

Dec. 14, 1943.

G. WINTRISS

2,336,662

APPARATUS FOR MAKING SLIDE FASTENERS

Filed June 5, 1941

4 Sheets-Sheet 1

Fig. 2

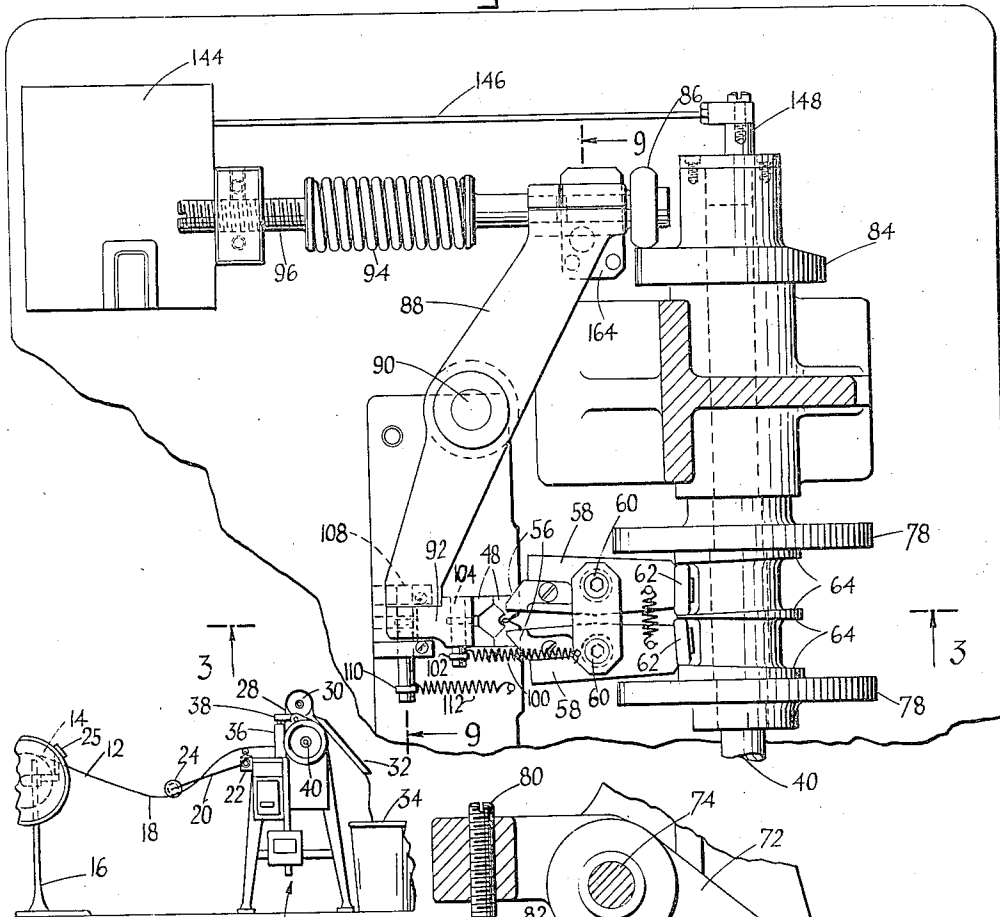


Fig. 1

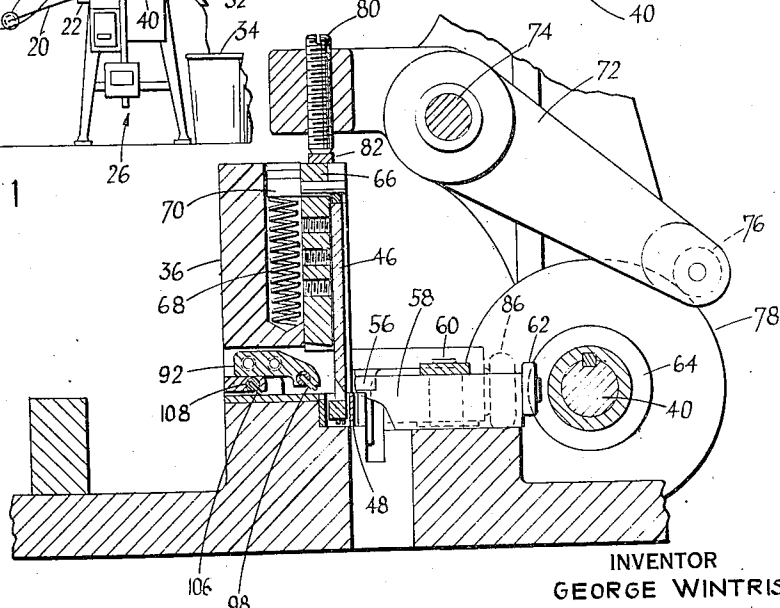
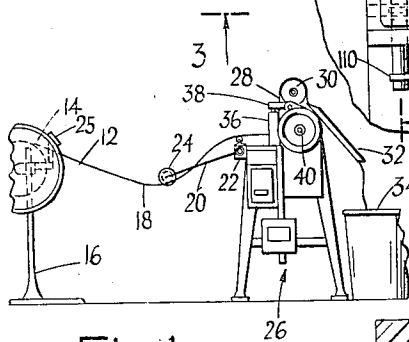


Fig. 3

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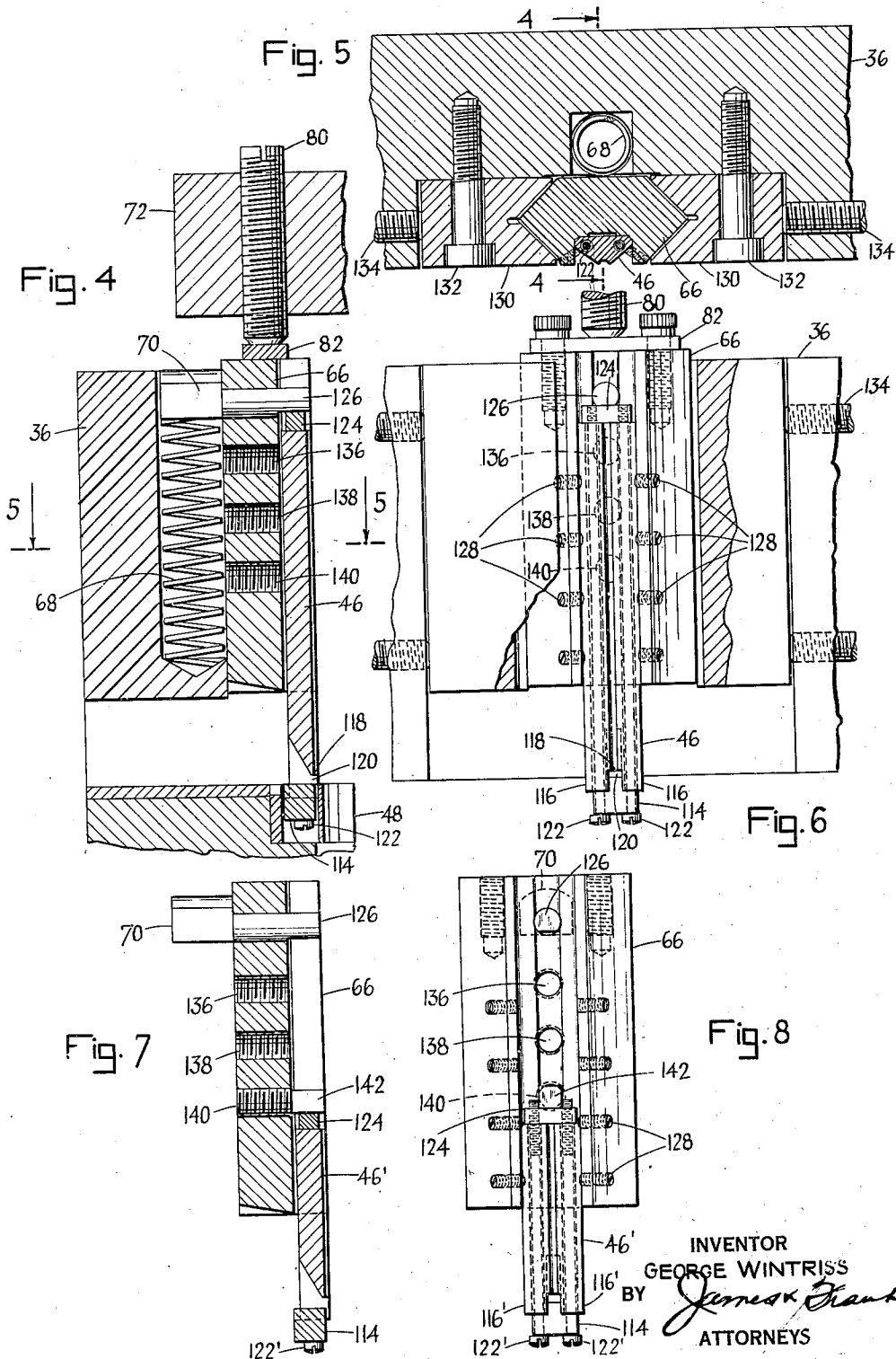
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Fig. 9

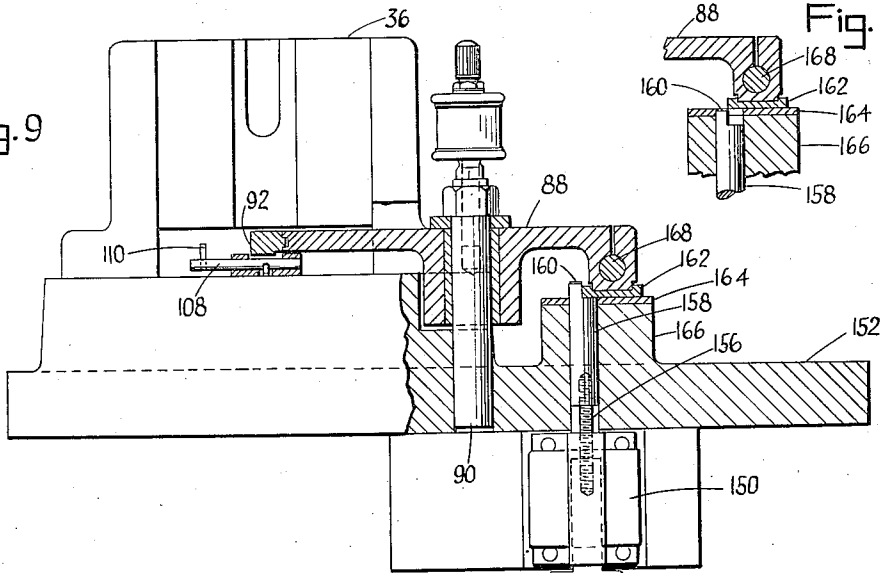


Fig. 10

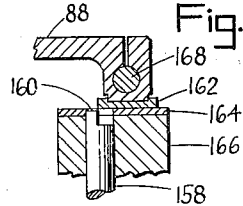


Fig. 11

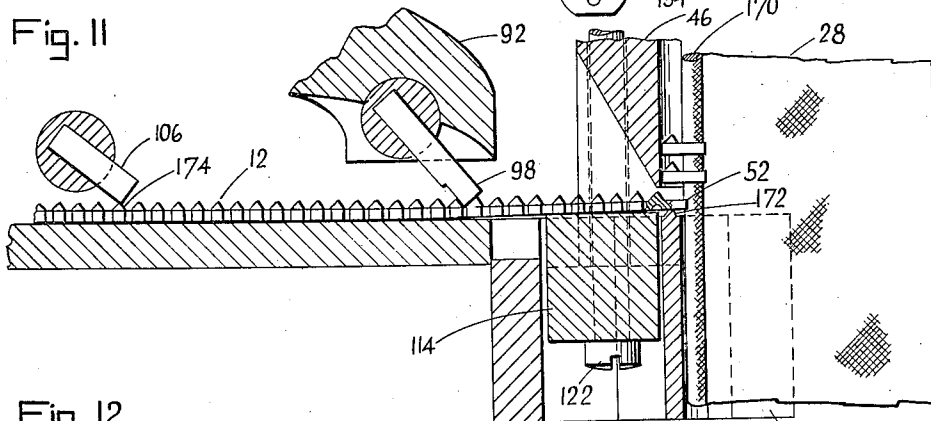
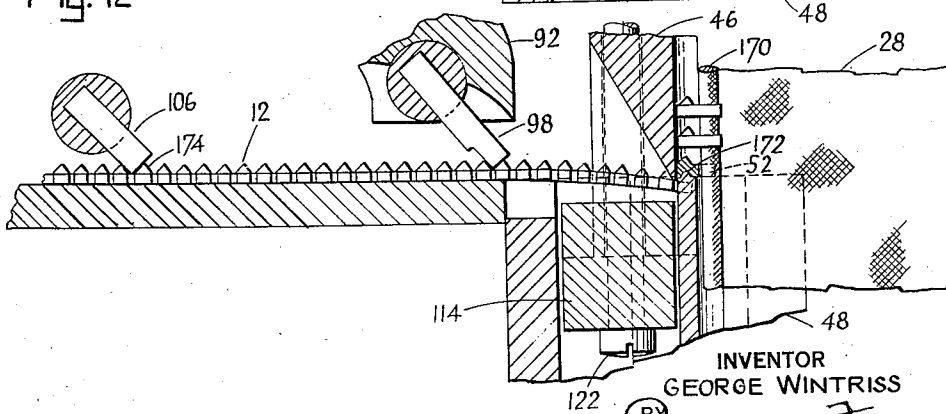


Fig. 12



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Fig. 13

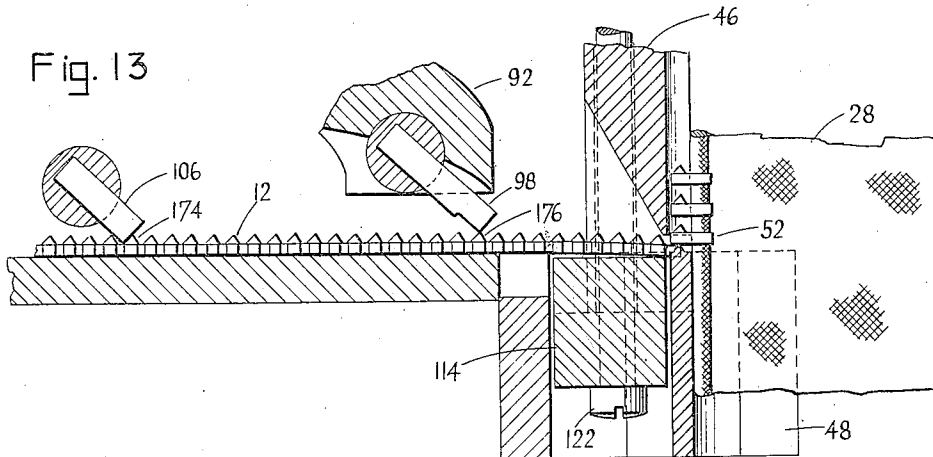


Fig. 14

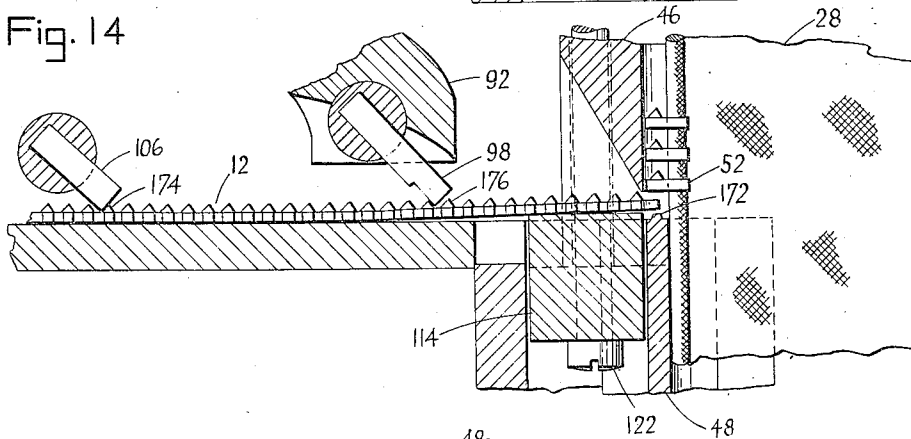


Fig. 15

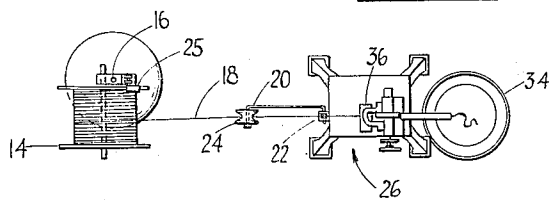
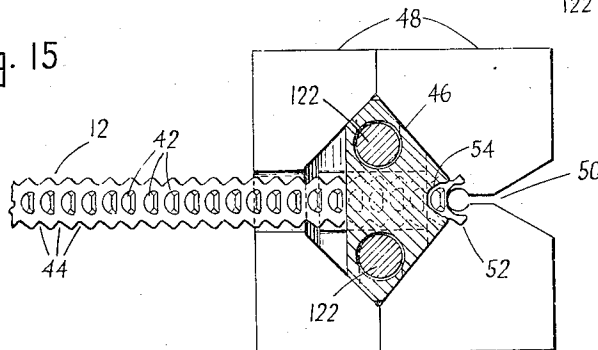


Fig. 16

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UNITED STATES PATENT OFFICE

2,336,662

APPARATUS FOR MAKING SLIDE
FASTENERS

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Application June 5, 1941, Serial No. 396,661

14 Claims. (Cl. 164—88)

This invention relates to apparatus for making slide fasteners.

The primary object of the invention is to simplify the construction and to increase the operating speed, and to generally improve machines for severing and attaching fastener elements to a tape.

A more specific object is to eliminate the use of spring pads ordinarily forming a part of the die. This is done by providing the severing punch with a cross-bar at its lower end so that the punch when rising, will itself function to lift the strip of material to the desired elevation, preparatory to feeding the same through the die toward the tape. Still another object is to make it possible to grind or sharpen the punch throughout most of its working length, despite the provision of the aforesaid cross-bar at the bottom end of the punch. The elimination of the heavy spring pad contributes to reduced inertia and faster operation, and a further object of the invention is to appropriately and commensurately increase the operating speed of the feed means for the strip of embryo elements, this also being done, generally, by reducing inertia effects in the feed means. Another object is to simplify the structure of said feed means.

To the accomplishment of the foregoing general and other more specific objects, which will hereinafter appear, my invention consists in the apparatus elements and their relation one to the other, as hereinafter are more particularly described in the specification, and sought to be defined in the claims. The specification is accompanied by drawings in which:

Fig. 1 is a side elevation of apparatus embodying features of my invention;

Fig. 2 is a partially sectioned plan view of the same with the ram, ram housing, rocker arm, and tape feed mechanism removed;

Fig. 3 is a section taken in elevation approximately in the plane of the line 3—3 of Fig. 2;

Fig. 4 is a similar section through the punch and ram housing, drawn to enlarged scale, this section being taken approximately in the plane of the line 4—4 of Fig. 5;

Fig. 5 is a horizontal section taken approximately in the plane of the line 5—5 of Fig. 4;

Fig. 6 is a partially sectioned front elevation of the punch, looking in the direction from the cam shaft toward the ram and ram housing;

Fig. 7 is a section through the punch and ram, but showing the relation of the parts after long wear of the punch;

Fig. 8 is a side elevation of the punch and ram shown in Fig. 7;

Fig. 9 is a section through the feed lever and lock for the same, said section being taken approximately in the plane of the line 9—9 of Fig. 2;

Fig. 10 shows a part of Fig. 9, but with the feed lever unlocked;

Fig. 11 is a section taken in the same plane as Fig. 3, but showing the feed movement with the parts drawn to enlarged scale;

Fig. 12 is a similar view showing the cutting operation;

Fig. 13 is a similar view but showing the return movement of the parts;

Fig. 14 is a similar view, but illustrates the parts in their end position, preparatory to the next feed movement;

Fig. 15 is a horizontal section through the punch, and shows the strip of embryo fastener elements being operated on thereby; and

Fig. 16 is a plan view of the complete apparatus.

Referring to Figs. 1 and 15, the strip of embryo fastener elements 12 is unwound from a reel 14 supported on a suitable stand 16. The unwinding operation is preferably gravity controlled to provide a loop of slack 18, this loop being controlled by an arm 20 pivoted at 22 and carrying a rotatable, spool-like weight 24. The strip 18 is fed into an attaching machine generally designated 26, said machine comprising means to intermittently feed the strip 12 in a horizontal direction toward a vertically disposed tape 28, said tape being intermittently fed by a tape feed wheel 30. The tape with the fastener elements runs through a guide tube 32 into a basket 34. The vertically reciprocable punch which severs the individual elements from the strip is carried in a ram housing 36 and is actuated by a rocker arm 38. All of the parts of the machine are operated by a main cam shaft 40 driven by a motor. The cam shaft, motor, and tape feed mechanism, etc., need not be described in detail, as they are substantially the same as those described in my Patent No. 2,201,068, issued May 14, 1940, and entitled "Manufacture of slide fasteners," and in my Patent No. 2,302,084, issued November 17, 1942, and entitled "Manufacture of slide fasteners."

The reel 14 is restrained somewhat by an adjustable brake 25 carried by stand 16 and bearing constantly against the periphery of reel 14. The static friction of the brake is somewhat greater than the sliding friction when the reel is in motion. The gravitational pull of weight 24 on wire 18 is greater when the weight is in the

raised position shown in Fig. 1, than when it is lowered so that arm 20 is more nearly vertical. The consequent operation is that when loop 18 becomes short, as shown in Fig. 1, the weight 24 overcomes the static friction of brake 25, and the weight descends, producing a long loop of wire. When the weight can no longer overcome even the sliding friction, the reel stops, and weight 24 is again raised until it again overcomes the static friction of brake 25.

Referring now to Fig. 15, the strip 12 has a series of projections 42 on its upper face, and a series of recesses on its lower surface, these corresponding to the heads of the embryo fastener elements. The side edges of the strip are serrated as indicated at 44, the serrations corresponding to the ends of spread jaws, these being so widely spread as to receive the heads of the elements therebetween. The punch which operates on the strip 12 is shown in section at 46, and moves into a die 48. The said die is slotted at 50 to receive the beaded edge of the tape on which the fastener elements are to be secured. The endmost element which has just been severed from the strip is indicated at 52, the remainder of the strip being forced downwardly by punch 46, the effective cutting edge of which is indicated at 54, said edge outlining the head of the element. In Fig. 15, the element 52 is shown with the jaws still in spread condition, it being understood that the machine includes a pair of clamping jaws (shown at 56 in Figs. 2 and 3) which move sidewardly to close the jaws around the bead of the tape, thereby bringing the outer edges of the jaws into substantially parallel formation.

Referring to Figs. 2 and 3 of the drawings, it will be seen that the clamping jaws 56 are located immediately above the die 48. In Fig. 2, the punch has been removed from the die, and the ram and ram housing have also been removed. The tape and the element strip are also omitted. The clamping jaws 56 are carried on levers 58 pivoted at 60 and having cam rollers 62 received between cylindrical cams 64, said cams being carried by the main cam shaft 40 previously referred to.

Referring to Fig. 3, the punch 46 is secured in a ram 66 which is vertically reciprocable in ram housing 36. The ram is raised by a compression spring 68 bearing against a stud 70 projecting from ram 66. The ram is operated by a bifurcated rocker or ram lever 72 pivoted at 74, and carrying cam rollers 76 at its bifurcated lower end. The ram lever is preferably made of duralumin or equivalent light-weight metal. These cam rollers engage cams 78 which are mounted on cam shaft 40. The opposite end of the ram lever is provided with an adjusting screw 80 the lower end of which bears against a hardened wear plate 82 at the top of ram 66. The purpose of screw 80 is to readjust the position of the ram to compensate for wear when the lower end of punch 46 is ground or sharpened.

The feed means for the element strip (not shown) comprises a cam 84 (Fig. 2) working against a cam roller 86 mounted on one end of a feed lever 88, said lever being pivoted at 90 and carrying a feed dog 92 at its opposite end. The lever 88 is preferably made of duralumin or equivalent light-weight metal in order to minimize its inertia. A compression spring 94 holds cam roller 86 against cam 84. This spring may be adjusted by means of an adjusting screw 96. The feed dog 92 is rigidly secured on arm 88 without any intermediate slide or similar guide means to insure rectilinear motion, these parts

being omitted in order to minimize the mass of the reciprocating parts of the feed mechanism. Furthermore, the dog 92 is not pivoted for vertical movement, and instead is provided with a very small insert 98 (Fig. 3) which is pivoted on the main dog 92. This insert is normally urged downwardly into engagement with the element strip by means of a spring 100 (Fig. 2) connected to an arm 102 projecting upwardly from the spindle 104 in which insert 98 (Fig. 3) is carried.

The angular movement of the feed lever 88 is comparatively slight, and while the dog 92 is rigidly secured to the end of the feed lever, the resulting sideward movement of the feed dog and feed tooth is small enough to be accommodated by simply permitting such sideward movement. The feed tooth is made without side walls which would engage the sides of the element strip, and is made somewhat wider than the projections on the element strip so as to remain in engagement therewith during any such sideward movement.

The element strip is held against backward movement during return movement of the feed dog, by means of a check dog or strip lock 106 (Fig. 3), this comprising an insert carried by a spindle 108 which in turn has an upwardly extending arm 110 (Fig. 2) to which a pull spring 112 is connected.

The punch and ram construction is shown in greater detail in Figs. 4 through 8 of the drawings. The punch 46 carries a cross-bar 114 at its lower end, this cross-bar being secured to side extensions or heels 116 (Fig. 6) which extend below the cutting edge 118 of the punch. The cross-bar 114 closes the lower end of the punch, thereby forming a window or passage 120 through the punch, said passage being dimensioned to receive the element strip being operated on by the punch. As a result of this construction, the punch functions not only to shear the element strip downwardly away from the endmost element resting on the die 48 (Fig. 4), but also to thereafter lift or restore the element strip to initial position preparatory to feeding the next element (the new end of the strip) over the die 48.

The cross-bar 114 is preferably detachably secured to the punch in order not to interfere with grinding or sharpening of the punch when it has been dulled. The punch is preferably made of uniform cross-section throughout its length so that it may be resharpened many times, and much of its length usefully employed. With this same object in view, the cross-bar 114 is preferably secured to the punch by means of a pair of long, slender screws 122 which pass upwardly through holes running through the heels of the punch and extending upwardly throughout the entire length of the punch. The threaded upper ends of these screws are received in a block 124 mounted at the top of the punch and bearing against the end part 126 of the aforesaid stud 70. The stud 126 applies the operating force of ram 66 to the punch 46, although the punch is additionally secured to the ram by rows of set screws 128. The ram 66 is slidable in ways 130 (Fig. 5) which are themselves mounted on ram housing 36 by means of screws 132. These are received in over-sized holes, thus affording adjustment of the ways 130 under control of adjusting screws 134.

It has already been mentioned that the screw 80 (Fig. 4) on the rocker or ram lever 72, may be adjusted to compensate for grinding the cutting edge of punch 46. After extensive wear, the

punch is reset in the ram, and for this purpose the ram is provided with a series of spaced threaded holes 136, 138 and 140. The spacing between these holes may, for example, be one-half inch, in which case the range of adjustment of the screw 80 should be one-half inch or nearly that.

Referring to Figs. 7 and 8, I there show the punch in its lowermost position on the ram, this position being reached only after more than half the length of the punch has been ground away. The force of the ram is applied to the block 124 at the upper end of the punch, by means of a square-headed stud 142, said stud being received in the hole 140. It will be understood that in intermediate stages of punch wear, the stud 142 is positioned in the hole 136, then in the hole 138, and finally in the hole 140.

The screws holding the cross-bar 114 have been changed, the screws 122' being like the screws 122, but shorter. Several pairs of such screws are used, preferably in lengths corresponding to the step-by-step movement of the stud 142. These screws are threaded far enough to accommodate the small, individual sharpenings or grindings of the punch, the upper ends of the screws projecting through the bar or nut 124 as the punch is worn. Theoretically, there is no reason why the original pair of long screws 122 might not be used, these screws then being threaded nearly throughout their length, but because of the extremely long, slender nature of the screws, I prefer to thread the same for only a limited distance, and to use other screws of shorter length as the punch is more extensively worn.

Theoretically, the holes in the punch might be tapped or threaded for the reception of short screws. However, this would have to be done for the full distance before hardening the punch, and I prefer not to even attempt so difficult a threading operation.

Referring now to Figs. 2, 9 and 10 of the drawings, the feed lever 88 may be locked in its outer position, thereby interrupting the feed of the element strip 12. As will be understood by those skilled in the art, this is done in order to provide gaps in the elements secured to the tape, these gaps being, say, two inches long, so that the tape may be severed into individual stringers each having about an inch of spare tape at its ends. A suitable counter is schematically indicated at 144 in Fig. 2, this being operated by link 146 connected to a crank pin 148 on cam shaft 40. The counter may be of the type shown in U. S. Letters Patent No. 2,167,259, issued July 25, 1939, and entitled "Counter." In said patent, a circuit is closed for energizing a solenoid-controlled mechanism during the gap-spacing interval. Such a mechanism is shown in my aforesaid Patent No. 2,201,068. A modified and improved solenoid mechanism, which may be responsive to same counter mechanism, is employed with the present apparatus.

Referring to Fig. 9, a solenoid 150 is mounted beneath the table 152 of the machine, with its core 154 movable vertically. In Fig. 9, it is shown in the elevated position which it assumes when the solenoid is energized. The core is connected by means of a screw 156 to a lock 158, the upper end 160 of which is moved into the path of the feed lever 88. In order to avoid wear, a hardened wear plate 162 is preferably secured at the bottom of the feed lever 88, but this moves with and acts as a part of the feed lever. It rides on a

stationary wear plate 164. In Fig. 10, the rod 158 is shown in the dropped or lowered position which it assumes when the solenoid is deenergized, and at this time the upper end 160 is disposed beneath the hardened stationary wear plate 164 on which the movable wear plate 160 rides. The wear plate is fixed on top of a boss 166 cast integrally with the machine table 152. The rod 168 carried in feed lever 88 is the shaft or spindle on which the cam roller of the feed lever rotates.

The operation of the machine may be described with particular reference to Figs. 11 through 14 of the drawings, which show successive stages in the operating cycle. In Fig. 11, the element strip 12 is being fed forwardly to bring the jaws 52 of the endmost element astride the beaded edge 170 of the tape 28. At this time the punch 46 is in elevated position, and the strip 12 is being fed forwardly by movement toward the right of feed dog 92 and tooth 98. The forward end of strip 12 is elevated by the punch cross-bar 114, and this elevation is so adjusted as to raise the strip slightly from the surface of the die 48 in order to permit the strip to be fed over a locating pilot 172 forming a part of die 48 and projecting upwardly therefrom. This pilot is adapted to be received in the recess at the bottom of the endmost element in order to properly locate the element during the cutting operation. As strip 12 is fed toward the right by feed tooth 98, the strip lock 106 rises to pass over the projection 174.

Fig. 12 illustrates the cutting operation. The endmost element is resting on die 48, the recess at the bottom of the element being disposed on the pilot 172 previously referred to. The end portion of strip 12 has been flexed downwardly slightly (the curvature is exaggerated in the drawings) by the shearing action of punch 46, which is now in its lowermost position. The locking tooth 106 is disposed behind the projection 174 of strip 12. Although the clamping jaws (56 in Fig. 2) are not shown in this figure, it will be understood that they are operated to clamp the element jaws 52 around the tape bead 170 while the element still rests on die 48. Element jaws 52 seem shortened in Fig. 12 because they are assumed to be still in angular or spread position.

Fig. 13 illustrates the return movement of the punch and feed dog. Punch 46 has risen part-way. The element strip now rests on and has been raised slightly by the cross-bar 114. The tape 28 has also experienced part of its upward feed movement, thereby lifting the clamped element 52 upwardly somewhat from die 48. The feed dog 92 has moved part of its return stroke toward the left, the feed tooth 98 rising to pass over the projection 176. The strip is locked by strip lock 106.

Fig. 14 shows the parts in their end position. The strip lock 106 still bears against the projection 174. The feed tooth 98 has moved well back of the projection 176, the feed stroke of tooth 98 being made slightly greater than the pitch of the element wire. The punch cross-bar 114 has raised element strip 12 to a position high enough to clear the pilot 172 of die 48. The previously attached element 52 has been carried up far enough by movement of the tape 28 to properly space the next element therefrom.

The next stage in the operation of the machine may, of course, be illustrated by reverting to Fig. 11, in which the strip is being fed toward the tape by the feed dog.

It is believed that the construction and operation, as well as the advantages of my improved apparatus for making slide fasteners, will be apparent from the foregoing detailed description thereof. The machine is simple, has a minimum of parts, and these are given as short a stroke as possible, and are minimized in mass, thus giving the machine a high operating speed. The punch cross-bar replaces the usual elaborate, complex spring pad arrangements. Despite the use of this cross-bar, the punch may be sharpened or reground, and in fact, this may be done repeatedly so as to use a substantial part of the length of the punch. The strip feed mechanism, as well as the punch and die mechanism, are simplified and lightened, in order to reduce the cost and to increase the operating speed of the machine. The strip lock for interrupting the feed of elements to the tape has also been simplified.

It will be apparent that while I have shown and described my invention in a preferred form, many changes and modifications may be made in the structure disclosed, without departing from the spirit of the invention as sought to be defined in the following claims.

I claim:

1. Apparatus for the manufacture of slide fasteners, said apparatus comprising a stationary die for supporting a fastener element to be cut from a strip of connected fastener elements, means to intermittently feed the strip, a punch for operating on said strip and for shearing the same downwardly away from an element left on the stationary die surface, said punch having downward extensions at the sides of the strip and having a cross bar secured to the lower end of said extensions thereby forming a passage through the punch in which the aforesaid strip is received, said cross bar being so located that it raises the strip to elevated position after the cutting operation and preparatory to the next feed movement of the strip over the die.
2. Apparatus for the manufacture of slide fasteners, said apparatus comprising a stationary die including an upwardly projecting pilot for properly locating a fastener element to be cut from a strip of connected fastener elements, means to intermittently feed the strip, a punch for operating on said strip and for shearing the same downwardly away from an element left on the stationary die surface and pilot, said punch having downward extensions at the sides of the strip and having a cross bar secured to the lower end of said extensions thereby forming a passage through the punch in which the aforesaid strip is received, said die being devoid of spring pads or the like and the cross bar of the punch being so located that it raises the strip to elevated position after the cutting operation and preparatory to the next feed movement of the strip over the die and pilot.
3. Apparatus for the manufacture of slide fasteners, said apparatus comprising a stationary die supporting a fastener element to be cut from a strip of connected fastener elements, means to intermittently feed the strip, a punch for operating on said strip and for shearing the same downwardly away from an element left on the stationary die, said punch having heels extending downward at the sides of the strip of the punch, a cross bar at the lower end of the punch, slender screws passing vertically through the cross bar and heels in order to detachably hold the cross bar in position so as to permit grinding or sharpening of the lower end of the punch, said

cross bar being so located that it raises the strip to elevated position after the cutting operation and preparatory to the next feed movement of the strip over the die.

4. Apparatus comprising a stationary die for supporting an element to be cut from a strip of connected elements, means to intermittently feed the strip, a punch for operating on said strip and for shearing the same downwardly away from an element left on the stationary die, said punch having heels extending downward at the sides of the strip, holes extending through said heels longitudinally of the punch all the way to the upper end of the punch, a cross bar at the lower end of the punch, long slender screws passing upwardly through the cross bar and through said holes to a threaded member at the top of the punch, in order to detachably hold the cross bar in position so as to permit grinding or sharpening of the lower end of the punch, said cross bar being so located that it raises the strip to elevated position after the cutting operation and preparatory to the next feed movement of the strip over the die.

5. Apparatus for the manufacture of slide fasteners, said apparatus comprising a stationary die including an upwardly projecting pilot for properly locating a fastener element to be cut from a strip of connected fastener elements, means to intermittently feed the strip, a punch for operating on said strip and for shearing the same downwardly away from an element left on the stationary die and pilot, said punch having heels extending downward at the sides of the strip, holes extending through said heels longitudinally of the punch all the way to the upper end of the punch, a cross bar at the lower end of the punch, long slender screws passing upwardly through the cross bar and through said holes to an appropriately threaded member at the top of the punch, in order to detachably hold the cross bar in position so as to permit grinding or sharpening of the lower end of the punch, said cross bar being so located that it raises the strip to elevated position after the cutting operation and preparatory to the next feed movement of the strip over the pilot and die.

6. Apparatus including a die, means to intermittently feed a strip of connected elements through the die, a relatively long slender punch cooperating with the die for cutting the strip into individual elements, said punch having a uniform cross-section throughout its length, said cross-section being a contoured cross-section to produce a shaped cut, a ram to which the punch is secured, a ram housing slidably receiving the ram, drive means bearing against the top of the ram and including an adjustable screw for varying the position of the ram and with it the punch to compensate gradually for sharpening of the punch, a stud projecting from said ram at the top end of the punch, and a plurality of spaced holes along the ram for receiving said stud in one of a number of different positions to compensate for extensive shortening of the punch, the aforesaid adjusting screw affording a range of adjustment at least equalling the spacing between successive positions of the stud on the ram, the ram housing accommodating a range of movement of the ram at least equalling the stroke of the ram plus the spacing between successive positions of the stud on the ram.

7. Apparatus for the manufacture of slide fastener elements, said apparatus including a die, means to intermittently feed a strip of con-

nected embryo fastener elements through the die, a relatively long slender punch cooperating with the die for cutting the same into individual fastener elements, said punch having a uniform cross-section throughout its length, said cross-section being a contoured cross-section to produce a shaped cut, a ram to which the punch is secured, a ram housing slidably receiving the ram, drive means bearing against the top of the ram and including an adjustable screw for varying the position of the ram and with it the punch to compensate gradually for sharpening of the punch, a stud projecting from said ram at the top end of the punch, and a plurality of spaced holes along the ram for receiving said stud in one of a number of different positions to compensate for extensive shortening of the punch, the aforesaid adjusting screw affording a range of adjustment at least equalling the spacing between successive positions of the stud on the ram, the ram housing accommodating the stroke of the ram plus the spacing between successive positions of the stud on the ram.

8. Apparatus comprising a stationary die for supporting an element to be cut from a strip of connected elements, means to intermittently feed the strip, a relatively long slender punch for operating on said strip and for shearing the same downwardly away from an element left on the stationary die, said punch having a uniform cross-section throughout its length, said cross-section being a contoured cross-section to produce a shaped cut, said punch having heels extending downward at the sides of the strip, a cross bar detachably mounted at the lower end of the punch, said cross bar being so located that it raises the strip to elevated position after the cutting operation and preparatory to the next feed movement of the strip over the die, a ram to which the punch is secured, a ram housing slidably receiving the ram, driving means bearing against the top of the ram and including an adjustable screw for varying the position of the ram and with it the punch to compensate gradually for sharpening of the punch, a stud projecting from said ram at the top end of the punch, and a plurality of spaced holes along the ram for receiving said stud in one of a number of different positions to compensate for extensive shortening of the punch, the aforesaid adjusting screw affording a range of adjustment at least equalling the spacing between successive positions of the stud on the ram, the ram housing accommodating the stroke of the ram plus the spacing between successive positions of the stud on the ram.

9. Apparatus for the manufacture of slide fasteners, said apparatus comprising a stationary die including an upwardly projecting pilot for properly locating a fastener element to be cut from a strip of connected fastener elements, means to intermittently feed the strip, a relatively long slender punch for operating on said strip and for shearing the same downwardly away from an element left on the stationary die and pilot, said punch having a uniform cross-section throughout its length, said cross-section being a contoured cross-section to produce a shaped cut, said punch having heels extending downward at the sides of the strip, a cross bar detachably mounted at the lower end of the punch, said cross bar being so located that it raises the strip to elevated position after the cutting operation and preparatory to the next feed movement of the strip over the pilot and die, a ram to which the

punch is secured, a ram housing slidably receiving the ram, driving means bearing against the top of the ram and including an adjustable screw for varying the position of the ram and with it the punch to compensate gradually for sharpening of the punch, a stud projecting from said ram at the top end of the punch, and a plurality of spaced holes along the ram for receiving said stud in one of a number of different positions to compensate for extensive shortening of the punch, the aforesaid adjusting screw affording a range of adjustment at least equalling the spacing between successive positions of the stud on the ram, the ram housing accommodating the stroke of the ram plus the spacing between successive positions of the stud on the ram.

10. Apparatus for the manufacture of slide fasteners, said apparatus comprising a stationary die including an upwardly projecting pilot for properly locating a fastener element to be cut from a strip of connected fastener elements, means to intermittently feed the strip, a punch for operating on said strip and for shearing the same downwardly away from an element left on the stationary die surface, said punch having heels extending downward at the sides of the strip, holes extending through said heels longitudinally of the punch all the way to the upper end of the punch, a cross bar at the lower end of the punch, long slender screws passing upwardly through the cross bar and said holes to an appropriately threaded member at the top of the punch in order to detachably hold the cross bar in position so as to permit sharpening of the lower end of the punch, said cross bar being so located that it raises the strip to elevated position after the cutting operation and preparatory to the next feed movement of the strip over the pilot and die, a ram to which the punch is secured, a ram housing slidably receiving the ram, driving means bearing against the top of the ram and including an adjustable screw for varying the position of the ram and with it the punch to compensate for sharpening of the punch, a stud projecting from said ram at the top end of the punch, and a plurality of spaced holes along the ram for receiving said stud in one of a number of different positions to compensate for extensive shortening of the punch, the aforesaid adjusting screw affording a range of adjustment at least equalling the spacing between successive positions of the stud on the ram.

11. Apparatus for the manufacture of slide fasteners, said apparatus including a punch and die for operating on a strip of connected embryo fastener elements having projections, and high speed feed means for intermittently feeding said strip, said feed means comprising a cam, a pivoted feed lever having a cam roller bearing against the cam, a feed dog mounted directly on said feed lever, a very tiny feed tooth pivotally mounted on the end of said feed dog, and resilient means urging said feed tooth into engagement with the projections on the strip, whereby the horizontally reciprocable mass is minimized by the omission of slides or the like for carrying the feed dog, and the transversely reciprocable mass is minimized by localizing the same to the relatively minute feed tooth.

12. Apparatus for the manufacture of slide fasteners, said apparatus including a punch and die for operating on a strip of connected embryo fastener elements having projections, and high speed feed means for intermittently feeding said strip, said feed means comprising a cam, a pivoted feed

lever made of duralumin or equivalent light-weight metal and having a cam roller bearing against the cam, a feed dog fixedly mounted directly on said feed lever at a point immediately over the strip, a very small hardened feed tooth pivotally mounted on the end of said feed dog, and resilient means urging said feed tooth downwardly into engagement with the projections on the strip, whereby the horizontally reciprocable mass is minimized by the light-weight feed lever and the omission of slides or the like for carrying the feed dog, and the vertically reciprocable mass is minimized by localizing the same to the relatively minute feed tooth, said tooth being slidable transversely of the projections on the element strip.

13. Apparatus for the manufacture of slide fasteners, said apparatus including a punch and die for operating on a strip of connected embryo fastener elements, feed means for intermittently feeding said strip, said feed means comprising a cam, a horizontal feed lever having a cam roller bearing against the cam, a feed dog moved by said feed lever for engaging and moving the strip, and means to interrupt feed of the element strip for gap spacing, said means comprising a locking pin slidable vertically into an upward position for engaging the feed lever when the cam has moved the lever to outermost position, a solenoid beneath said locking pin, and a solenoid core 30

connected to said locking pin, the arrangement being such that energization of the solenoid moves the core and locking pin upwardly into position to lock the feed lever, said core and pin being gravitationally moved downward out of the path of the feed lever when the solenoid is deenergized.

14. Apparatus for the manufacture of slide fasteners from a strip of integrally connected embryo fastener elements, said apparatus comprising a reel of element strip, means to rotatably support the same, brake means to resist too free unwinding of the reel, punch and die means to sever the element strip into individual elements, feed means to intermittently feed the strip, and means to maintain a loop of relatively slack wire between the reel and the feed means, said means comprising an arm pivoted at one end and carrying a rotatable grooved weight at the opposite end, said weight resting on said element strip, and said arm being so located that it is moved upwardly toward a horizontal position when the loop of element strip is shortened, and is lowered toward a vertical position when the loop of element strip is lengthened, the brake being so adjusted that its static friction is overcome by the weight when the weight arm is moved toward horizontal position.

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