element fastening slides.

Fig. 6 is a fragmentary vertical elevation, partly in section, of the element feeding slide and the ratchet timing mechanism, the view taken along the line 6—6 of Fig. 1, looking in the direction of the arrows.

Fig. 7 is a perspective view of the stringer operated switch located upon the tape guide rail.

Fig. 7A is an enlarged perspective view of one of the fastener elements, per se.

Fig. 8 is a vertical sectional view through the stringer-operated switch and supporting guide-way.

Fig. 9 is a perspective view of the element-engaging finger of the switch.

Fig. 10 is a diagrammatic lay-out of the electric circuit.

Referring now to the drawings in which like reference numerals denote corresponding parts throughout the several views, the numeral 10 indicates a rectangular bed plate or table supported on pedestal legs 11. The table 10 has four grooves in its upper surface arranged at right-angles and adapted to receive four reciprocating slides 12, 13, 14 and 15, the slide 12 being the feeding slide, the slides 13 and 14 being lateral forming slides, and the slide 15 being an auxiliary positioning slide. The slides 12, 13, 14 and 15 are all actuated through suitable linkages, as will be explained later, from a single constantly rotating power-driven main shaft 16 located at the rear of the machine, and journaled in a pair of bearings 17 and 18 located at the opposite rear corners of said machine.

The main shaft 16, as best shown in Fig. 1, is provided at its right-hand end with a pulley 19 having free running engagement on said shaft and adapted to be driven by a belt, not shown. The pulley 19 is adapted to be selectively engaged by a suitable clutch member 20 on the shaft 16 and controlled by a manually operated hand lever 21 for controlling the operation of the machine. The lever 21 is fulcrumed on the outer end of a lateral supporting bracket 22, rigidly secured to the top surface of the bed plate 10. A hand balance wheel 23 is rigidly secured to the extreme right end of the shaft 16, and may be used for manually adjusting and setting up the machine when the clutch 20 is disengaged.

Tape tensioning and feeding mechanism

The numeral 24 indicates a continuous strip of tape which is adapted to be intermittently pulled through the machine at a uniform rate of speed, and is adapted to receive a succession of rows of separable fastener elements 25. One of the fastener elements 25 is clearly illustrated in Fig. 7A as having a pair of opposed jaws 25a which are adapted to be securely closed or clamped upon the corded edge 24a of the tape 24 in uni-

formly spaced relation, as said tape is fed intermittently through the machine.

The tape 24, as indicated in dot and dash lines in Fig. 2, may be fed to the machine from a suitable roll or spool (not shown), and directed through a horizontal slot 26 provided at a lower end of a depending bracket 27 secured to the right-hand supporting pedestal leg 11 of the machine. The tape 24 is next passed through a novel tensioning unit 28 and around three guide rolls 29 in the manner shown in Fig. 2, thence passing vertically up through a slot 30 in an annular anvil member 31, (see Fig. 5) located in the center of the bed plate 10, at which point the elements 25 are fastened successively upon the corded edge of the tape 24. The three guide rolls 29 are journaled on studs 32 projecting forwardly from a depending bracket plate 33 attached to the underside of the bed plate 10.

The tensioning unit 28 comprises a substantially horizontal guide block 34, having a guide channel 35 in its upper surface, said block 34 being pivotally connected to the lower end of the bracket plate 33 by means of a pivot stud bolt 36. The base of the guide channel 35 is adapted to be covered with a metal lining strip 37, the right-hand end of which is looped around the outer edge of the guide block 34. The opposite end of the metal lining strip 37 is formed into an arcuate section 38 which is adapted to embrace a portion of the adjacent roll 29, and exert a light pressure upon the tape 24 as it is drawn therebetween. A pressure clip 39 provided with a pair of opposed slotted slide ears 40 is detachably connected to the guide block 34 by means of the engagement of said ears 40 with a pair of opposed headed studs 41. The pressure clip 39 is integrally formed with a depressed spring finger 42, which is adapted to rest upon a portion of the metal lining 37 and resiliently press upon the tape 24 as it is drawn thereunder. The pressure clip 39 is provided with a looped handle 43 for convenience in manipulating said clip 39 in setting up the machine.

In order to hold the arcuate end section 38 of the metal lining 37 resiliently against the tape 24 passing around the adjacent guide rail 29, provision is made of a tension spring 44 fixed at one end to the pivoted guide block 34, and having its other end attached to a projecting pin 44a carried on the lower end of an inclined arm 45 rigidly secured to the bracket plate 33 by means of the stud bolt 36. By means of this construction the guide block 34 will be urged in a clockwise direction at all times.

In order to intermittently draw the tape 24 through the machine, provision is made of a pair of serrated rollers 46 and 47 located one above the other and adapted to intermittently rotate by a mechanism to be described later. From this point, the tape 24 will pass along a grooved tape guide rail 48 extending horizontally above and beyond the left-hand edge of the table 10 as viewed in Fig. 2. The outer end of the rail 48 is supported by a bracket 49 attached to the base plate 10, and the inner end of said rail 48 is supported on an angle iron 50 secured to the side wall of a bearing block 51 supported on the bed plate 10. The tape 24 is drawn horizontally along the top of the guide rail 48 by means of a pair of slip friction rollers 52 and 53 located at the outer end of said rail 48, and having their axes in the same horizontal plane, the innermost roll 52 being secured to a driven stud shaft 54 mounted in the bracket 49. A small sheave 55 is

secured to the opposite end of the shaft 54 and is adapted to be driven by a belt 56 passing at right-angles around a pair of guide pulleys 57 and around a constantly rotating crank head 58 on the extreme left end of the crank shaft 16. The crank head 58 is provided with a peripheral groove 59 for receiving the belt 56. The outer idle friction roll 53 is rotatively supported in the upper end of a bifurcated bracket 60 having its lower end journaled on a pivot pin 61 attached to the bracket 49. The upper end of the bracket 60 is provided with a vertical pin 62 to which is attached one end of a coiled tension spring 63, the opposite end of said spring being secured to a vertical pin 64 mounted on the bracket 49. The tape 24 is thus maintained under uniform tension at all times.

Element fastening mechanism

The fastener elements 25, previous to their attachment to the tape 24, are contained within a detachable magazine 65 held in a vertical position by means of a bracket 66 secured to the top of the table 10. The magazine 65 is positioned above and in alignment with the feed slide 12 in close proximity to the slot 30 in the anvil member 31.

The inner end of the slide 12 is provided with an element pick-up forked finger 12a (Fig. 5) having a slotted end 12b shaped to conform to the general outside contour of the fastener element 25. The feed slide 12 is successively moved forwardly by a relatively heavy coiled spring 68 located underneath the bed plate 10, and then retracted by a cam wheel 67 carried by the shaft 16. The rear end of the feed slide 12 is pivotally connected to the upper end of a substantially vertical link member 69 by a pin 69a in the link 69 disposed in an elongated slot 69b in the slide 12. The link 69 is in turn pivotally secured at its lower end to a depending offset bracket 70 mounted on the under side of the bed plate 10 (see Figs. 2 and 6). The spring 68 is secured at one end to a stationary part of the machine, such as a pin 68a, and at its opposite end to an intermediate portion of the link 69. In order to provide a loose connection between the cam wheel 67 and the feed slide 12, a roller 71 is mounted on the rear end of said feed slide 12 opposite from the link 69 and is adapted to engage within a single faced groove 72 formed in the cam 67.

When each fastener element 25 is slipped out from underneath the magazine 65 by means of the forked finger 12a, said element 25 will be pushed astride the corded edge of the tape 24 at the center of the machine. The lateral forming slides 13 and 14 having forming fingers 13a and 14a, respectively, will at the same time be moved inwardly to close the jaws of the element 25 upon said tape 24. The element positioning or locating slide 15 is provided with a finger 15a which is slotted at 15b to straddle the portion of the tape 24 which is above the flat top surface of the anvil 31 to support the same while the element 25 is pushed astride the tape by the forked finger 12a. The ends 15c of the finger 15a insure the proper position and location of the element on the tape in cooperation with the finger 12a by presenting a positive stop against which they strike. The fingers 12a, 13a, 14a, 70 and 15a ride in a horizontal plane over the flat top surface of the anvil 31 upon which the element 25 is disposed by the finger 12a, to be located and supported by the anvil 31 in a position substantially at right-angles to the tape 24,

while the fingers 13a and 14a are actuated to close the opposed jaws 25a of the element 25 in tight gripping relation upon the tape 24.

The slides 13 and 14 are actuated by a pair of toggle units 73 and 74 which are located in suitable pockets 75 provided in the bed plate 10. The toggles 73 and 74 are actuated by slides 76 and 77 located in parallel grooves provided in the bed plate 10, and extending to the rear of the bed plate 10. The slide 76 is provided with a follower roller 76a which engages in a double faced cam groove 78a formed in a cam 78 mounted on the shaft 16. The rotation of the cam 78 reciprocates the slide 76 which in turn actuates the toggle 73 for reciprocating the lateral forming slide 13. The slide 77 is similarly reciprocated by a cam 79 having a double-faced cam groove 79a engaged by a suitable roller attached to the end of the slide 77, whereby the lateral forming slide 14 is also reciprocated. The toggle units 73 and 74 are capable of adjustment by means of knuckle screws 80 engaging in suitable horizontal apertures in the bed plate 10, said screws 80 being pivotally connected to the outer links 25 of the toggles 73 and 74 and held in adjusted position by means of a pair of opposed nuts 81. This construction permits the throw of the slides 13 and 14 to be varied according to the various sizes of fastener elements, and compensates for the wear of the associated fingers 13a and 14a.

The positioning slide 15 is adapted to move inwardly in advance of the feed slide 12 and the lateral forming slides 13 and 14, and is provided with a bifurcated split end finger 15a which is adapted to straddle the tape 24 and operates to control the proper space between the successive elements as they are attached to said tape 24 by moving in a plane just above the plane of the slide fingers 12a, 13a and 14a. The slide 15 is adapted to be actuated by means of the cam 79 which also operates the slide 77. This is accomplished by connecting the front or outer end of the slide 15 through a knuckle connected with one end of a first degree lever 82 fulcrumed in a bracket 83 attached to the front edge of the base plate 10. The opposite end of the lever 82 in turn is connected by a knuckle joint 82a to a push rod 84 operating underneath the table 10. The rear end of the push rod 84 is pivotally connected to the lower end of a link 85 having its upper end pivotally connected to a bifurcated bracket 86 located on top of the bed plate 10. A roller 87 is rotatably connected to the intermediate portion of the link 85 and engages in a double-faced cam groove 87a formed in the adjacent face of the cam 79.

Intermittent tape feed

The progressive upward movement of the tape 24 and the proper spacing of the successive elements 25 on said tape are controlled by the intermittent rotation of the serrated rolls 46 and 47 which are integrally formed upon the ends of a pair of horizontal shafts 88 and 89. The shafts 88 and 89 are adapted to be rotated in opposite directions by means of a pair of intermeshed gears 90 and 91 having an equal number of teeth. The lower shaft 89 is journaled in the bearing block 51, while the upper shaft 88 is journaled in one end of a T-shaped swinging block 92 pivotally connected in said block 51 by means of a horizontal hinging pin 93.

In order to normally resiliently press the upper serrated roll 46 down against the lower serrated roll 47, the T-shaped block 92 is resiliently urged

in a clockwise direction around the hinging pin 93 by means of a coiled compression spring 94 seated in a socket 95 provided in the block 51. The compression of the spring 94 may be varied by means of a set screw 96, threadedly engaged in the swinging block 92, and a locking nut 96a. A longitudinal handle rod 97 is secured in the swinging block 92 and permits the block 92 to be manually swung about the pin 93 against the influence of the spring 94 to separate the serrated rolls 46 and 47 whenever it is desired to thread the end of the tape therethrough.

The lower shaft 89 is the power driven shaft, and extends forwardly a greater distance than the upper shaft 88, the front end of said shaft 89 being journaled in an angle bracket 98 attached to the front edge of the base plate 10. The shaft 89 is rotatably actuated in a step-by-step manner by a ratchet wheel 99 keyed on the shaft 89, a cooperating pawl 100, an oscillating lever 101 and a push-rod 102. The left-hand end of the push rod 102, as viewed in Fig. 1, is pivotally connected to one arm of a bell-crank 103 fulcrumed on top of the base plate 10. The opposite arm of the bell-crank in turn is connected to a pitman rod 104 having adjustable eccentric connection in the rotating crank head 58.

In order to prevent the serrated tape-feeding rolls 46 and 47 from "over-running," a braking member 105 is attached to the bracket 98 by means of screws 98a and is adapted to embrace a brake drum 106 carried by the shaft 89. The tension of the brake member 105 upon the brake drum 106 may be adjusted by means of a screw 107 and a cooperating helical spring 108. A knurled hand wheel 109 is rigidly secured to the extreme front end of the driven shaft 89 by means of a locking nut 109a, for permitting the mechanism to be manually actuated in setting up the machine.

Electric operating devices

In order to allow the manufacture of fastener stringers having any desired number of successive fastener elements attached thereto, and also to allow for a blank space between the rows of fastener elements, provision is made of an element operated adjustable switch 110, a controlling switch 111, a solenoid 112, and a ratchet timing mechanism 113, all of which units are adapted to cooperate synchronously with each other.

The element-operated switch 110, as best shown in Figs. 2, 7 and 8, consists of a rectangular elongated block 118, having a longitudinal groove 118a, formed in its lower front face for fitting over the rear edge of the tape guide rail 48. A guide screw 119 extends up through the base of the block 118 into a slot 120 formed in the under surface of the guide rail 48, whereby said block will be permitted to slide along said guide rail 48. The block 118 is adapted to be clamped thereon in any desired adjusted position according to the length of the rows of fasteners desired, as by a winged set screw 121. The position of the switch 110, relative to the guide rail 48, determines the length of the successive rows of fastener elements 25 to be fastened on the tape 24. Attached to the top of the block 118, as by screws, is a rectangular plate 122 having an integral raised forwardly offset goose-neck arm 123 at its right-hand end for receiving a vertical adjustable binding post 124. The binding post 124 extends downwardly through an insulation bushing 125 to a point below the goose-neck arm 123 to form a stationary contact 124a, 75

and it is adapted to be connected by an electric conductor wire 126 leading to the controlling switch 111.

To the front face of the block 118 is pivotally attached a rocking lever 127 by means of a headed pivot screw 128, and integral with said lever is a raised forwardly offset goose-neck arm 129 arranged underneath and in vertical alignment with the similarly-shaped goose-neck arm 123 of the plate 122. The goose-neck arm 129 supports a movable contact button 130 which is insulated from said arm by means of an insulating bushing 131. A conductor wire 132 is electrically connected to the contact button 130 and leads to the solenoid 112 (see Figs. 1 and 10).

In order to render the switch responsive to the rows of elements fastened on the tape 24, the lower right-hand edge of the rocking lever 127 is provided with a transverse slot 133 carrying a vertically slidable feeler finger 134, shown separately in Fig. 9. The feeler block 134 is provided with an upstanding reduced vertical shaft 135 which slidably engages in a vertical aperture in the rocking lever 127 and is provided in its upper exposed end with a pair of opposed slots 136 for slidably receiving the bifurcated end 137 of a leaf-spring 138 rigidly connected at one end to the top edge of said rocking lever 127. The lower surface of the feeler block 134 is adapted to ride along the top of the tape 24 and upon the rows of elements attached thereto, as the tape is intermittently moved to the left along the guide rail 48. When the initial element 25 of a row of elements engages the feeler block 134, the latter will cause the lever 127 to swing about the pivot screw 128, and cause the movable contact button 130 to engage the stationary contact 124a of the upper goose-neck arm 123, thus closing the circuit through the element-operated switch 110, the controlling switch 111 which is at this time closed, and the solenoid 112 which is thereby actuated to operate the feed slide locking plunger rod 165 to be later described.

As the tape continues to advance along the rail 48, the leading end of the row of elements will engage a depending heel 139 secured to the left-hand part of the lever 127, causing the latter to rock on its pivot in a clockwise direction, and consequently, opening the switch 110. Both the heel 139 and the feeler block 134 will then be sliding along the top of the row of elements 25, and the switch 110 will be held in open position. However, at this time the feeler block 134 will be forced to the top of the slot 133 and will remain in the top of the slot 133 until the end of the row of elements passes to the left from under said feeler block 134. The feeler block 134 will then be forced downwardly by the leaf-spring 138 upon the blank tape 24 to the position shown in Fig. 7.

As shown in Figs. 1 and 10, the circuit through both switches 110 and 111, the solenoid 112, and the conductors 126 and 132, also includes conductors 140 and 141 leading to a suitable source of energy, not shown. If desired, as shown in the wiring diagram of Fig. 10, an additional switch 140a may be placed in circuit with the conductor 140 to control the circuit to the machine.

The controlling switch 111 (see Figs. 1, 4 and 6) consists of an angle bracket 142, one leg of which is attached to the top of the base plate 10, and the other leg extends upwardly for supporting a pair of opposed resilient stationary conductor strips 143 of sinuous configuration. The conductor strips 143 are supported in spaced rela-

tion and insulated from the upstanding leg of the bracket 142 by means of an interposed insulating block 144 and a pair of binding screws 145 and 146. The stationary strips 143 are adapted to be connected to close the switch 111 by means of a double-ended movable contactor button 147 transversely located in the end of a horizontal laterally slidable insulation block 148. The block 148 is adapted to move into and out of switch closing position through the operation of the ratchet timing mechanism 113, now to be disclosed.

Ratchet controlled timing mechanism

The ratchet controlled timing mechanism 113 in cooperation with the solenoid 112 performs the double duty of locking the feed slide 12 a predetermined length of time according to the intervening blank space desired on the stringers between the rows of elements, and also breaking the electrical circuit established through the solenoid 112, the element operated switch 110, and the controlling switch 111 at the proper times. The ratchet timing mechanism 113, as best shown in Figs. 1, 4 and 6, is supported by a bracket block 149 overhanging the rear edge of the bed plate 10. The bracket 149 is provided with a horizontal stud 150 upon which is rotatably mounted a ratchet wheel 151. One side of the ratchet wheel 151 is provided with an integral raised cam face 152 provided with a V-shaped radial notch 153.

An oscillating lever 154 is journaled on the stud 150 adjacent the cam face 152 and carries a transverse pivot stud 155 on its outer end for pivotally supporting a pawl 156 engaging the ratchet wheel 151. The pawl 156 is held in spaced relation from the oscillating lever 154 by means of an intervening flange 155a preferably made integral with the stud 155. The pawl 156 is held in resilient engagement with the ratchet wheel 151 by means of a small helical spring 157 attached at one end to a pin 158 on the pawl 156, and adapted to pass around a portion of the flange 155a, the other end of said spring being secured to a radial pin 159 projecting from the top of the flange 155a.

In order to oscillate the pawl carrying lever 154, the transverse stud 155 is provided with a roller 160, which engages the peripheral surface of an eccentric cam 161 keyed to the main driving shaft 16. The roller 160 is normally held against the cam 161 by means of a spring 162 tensioned between a pin 163 on the end of the pivot stud 155 and an anchor plate 164 projecting from underneath the bed plate 10, as shown in Fig. 6.

The ratchet wheel 151 may be tensioned against accidental movement by friction means, such as is clearly illustrated in Fig. 7 in the patent referred to above.

The locking of the feed slide 12 is effected by means of the solenoid 112 which is provided with a plunger rod 165 carrying an adjustable set screw 166 on the forward end, as best shown in Figs. 1 and 4. The set screw 166 is adapted to abut against the head of a screw 167 engaged in one end of a locking slide 168 resting on the bed plate 10, said slide being suitably guided in a slot in the bracket block 149, previously mentioned. The forward nose 168a of the locking slide 168 engages in a slot 169 provided in an L-shaped guide block 170 attached to the top of the bed plate 10, one leg of said block being adapted to bridge across the top of the feed slide 12.

When the solenoid is electrically energized, the

plunger rod 165 is suddenly actuated to give the locking slide 168 a forward thrust and carry the nose 168a thereof into the path of a stop block 171 mounted rigidly on the feed slide 12, whereby the latter will be held stationary against the influence of the spring 68 or the driving cam 67.

The intermediate section of the locking slide 168 between the L-shaped bracket 170 and the bracket block 149 carries a transverse ratchet locking dog 172 fitted into a corresponding transverse groove provided in said locking slide 168 and made rigid thereto. The forward end of the locking dog 172 carries the insulating block 148 previously mentioned. The locking slide 168 is normally held in retracted position by means of a helical tension spring 173 connected between a pair of upright posts 174 and 175, the post 174 being made rigid to the bracket block 149, while the post 175 is secured to the top of the dog 172, and moves with the locking slide 168. The rear end of the ratchet locking dog 172 is provided with a beveled detent 176 normally lying in the radial notch 153 of the cam face 152 when the locking slide 168 is in its retracted position.

In order to hold the ratchet wheel 151 against rotation while the feed slide 12 is in operation, it is necessary to hold the roller 160 on the end of the oscillating lever 156, up out of contact with the eccentric cam 161. This is accomplished by means of a snug 177 preferably formed integral with the hub 154a of the oscillating lever 156, and adapted to abut underneath a projecting lug 178 formed at the rear end of the ratchet locking dog 172 adjacent the detent 176.

A precise adjustment of the forward throw of the feed slide 12 may be obtained by means of a set screw 180 and locking nut 181 engaging in the L-shaped bracket 170 in direct alignment with the stop block 171.

Operation

In operation, the element-operated switch 110 will first be clamped in the desired adjusted position on the guide rail 48, said position being determined by the predetermined length of the rows of fastener elements 25 which are to be applied to the tape 24. The blank space in the tape 24 between said rows will of course depend upon the number of teeth in the ratchet wheel 151 and the relative throw of the pawl 158.

The machine may be started manually by moving the handle of the lever 21 to the right, as shown in Fig. 1, which action will throw in the clutch 20 and start the revolution of the main shaft 16 and the attached cam wheels 67, 70, 79 and the eccentric head 68. At the same time the slides 12, 13, 14 and 15 will be synchronously reciprocated for attaching the fastener elements 25 fed from the magazine 35 upon the intermittently advancing tape 24, and said elements will continue to be attached to said tape 24 until the initially fastened element 25 comes into contact with the feeler block 134.

The feeler block 134 will then be caused to rise up on the top of the row of elements 25, which action will cause the lever 127 to pivot about the screw 128 in a counterclockwise direction. The contact button 136 will thus be brought into engagement with the stationary contact button 124a of the binding screw 124 to close the circuit through the solenoid 112 and the switch 111 which at this time is in closed position. The magnetic flux thus produced in the solenoid 112 will cause the plunger rod 165 to be instantly thrust to the right as viewed in Figs. 1 and 4,

forcing the nose 168a of the locking slide 168 into the path of the stop-block 171 on the feed slide 12 to lock the latter against operation and cause it to cease feeding elements 25 to the tape 24.

The tape 24, however, will continue to be intermittently drawn through the machine, and when the row of elements 25 is carried into contact with the heel 139 of the lever 127, the latter will be swung about its pivot in a clockwise direction, consequently opening the switch 110.

Simultaneously with the forward movement of the locking slide 168, the insulating block 148 will disconnect the contactor button 147 from the stationary contacts 143 of the switch 111 to open the circuit, and immediately de-energize the solenoid 112 after the latter has performed its function. Also, the beveled detent 176 of the dog 172 will become disengaged from the notch 153 of the cam face 152, and the lug 178 of the ratchet locking dog 172 will move out of the path of the snug 177 to permit the lever 154 to drop and again start the ratchet wheel 151 into rotation.

After the locking slide 168 has been moved into locking position, and the plunger 165 has been rendered inactive, said slide 168 will be held in locked position against the influence of the tension spring 173 by reason of the beveled detent 176 riding upon the raised cam face 152 of the ratchet wheel 151. The locking slide 168 will retain the feed slide 12 in locked position for the period of time that it takes the ratchet wheel 151 to make one complete revolution, after which time the beveled detent 176 will snap into the notch 153 of the cam face 152. This will permit the spring 173 to retract the locking slide 168 from the feed slide 12 and obviously effect the closing of the controlling switch 111 at the same time. It will be understood that at this time the element-operated switch 110 will be open, so that the closing of the switch 111 will not operate the solenoid 112. The feed slide 12 will then start reciprocating again and the attachment of the fastener elements 25 to the tape 24 will continue until the above described cycle of operations has been repeated.

If it is desired to increase or decrease the length of the rows of elements on the stringers, it will only be necessary for the operator to move the adjustable switch 110 along the rail 48 to the left or to the right, respectively.

While there has been disclosed in this specification one form in which the invention may be embodied, it is to be understood that this form is shown for the purpose of illustration only, and that the invention is not to be limited to the specific disclosure but may be modified and embodied in various other forms without departing from its spirit. In short, the invention includes all the modifications and embodiments coming within the scope of the following claims.

Having thus fully described the invention, what is claimed as new, and for which it is desired to secure Letters Patent, is:

1. In a machine for attaching fastener elements to a strip of tape, a magazine containing a stack of fastener elements, a driving shaft, cam means, a feed slide operatively connected to said shaft by said cam means for removing said elements successively from said magazine and moving them into clamping position, cam and toggle linkage mechanism, and a pair of laterally movable slides operatively connected to said shaft by said cam and toggle linkage mechanism for clamping said elements along the edge of said tape.

2. In a machine for attaching fastener elements to a vertically movable strip of tape, a magazine containing a stack of fastener elements, a horizontal four slide mechanism surrounding said tape, including a feed slide for transferring said elements from said magazine to the edge of said tape, a positioning slide on the opposite side of said tape from said feed slide to hold said elements while being clamped upon said tape, a pair of opposed clamping slides movable at right-angles to said feed and positioning slides, a toggle mechanism operatively connected to each clamping slide, and means to actuate said toggle mechanisms to move said clamping slides toward each other.

3. In a machine for attaching fastener elements to a vertically movable strip of tape, a magazine containing a stack of fastener elements, a horizontal four slide mechanism surrounding said tape, including a feed slide for transferring said elements from said magazine to the edge of said tape, a positioning slide on the opposite side of said tape from said feed slide to hold said elements while being clamped upon said tape, a pair of opposed clamping slides at right-angles to said feed and positioning slides, a single driving shaft, cam means, said feed slide being driven from said shaft by said cam means, and cam and toggle linkage means, said positioning and clamping slides being driven from said shaft by said cam and toggle linkage means.

4. In a machine for attaching fastener elements to a strip of tape in a series of spaced rows, a magazine for holding a stack of fastener elements, means for intermittently conveying said elements to said tape and clamping them along one edge thereof, means for intermittently moving said tape between the fastener clamping operations, an electric switch having a movable contact member, a lever for carrying said contact member, and a spring-pressed slidable feeler block resiliently resting upon the elements affixed to said tape, said feeler block having an upstanding guide rod connected to said spring, and means responsive to the closing of said switch for interrupting the feeding of said elements for a period of time sufficient to leave a blank space between successive rows thereof.

5. In a machine for attaching fastener elements to a strip of tape in a series of spaced rows, a magazine for holding a stack of fastener elements, means for intermittently conveying said elements to said tape and clamping them along one edge thereof, means for intermittently moving said tape between the fastener clamping operations, an electric switch having a movable contact member, a lever for carrying said contact member, said lever also carrying a vertically slidable feeler block adapted to yieldably rest upon the elements affixed to said tape, said feeler block having an upstanding guide rod, and a leaf-spring attached at one end to said lever and having its free end connected to said rod for pressing said block downwardly, and means responsive to the closing of said switch for interrupting the attachment of said elements to said tape for a period of time sufficient to leave a blank space between successive rows.

6. In a machine for attaching fastener elements successively to an intermittently moving strip of tape in a series of spaced rows, a magazine containing a stack of said elements, a feed slide for transferring said elements from said stack into position to be clamped upon said tape,

a spring-retracted locking slide for temporarily restraining the reciprocation of said feed slide between the rows of said elements, a solenoid operated plunger for actuating said locking slide, said locking slide carrying a control switch for breaking the circuit through said solenoid, and a supplemental switch actuated by the rows of elements on said tape for closing the circuit through said solenoid.

7. In a machine for attaching fastener elements to a tape in a series of spaced rows, a magazine containing a stack of said elements, a feed slide for transferring said elements from said stack into position to be clamped upon said tape, a spring retracted locking slide for temporarily restraining said feed slide between the rows of elements, a plunger in alignment with said locking slide, a solenoid for moving said plunger to actuate said locking slide, and a supplemental switch responsive to the interruption of elements on said tape for closing the circuit through said solenoid, said locking slide carrying means to break the circuit at the end of its movement into locking position.

8. In a machine for attaching fastener elements to a tape in a series of spaced rows, a magazine containing a stack of said elements, a feed slide for transferring said elements from said stack into position to be clamped upon said tape, a spring-retracted locking slide for temporarily restraining said feed slide between the rows of elements, a ratchet wheel, a pawl-carrying lever for intermittently actuating said wheel, a cam for rocking said lever, said lever being held out of engagement with said cam during the operation of said feed slide.

9. In a machine for attaching fastener elements to a tape in a series of spaced rows, a magazine containing a stack of said elements, a feed slide for transferring said elements from said stack into position to be clamped upon said tape, a spring-retracted locking slide for temporarily restraining said feed slide between the rows of elements, a ratchet wheel, a pawl-carrying lever for intermittently actuating said wheel, a cam for rocking said lever, and means on said lever adapted to engage said locking slide to disengage said lever from said cam during the operation of said feed slide.

10. In a machine for attaching fastener elements to a tape in a series of spaced rows, a magazine containing a stack of said elements, a feed slide for transferring said elements from said stack into position to be clamped upon said tape, a spring-retracted locking slide for temporarily restraining said feed slide between the rows of elements, a ratchet wheel, a pawl-carrying lever for intermittently actuating said wheel, and a cam for rocking said lever, said locking slide having means effective when in retracted position for withholding said lever from engagement by said cam.

11. In a machine for attaching fastener elements to a tape, means for imparting a continuous step by step motion to said tape, a plurality of idle guide rolls arranged in triangular formation to impart frictional resistance to the movement of said tape, and a spring-pressed lever having an arcuate section for frictionally embracing a portion of the tape on one of said rolls.

12. In a machine for attaching fastener elements to a tape, means for imparting a continuous step by step motion to said tape, a plurality of idle guide rolls arranged in triangular formation to impart frictional resistance to the move-

ment of said tape, and means embracing a portion of one of said rolls for frictionally clamping upon said tape to control the tension therein.

13. In a machine for attaching fastener elements to a tape, means for imparting a continuous step by step motion to said tape, a plurality of idle guide rolls arranged in triangular formation to impart frictional resistance to the movement of said tape, a spring-pressed lever having an arcuate section for frictionally embracing a portion of the tape on one of said rolls, and a clip member detachably secured to said lever for embracing the top of said tape.

14. In a machine for attaching opposed jawed fastener elements to a tape, a magazine for containing a stack of such elements, a detachable anvil having a flat top surface and provided with a guiding and alining slot through which the tape is fed, a feed slide adapted to be moved to engage an element and move it from said magazine and dispose it upon said anvil to be supported thereby and with its jaws astride the tape portion above said anvil, an element positioning slide cooperating with said feed slide to position an element relatively to the tape, a pair of opposed element clamping slides disposed one on either side of the tape and movable to engage and close the element jaws thereon, all of said slides being movable in substantially the same plane and above the top surface of said anvil, and common means to move said slides.

15. In a machine for attaching opposed jawed fastener elements to a tape, a magazine for containing a stack of such elements, an anvil having a flat top surface and a slot through which the tape is fed, a feed slide adapted to be moved to engage an element and move it from said magazine and dispose it upon said anvil to be supported thereby and with its jaws astride the tape portion above said anvil, an element positioning slide cooperating with said feed slide to position an element relatively to the tape, a pair of opposed clamping slides disposed one on either side of the tape and movable to engage and close the element jaws thereon, all of said slides being movable in substantially the same plane and above the top surface of said anvil, and common means to move said slides including a toggle linkage for actuating each of said clamping slides.

16. In a machine for attaching opposed jawed fastener elements to a tape, a magazine for containing a stack of such elements, an anvil having a flat top surface and a slot through which the tape is fed, a feed slide adapted to be moved to engage an element and move it from said magazine and dispose it upon said anvil to be supported thereby and with its jaws astride the tape portion above said anvil, an element positioning slide cooperating with said feed slide to position an element relatively to the tape, a pair of opposed element clamping slides disposed one on either side of the tape and movable to engage and close the element jaws thereon, all of said slides being movable in substantially the same plane and above the top surface of said anvil, cam controlled means for moving each of said slides, the cam controlled means for moving said clamping slides including a toggle linkage operatively connected thereto.

17. In a machine for attaching opposed jawed fastener elements to a tape, a magazine for containing a stack of such elements, an anvil having a flat top surface and a slot through which the tape is fed, a feed slide adapted to be moved to engage an element and move it from said maga-

zine and dispose it upon said anvil to be supported thereby and with its jaws astride the tape portion above said anvil, an element positioning slide cooperating with said feed slide to position an element relatively to the tape, a pair of opposed element clamping slides disposed one on either side of the tape and movable to engage and close the element jaws thereon, all of said slides being movable in substantially the same plane and above the top surface of said anvil, cams and cam-controlled means for moving each of said slides, each cam-controlled means for moving said clamping slides including a toggle linkage operatively connected thereto, means to adjust the throw of each of said toggle linkages, and a common shaft upon which said cams are mounted and by which they are operated.

18. In a machine for attaching fastener elements to a tape, an upstanding magazine for containing a stack of such elements, a detachable annular anvil having a flat top surface and provided with a guiding and alining slot through which tape is fed, a feed slide adapted to engage an element and move it from said magazine and dispose it upon said anvil for support thereby, an element positioning slide adapted to be engaged by the element and to locate the element in position to be secured to the tape, a pair of opposed slides laterally movable to clamp the element to the tape, all of said slides being disposed and movable substantially in a horizontal plane above the flat top surface of said anvil, a common driving shaft, and means actuated by said shaft for operating all of said slides in synchronism.

19. In a machine for attaching fastener elements to a tape, a substantially vertical magazine for containing a stack of such elements, an anvil having a flat top surface and a slot through which a tape is fed, a feed slide adapted to engage said elements successively and move them upon said anvil for support thereby, an element-positioning slide adapted to be engaged by said elements for locating them in proper position to be secured to the tape, a pair of opposed slides laterally movable to clamp the element to the tape, all of said slides being disposed and movable substantially in a horizontal plane above the flat top surface of said anvil, and means to move said slides including a common driving shaft, cams on said shaft, and cam-controlled means for moving each of said slides, the cam-controlled means for moving each of said clamping slides including a toggle linkage.

20. In a machine for attaching fastener elements to a strip of tape, a magazine containing a stack of fastener elements, a driving shaft, cam means, a feed slide operatively connected to said shaft by said cam means for removing said elements successively from said magazine and moving them into clamping position, cam and toggle linkage mechanism, a pair of laterally movable slides operatively connected to said shaft by said cam and toggle linkage mechanism for clamping said elements along the edge of said tape, and adjustable knuckle joints in said cam and toggle linkage mechanism to vary the throw of said laterally movable slides to compensate for wear and in the size of said fastener elements.

21. In a machine for attaching fastener elements to a vertically movable strip of tape, a magazine containing a stack of fastener elements, a horizontal four slide mechanism surrounding said tape, including a feed slide for

transferring said elements from said magazine to the edge of said tape, a positioning slide on the opposite side of said tape from said feed slide to hold said elements while being clamped upon said tape, a pair of opposed clamping slides movable at right-angles to said feed and positioning slides, a toggle mechanism operatively connected to each clamping slide, means to actuate said toggle mechanisms to move said clamping slides toward each other, and means for actuating said positioning slide driven by means passing under one of said clamping slides.

22. In a machine for attaching fastener elements successively to an intermittently moving strip of tape in a series of spaced rows, a magazine containing a stack of said elements, a feed slide for transferring said elements from said stack into position to be clamped upon said tape, a spring-retracted locking slide for temporarily restraining the reciprocation of said feed slide between the rows of said elements, a solenoid operated plunger for actuating said locking slide, said locking slide carrying a control switch for breaking the circuit through said solenoid, and a supplemental switch actuated by the rows of elements on said tape for closing the circuit through said solenoid, said control switch comprising an insulating block carried by said locking slide, a movable contact on said block, and a fixed contact in said circuit.

23. In a machine for attaching fastener elements to a tape in a series of spaced rows, a magazine containing a stack of said elements, a feed slide for transferring said elements from said stack into position to be clamped upon said tape, a spring-retracted locking slide for temporarily restraining said feed slide between the rows of elements, a ratchet wheel, a pawl-carrying lever for intermittently actuating said wheel, a cam for rocking said lever, means responsive to the actuation of said machine to rotate said cam and release said locking slide after a predetermined interval to permit the feeding of said elements to be resumed, a snub on the axis of the shaft of said ratchet wheel, and a lug on said locking slide to engage said snub when the feed slide is in operation to hold said lever out of engagement with said cam.

24. In a machine for attaching fastener elements to a tape, means for moving said tape, a guide roll for said tape, and means for embracing a portion of said guide roll to resiliently and frictionally press said tape against said guide roll comprising a pivoted block having a pair of resilient fingers thereon through which said tape passes on its way to said tape moving means.

25. In a machine for attaching fastener elements to a tape, means for moving said tape, a guide roll for said tape, and means for embracing a portion of said guide roll to resiliently and frictionally press said tape against said guide roll, comprising a pivoted block having a resilient arcuate end finger and an adjustable pressure clip detachably secured to said block, said clip having a finger located adjacent said arcuate end finger for cooperating therewith.

26. In a machine for attaching fastener elements to a tape, means for moving said tape, a guide roll for said tape, and means for embracing

ing a portion of said guide roll to resiliently and frictionally press said tape against said guide roll comprising a spring-pressed pivoted block having a pair of resilient fingers thereon through which said tape passes on its way to said tape moving means.

27. In a machine for attaching fastener elements to a strip of tape, a magazine containing a stack of fastener elements, a driving shaft, cam means, a feed slide operatively connected to said shaft by said cam means for removing said elements successively from said magazine and moving them into clamping position, cam and toggle linkage mechanism, a pair of laterally movable slides operatively connected to said shaft by said cam and toggle linkage mechanism for clamping said elements along the edge of said tape, and spring means to cooperate with said cam means to prevent backlash in the movements of said feed slide.

28. In a machine for attaching fastener elements to a vertically movable strip of tape, a magazine containing a stack of fastener elements, a horizontal four slide mechanism surrounding said tape, including a feed slide for transferring said elements from said magazine to the edge of said tape, a positioning slide on the opposite side of said tape from said feed slide to hold said elements while being clamped upon said tape, a pair of opposed clamping slides at right-angles to said feed and positioning slides, a single driving shaft, cam means, said feed slide being driven from said shaft by said cam means, and cam and toggle linkage means, said clamping slides being driven from said shaft by said cam and toggle linkage means, said positioning slide carrying operating means on its extremity located in a plane slightly above said feed slide and said clamping slides.

29. In a mechanism for feeding tape to a machine for attaching fastener elements thereto, a fixed driven shaft, an idler shaft parallel to said fixed shaft and movable transversely with respect thereto, a pair of serrated tape clamping rollers on the ends of said shafts, intermeshing gears to cause said shafts to rotate in opposite directions at the same speed, a ratchet wheel on said driven shaft, oscillating pawl means for indexing said ratchet wheel in synchronism with the operation of said element-attaching means, and brake means to retard the motion of said driven shaft and prevent overrunning.

30. In a machine for attaching zipper fastener elements to a continually moving tape in a series of spaced rows, means for feeding said elements into attaching position, means for clamping said elements upon said tape, a spring-retracted locking slide for temporarily restraining said feed means between successive rows of elements, a sliding plunger in alignment with said locking slide, a solenoid to directly engage and force said plunger against said locking slide, a switch responsive to the interruption of elements on said tape for closing the circuit through said solenoid and means carried by said slide for opening said circuit instantly after said plunger has operated said locking slide.

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