Nov. 25, 1952 H. P. CAMP 2,619,148

STOP APPLYING MACHINE FOR SLIDE FASTENERS

Filed Oct. 31, 1947 5 Sheets-Sheet 1

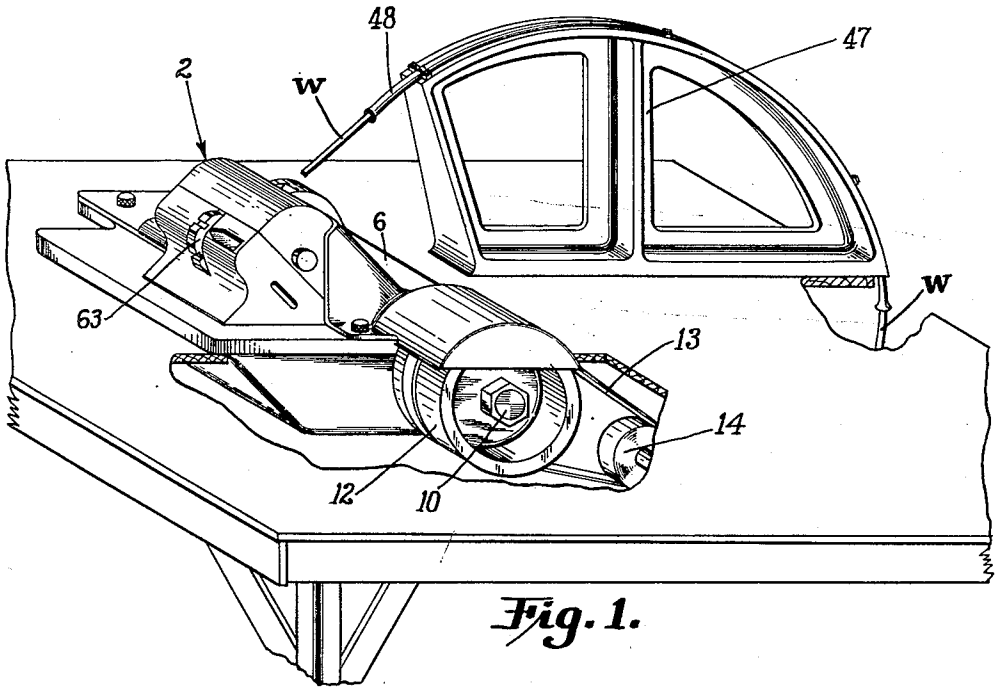


Fig. 1.

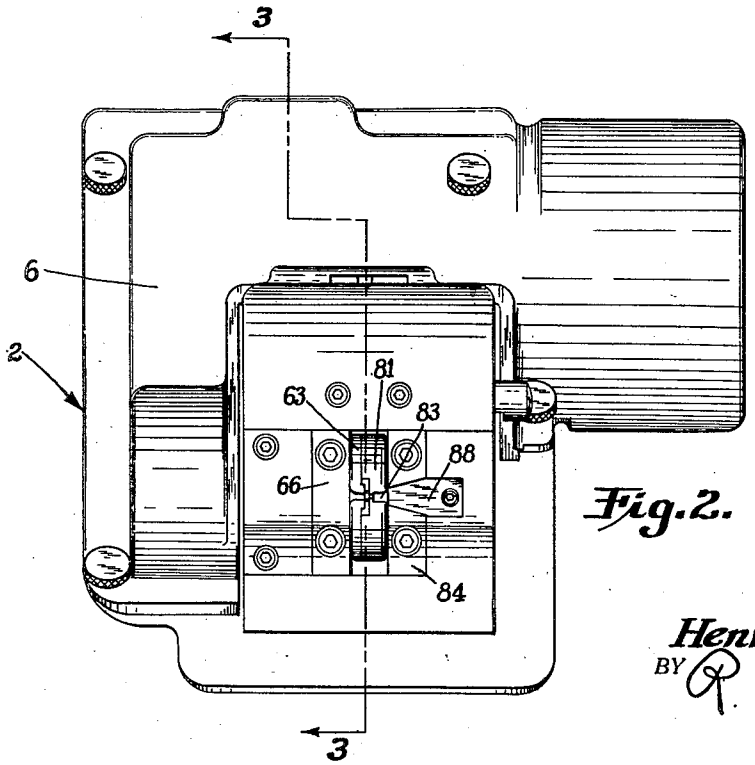


Fig. 2.

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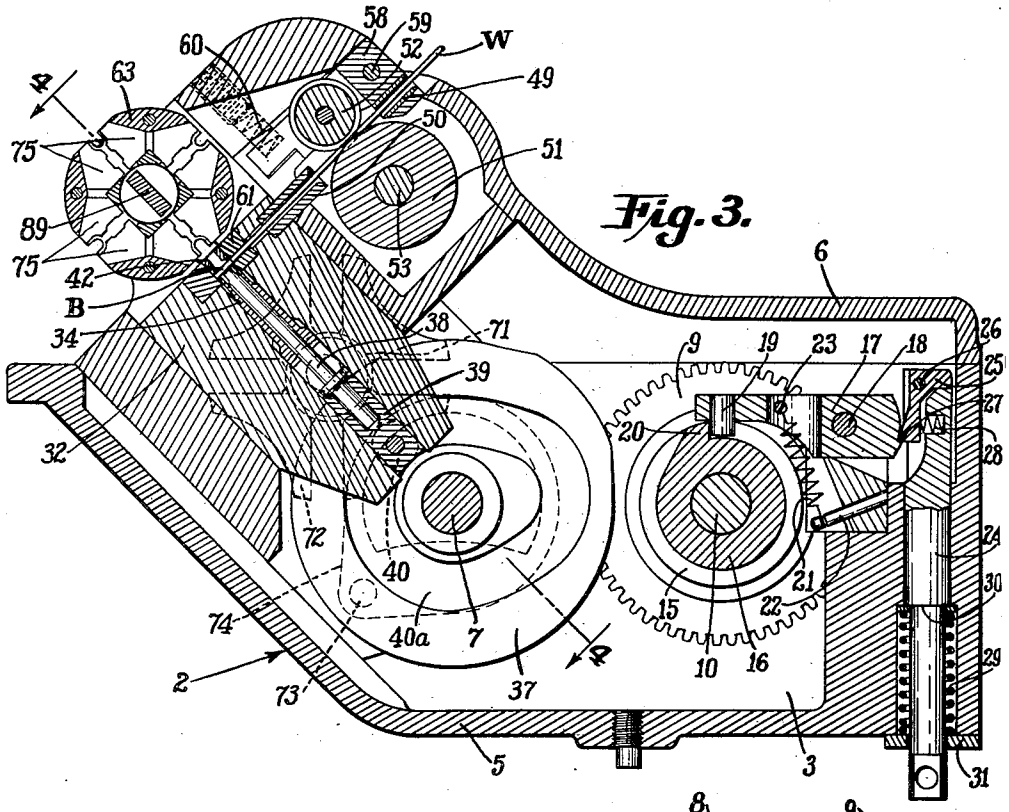


Fig. 3.

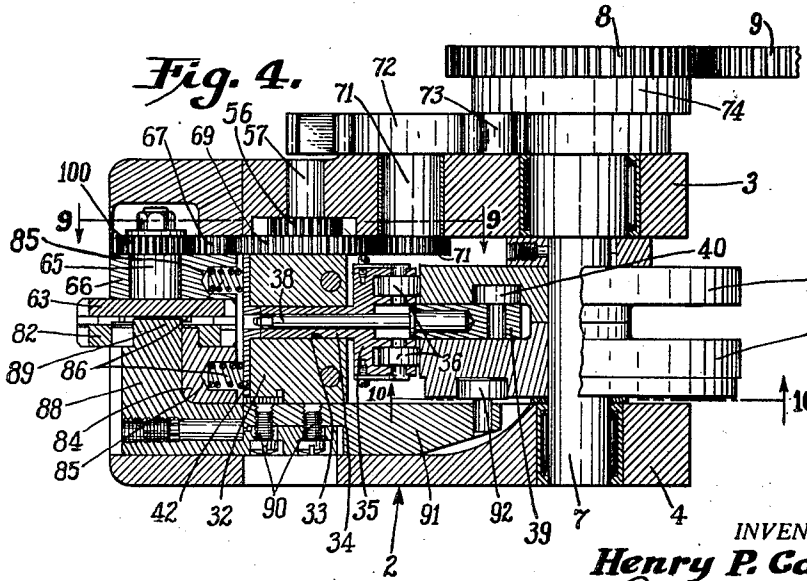


Fig. 4.

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STOP APPLYING MACHINE FOR SLIDE FASTENERS

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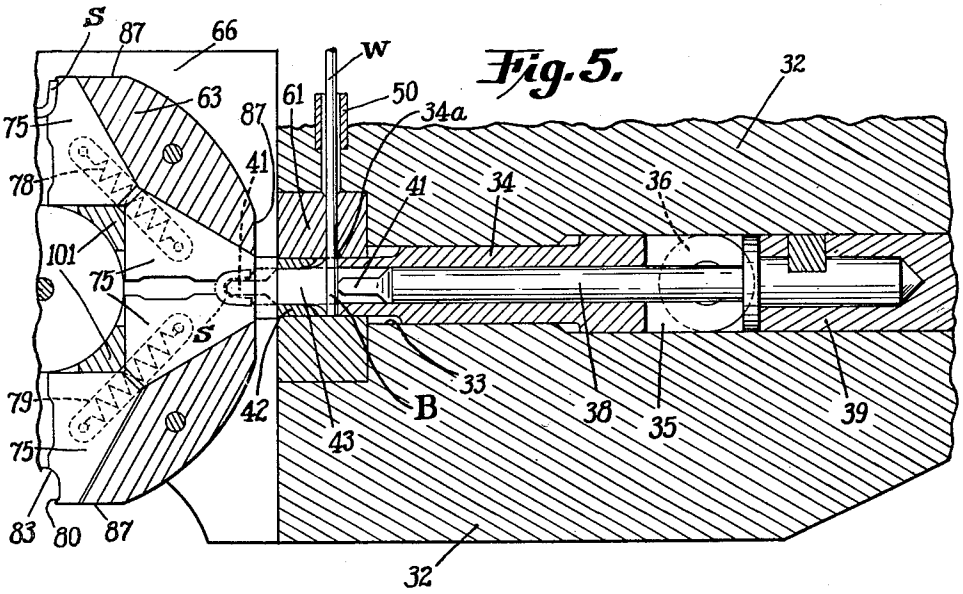


Fig. 5.

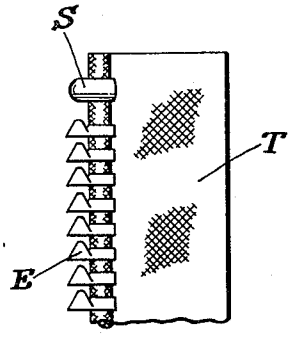


Fig. 8.

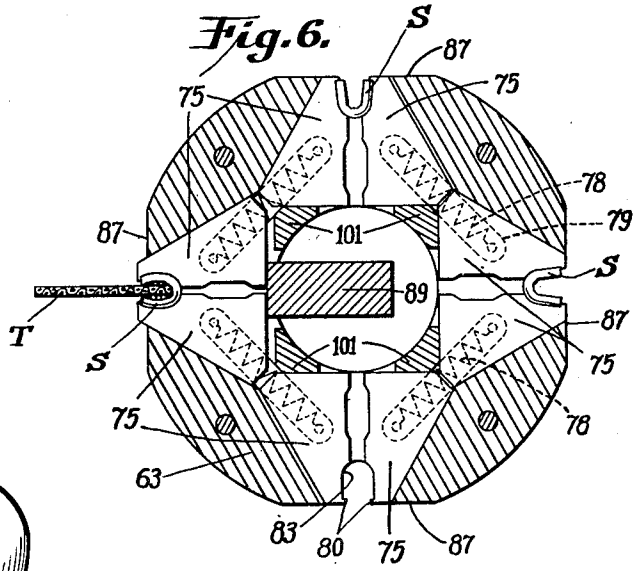


Fig. 6.

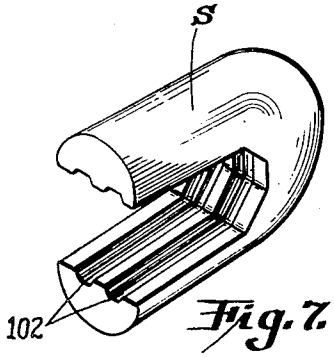


Fig. 7.

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STOP APPLYING MACHINE FOR SLIDE FASTENERS

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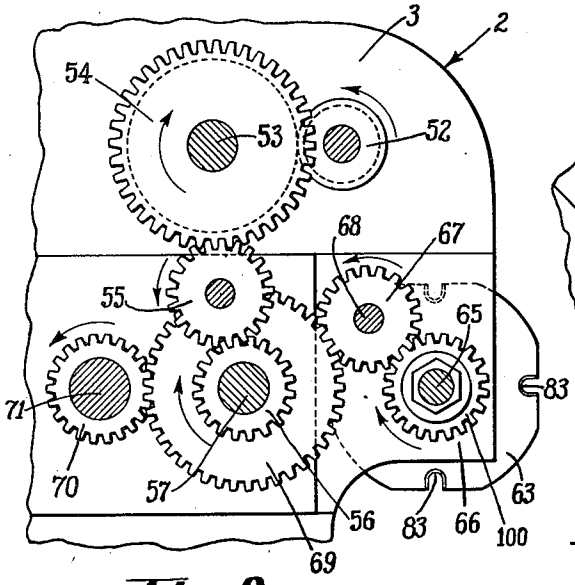


Fig. 9.

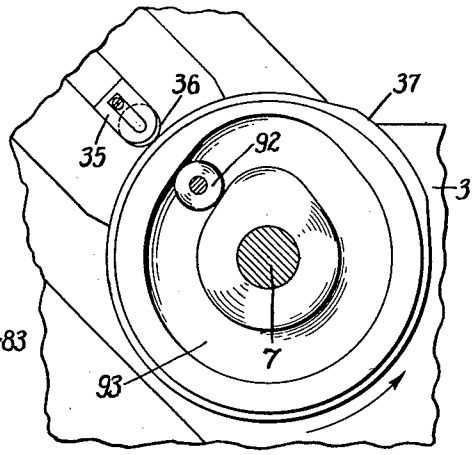


Fig. 10.

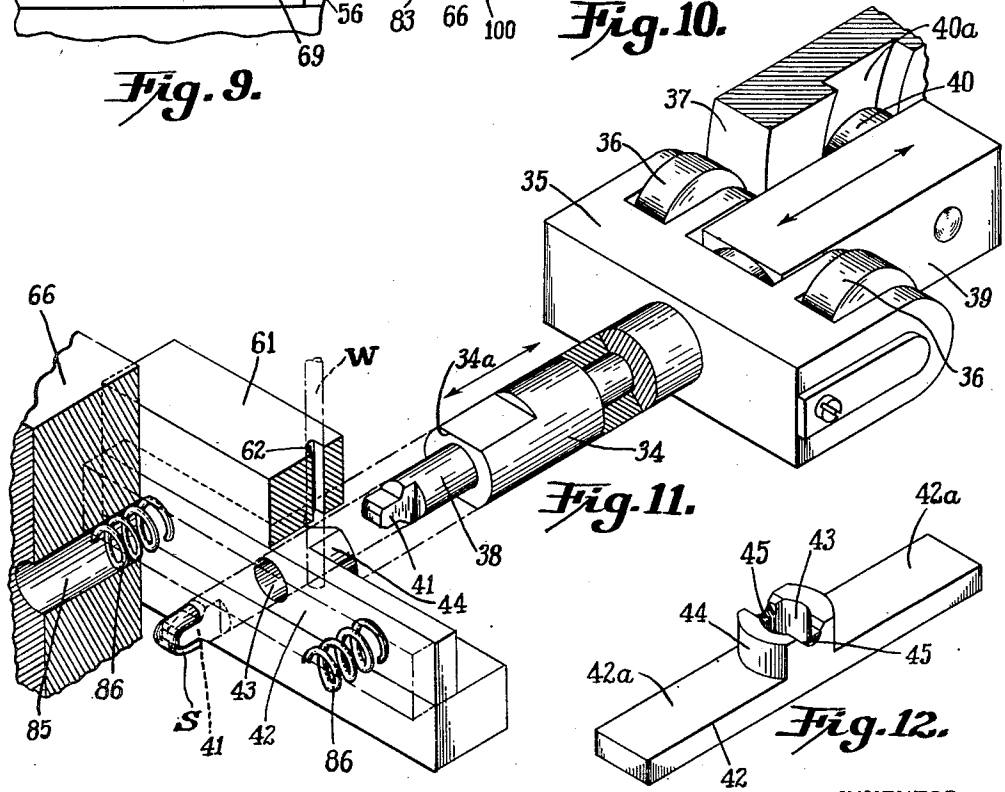


Fig. 11.

Fig. 12.

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STOP APPLYING MACHINE FOR SLIDE FASTENERS

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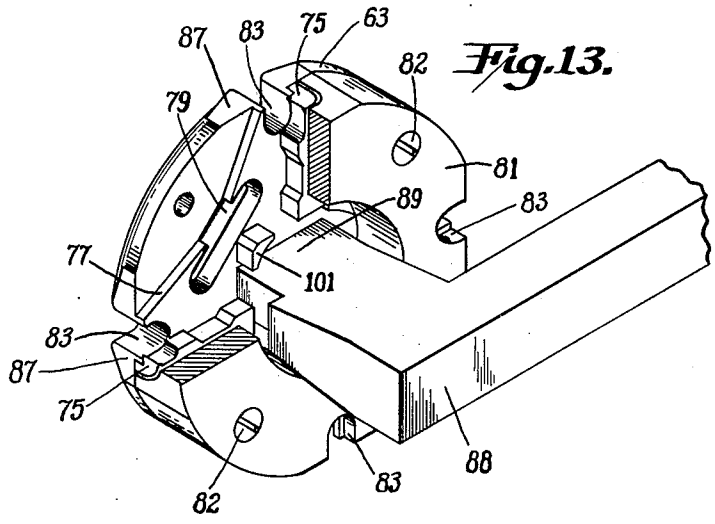


Fig. 13.

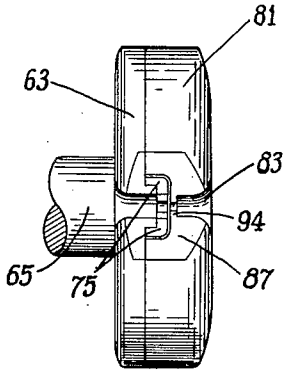


Fig. 14.

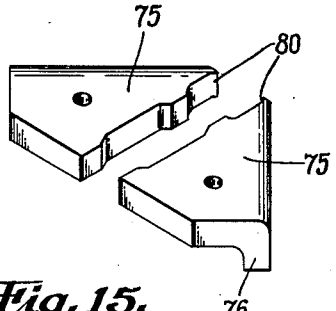


Fig. 15.

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Patented Nov. 25, 1952 2,619,148

UNITED STATES PATENT OFFICE

2,619,148

STOP APPLYING MACHINE FOR SLIDE FASTENERS

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Application October 31, 1947, Serial No. 783,346

7 Claims. (Cl. 153—1)

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This invention relates to a machine for applying stop members, particularly top stop members, to the stringer tapes of slide fasteners, or zippers as they are more commonly called.

A slide fastener consists generally of a pair of stringers with each comprising a series of spaced-apart interlocking fastener elements attached to the opposed edges of a pair of stringer tapes. There is positioned on the elements for longitudinal movement therealong, a slider for engaging and disengaging the elements in a manner well known to those skilled in the art.

It is conventional practice to provide stop members at each end of the series of fastener elements for limiting the opening and closing movement of the slider. One of these elements is known as the bottom stop which is attached and joins both stringers at the bottom of the fastener for limiting the opening movement of the slider, and the other is known as a top stop which is attached to the tape at the upper end of the fastener for limiting the closing movement of the slider. Usually there is provided a top stop on each stringer which stops are disposed substantially opposite each other. It is to a means for applying a top stop member to the edge of stringer tape that the present invention relates.

Accordingly, it is the general object of the present invention to provide an improved machine for applying top stop members to slide fastener stringer tapes which is simple and inexpensive in its construction and operation, and, at the same time, efficient and effective in its use.

It is another object of this invention to provide such a machine which is neat and compact in its design, and, at the same time, strong and rugged in its construction.

It is another object of this invention to provide an improved machine for applying stop members which not only cuts a blank from the end of continuous length strip material, such as wire, but, in addition, automatically forms it into a stop member and applies it to the stringer tape.

It is still another object of the present invention to provide a top stop applying machine which applies satisfactorily stop members at a relatively high rate of speed thereby tending to reduce the manufacturing cost of the finished fastener.

Various other objects and advantages of this invention will be more apparent in the course of the following specification, and will be particularly pointed out in the appended claims.

In the accompanying drawings, there is shown for the purpose of illustration, an embodiment which my invention may assume in practice.

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In these drawings:

Fig. 1 is a perspective view, partly in section, of the improved machine of the present invention;

Fig. 2 is a plan view thereof;

Fig. 3 is a sectional view taken on line 3—3 of Fig. 2;

Fig. 4 is a sectional view taken on line 4—4 of Fig. 3;

Fig. 5 is an enlarged cross-sectional view similar to Fig. 3, showing more in detail the cutting and forming punches, together with the rotatable transferring mechanism;

Fig. 6 is a cross-sectional view of the transferring mechanism;

Fig. 7 is a perspective view of a stop member formed by my machine;

Fig. 8 is a plan view of a slide fastener stringer, showing a stop member attached to the tape thereof;

Fig. 9 is a sectional view taken on line 9—9 of Fig. 4;

Fig. 10 is a sectional view taken on line 10—10 of Fig. 4;

Fig. 11 is an enlarged perspective view of the cutting and forming mechanism of my machine;

Fig. 12 is a perspective view of the forming die;

Fig. 13 is a perspective view, partly in section, of the transferring head;

Fig. 14 is a front view of the same; and

Fig. 15 is a perspective view of the holding and clamping jaws.

Referring more particularly to the drawings, the improved machine of my invention comprises a frame or housing 2 having side walls 3 and 4, a bottom wall 5, and a top cover plate 6. There is mounted in suitable bearings in the side walls 3 and 4, a rotatable shaft 7 on one end of which there is secured a gear 8 which meshes with a gear 9 arranged on one end of a drive shaft 10 which is also rotatably mounted in suitable bearings in the side walls 3 and 4. On the opposite end of the drive shaft 10, there is arranged preferably a pulley 12 around which there is disposed a belt 13 which passes preferably over a pulley 14 secured to the shaft of a motor (not shown) for rotating the drive shaft and driving the machine. It will be understood, however, that any other suitable means may be employed for rotating the drive shaft.

Intermediate the length of the drive shaft 10, there is arranged therewith, as shown in Fig. 3, a single revolution clutch 15 of any suitable construction. The clutch shown is a positive ratchet clutch which is adapted to be engaged by the op-

erator of the machine. This clutch includes a collar member 16 which is freely rotatable on the shaft 10. To one side of the shaft, there is positioned a latch member 17 which is pivoted to a portion of the housing 2, as at 18. On the outer end of this latch member, there is disposed a pawl 19 which cooperates with a stop portion 20 in the form of a shoulder arranged on the periphery of the member 16. The pawl 19 is maintained in contact with the periphery of the member 16 which acts as a cam for a purpose hereinafter to be described by means of a spring 21 arranged between a pin 22 carried by the housing and a pin 23 carried by the latch member 17. At the outer end of the latch member 17, there is arranged for reciprocable movement relative to the housing 2, a rod member 24 with the lower end thereof adapted to be connected to a foot-actuating lever (not shown). On the upper end of the rod 24, there is mounted a latch member 25 which is pivotally attached thereto, as at 26. The latch member 25 cooperates with a notch 27 in the outer end of the latch member 17 for the purpose of tripping the same in a manner to be described. There is provided a spring 28 for maintaining the latch member in contact with the outer end of the latch member 17. Adjacent the bottom of the rod 24, there is arranged thereabout, a compression spring 29 which cooperates with a shoulder 30 arranged on the rod 24 and a plate 31 arranged at the bottom of the housing for the purpose of maintaining the rod 24 in its uppermost position.

Cutting and forming mechanism

As shown in Figs. 3, 4, 5, and 11 of the drawings within the housing 2, there is arranged a die block 32 having a circular hole 33 arranged therethrough. Within this circular hole, there is arranged a hollow cutting punch 34 having a yoke-shaped portion 35 arranged on the inner end thereof on which there is mounted a pair of rollers 36 which cooperate with a pair of cams 37 arranged on the shaft 7 by which the cutting punch 34 is actuated upon the rotation of the shaft 7. On the opposite end of the cutting punch 34, there is arranged a cutting edge 34*a*.

There is arranged axially of the cutting punch 34, a forming punch 38 with the inner end thereof connected to a block 39 which carries a roller 40 which cooperates with a groove or race 40*a* arranged on the inner side of one of the cams 37 by means of which the forming punch is actuated. On the outer end of the forming punch 38, there is arranged a forming portion 41 for forming the stop in a manner to be described.

On the outer side of the die block 32, there is mounted a movable forming die 42 having a circular hole 43 arranged centrally of an enlarged circular portion 44 thereof. This enlarged circular portion 44 is disposed on one side of the forming die and extends into the circular opening 33 of the die block 32 and carries diametrically-opposed centering grooves 45 for a purpose to be described.

Wire feeding mechanism

To one side of the housing 2, as shown in Figs. 1, 3, and 5, there is arranged an arcuate-shaped bracket 47 which carries a tube-like guide member 48 for guiding the wire W to the machine from the source of supply. Adjacent the inner side of the bracket 47, there is arranged a wire feeding unit including a pair of wire guide members 49 and 50 between which there is arranged a pair of feed rolls 51 and 52 for feeding the wire into the machine. The feed roll 51 is mounted on a stud shaft 53 arranged in the side wall 3 of the housing. There is secured to the stud shaft 53, a gear 54 which meshes with a gear 55 which in turn meshes with another gear 56 mounted on the end of another stud shaft 57 rotatably mounted in the side wall 3 of the housing.

The feed roll 52 is an idler roller which is mounted on a lever 58 which is pivotally attached to the frame 6, as at 59. At the opposite end of the lever 58, there is arranged a compression spring 60 for moving this lever about its pivotal connection at 59 so as to maintain the roll 52 in contact with the wire W and the opposed feed roll 50. There is arranged in the die block 32 adjacent the outer end of the circular hole 33 therethrough, a wire cutting die block 61 with which the outer cutting end of the cutting punch 34 cooperates to cut a blank B from the end of the wire in a manner hereinafter to be described. There is arranged in this cutting block, a semi-circular hole 62 which communicates with the circular opening 33 in the die block 32, and it will be understood that the end of the wire passes through this semi-circular hole 62 into the circular hole 33 in the die block 32 so as to be arranged diametrically thereof, as shown in Figs. 3 and 5.

Stop transferring mechanism

At a point directly opposite the forming die 42, there is rotatably arranged a dial or head 63 for transferring the stop member S from the forming station at the forming die to an attaching station disposed diametrically opposite from the forming station on the opposite side of the dial. The dial 63 consists of a plate-like member secured to a stud shaft 65 which is rotatably mounted in suitable bearings in a dial housing block 66 carried by the frame. On the inner end of the shaft 65, there is secured thereto a gear 100 which meshes with a gear 67 carried by a stud shaft 68. The gear 67 also meshes with a gear 69 carried by the shaft 57. The gear 69 in turn meshes with a gear 70 carried by a stud shaft 71 arranged in suitable bearings in the side wall 3 of the frame. On the opposite end of the stud shaft 71, there is arranged a Geneva movement 72 which cooperates with a pin 73 carried by a collar 74 which is securely attached to the shaft 7.

On the inner side of the dial 63, there is arranged a plurality of pairs of triangular-shaped clamping jaws 75, as more clearly shown in Figs. 3, 5, and 13. In the present instance, there is shown four sets or pairs of jaws with each pair arranged ninety degrees from the other. Each of the jaws 75 has a flange portion 76 arranged along one side thereof which cooperates with an inclined shoulder 77 arranged on the inner face of the dial 63. Between one of each pair of jaws 75, there is arranged a coil spring 78 which is positioned in a slot 79 formed in the inner face of the dial inwardly of the shoulder 77 for holding and returning the jaws to their retracted position in a manner to be described. Inwardly of the jaws, there is arranged on the dial 63, a plurality of stop portions 101 against which the inner sides of the jaws are normally seated. On the outer end of each of the jaws 75, there is arranged a lip 80 for holding the stop S between the jaws. The jaws 75 are held in position in the dial 63 by means of a dial plate 81 which is secured to the dial by means of machine screws 82. In the periphery of the dial

63, there is arranged a plurality of U-shaped slots 83 with one disposed directly opposite the space between the jaws 75.

To either side of the transfer dial 63, there is arranged a spacer block 84 in which there is arranged a hole 85 to either side of the dial in which each of the holes there is disposed a compression coil spring 86 with one end of the spring abutting the bottom wall of the hole, and the other abutting the extending ends 42*a* of the forming die 42. The dial 63 has flat portions 87 arranged to either side of the U-shaped slots 83 therein against which the forming die abuts when a stop S is positioned between the jaws 75, as will be later described.

To one side of the dial 63, there is arranged an L-shaped ram 88 having a rectangular-shaped portion 89 which is disposed axially of the dial 63, and which is adapted to cooperate with the inner sides of the jaws 75 between the stop portions 101 to close the jaws in a manner to be described. There is attached to the other leg of the ram 88 by means of machine screws 90, a ram holder 91 having a roller 92 attached to the inner end thereof which is disposed in and cooperates with a groove or race 93 arranged on the inner side of one of the cams 37, as shown in Figs. 4 and 10 of the drawings.

Operation

The machine of my invention operates in the following manner. The tape stringer T to which the stop is adapted to be applied is positioned in one of the grooves 83 of the dial with the endmost fastener element E thereof disposed next to a guide or spacing portion 94 carried by the dial plate 81. It is the purpose of this spacer portion to space the stop member S the proper distance from the endmost fastener element E. It will be assumed that the machine is in operation with the shaft 10 being rotated. The operator then trips the clutch on the shaft 10, as shown in Fig. 3, by means of the rod 24 through the action of the pawl 25 and the latch member 17 thereby disengaging the pawl 19 from the shoulder or stop portion 29 of the clutch so as to permit the clutch to turn one revolution. After the clutch rotates one revolution, it will be seen that the rod 24, together with the latch 25, return to their normal positions due to the action of the springs 29 and 28, respectively. The latch member 17 will also return to its normal position and engage the shoulder 20 due to the action of the spring 21.

When the clutch is engaged, it will be seen that it rotates the shaft 7 due to the meshing of the gears 8 and 9. Upon rotation of the shaft 7, it will be seen that the cams 37 are rotated. It will be assumed that the end of the wire W has been fed into the machine and a blank is ready to be cut therefrom, as shown in Figs. 3 and 5 of the drawings, so that the end of the wire is substantially seated in the diametrically-arranged grooves 45 of the forming die 42. Upon rotation of the cams 37, it will be seen that both the cutting punch 34 and forming punch 38 are moved forwardly toward the wire by means of the rollers 36 carried by the cutting punch and the roller 40 carried by the forming punch which cooperate with the outer side and the groove or race 40*a*, respectively, of the cams 37. As the cutting punch moves forward, the cutting edge 34*a* thereof cooperates with the inner face of the wire cutting block 61 to shear a blank B from the end of the wire W. The cutting punch continues to move forward until the blank B is fully seated in the diametrical grooves 45 of the forming die 42 with the outer end of the cutting punch abutting the inner side of the forming die 42 and moving it to position, as shown in the broken lines of Fig. 11, against the action of the springs 86 so as to seat the inner face of the forming die against the inner side of the spacer blank and flush with the flat surface 87 disposed adjacent thereto on that side of the dial 63. At this point, the cutting punch 34 is arrested from further movement and the forming punch 38 continues to move so as to force the blank B through the hole in the forming die 42 so as to form a U-shaped stop member around the end forming portion 41 of the forming punch. The wire W from which the stop is formed is preferably half round in cross section with the inner side thereof preferably grooved or serrated, as at 102, in Fig. 7, so as to attach more securely the stop to the edge of the stringer tape. The U-shaped stop as formed at the forming station, as has just been described, is substantially of the shape as shown in Fig. 7 of the drawings, with the legs spread a little farther apart, the position they will assume before attaching.

The forming punch 38 continues on its movement through the hole in the forming die carrying the stop S with it and positioning it between the pair of jaws 75 disposed opposite the forming die with the lips of the jaws 80 being disposed around the ends of the stop so as to retain it between the jaws, as shown in Fig. 6. The stop is now positioned between the jaws 75 in readiness to be transferred from the forming station to the attaching station.

Upon further rotation of the shaft 7 and the cams 37 carried thereby, it will be seen that both the cutting punch and forming punch will be moved in the opposite direction to their retracted position in the hole 33 of the die block thereby permitting the forming die 42 to move to its retracted or normal position due to the action of the springs 86 in readiness for the next cutting and forming operation.

Simultaneously with the movement of the cutting and forming punches, as above described, the ram 88 is actuated by means of the cam 37 through the action of the roller 92 and the ram holder 91. It will be assumed that there is positioned at this time between the jaws 75 at the attaching station during a previous operating cycle of the machine, a stop member S, in a manner which has just been described, with the edge of the stringer tape positioned between the jaws of the stop S, as described, to which the stop is to be clamped. Upon movement of the ram 88, it will be seen that the inner end 89 thereof cooperates with the inner sides of the jaws 75, and when the ram is moved in a radial direction outwardly of the dial it strikes the inner ends of the jaws 75 positioned at the attaching station and moves them toward each other due to the action of the flange portions 76 carried thereby which cooperate with the shoulders 77 carried by the dial so as to clamp the stop S positioned between the jaws around the edge of the stringer tape. In other words, the jaws 75 are caused to clamp the stop to the tape by a camming action due to inclined surfaces (shoulders 77 and flanges 76) carried respectively by the dial and the jaw members. After the ram 88 has been moved to its retracted position upon further rotation of the shaft 7, it will be seen that the jaws 75 are moved to their retracted or normal position by means

of the springs 78 against the stops 101. The stringer is then removed from the groove 83 in the dial so as to permit the dial to rotate for the next attaching operation. As a result of this attaching operation, the stop S is attached to the stringer in a position substantially as shown in Fig. 8 of the drawings.

The dial 63 is then rotated by means of the Geneva motion 72 through the action of the gears 66, 67, 69, and 70 positioning the next stop S in position in readiness for the next attaching operation. Simultaneously with the movement of the transfer dial, the free end of the wire is fed into position for cutting a blank B from the end thereof, as has been described, by action of the feed roller 50 which is rotated by means of the gears 56, 55, and 54 which gear train is also actuated by the Geneva movement. This operation now positions the end of the blank adjacent the forming die for the next cutting and forming operation, and this completes one cycle of operation of my machine.

As a result of my invention, it will be seen that there is provided an improved automatic machine for attaching stop members to slide fastener stringers, which consists of a minimum number of parts so as to provide a compact unit which effectively applies the stops to the stringers in a simple and efficient manner.

While I have shown and described an embodiment which my invention may assume in practice, it will be understood that this embodiment is merely for the purpose of illustration and description, and that other forms may be devised within the scope of my invention as defined in the appended claims.

What I claim as my invention is:

1. In a machine for applying end stop members to slide fastener stringers, a rotatable head provided with a plurality of openings arranged around the periphery thereof for receiving substantially U-shaped stop members and adapted for movement from a forming station to an attaching station, a flat surface arranged to either side of each of said openings on the outer periphery of said head so as to provide a planar surface across each of said openings on the outer surface of said head, a pair of movable jaws arranged in each of said openings for holding a U-shaped stop member therebetween, each of said jaws having cam shoulders which co-operate with and slide on inclined cam shoulders carried by said head adjacent said openings, means for rotating said head intermittently so as to move a set of jaws opposite the forming station and another set of jaws opposite the attaching station, means arranged within and axially of said head for actuating said jaws at said attaching station, a movable die arranged opposite the periphery of said head at said forming station, means for feeding and delivering a continuous length of wire opposite said die at said forming station, reciprocable punching means arranged directly opposite said die, said punching means adapted to cut a blank from said wire and force the same into and through said die so as to form in co-operation therewith substantially a U-shaped stop member from said blank and said die adapted to be moved against the flat surface on said head adjacent said opening so as to position the U-shaped stop member in said opening between said jaws therein in co-operation with said punching means.

2. In a machine for applying end stop members to slide fastener stringers, a die block, a forming die arranged in said block, a rotatable head mounted directly opposite the outer end of said forming die and said block, said head having a plurality of openings arranged around the periphery thereof communicating with an opening arranged axially of said head, a pair of movable co-operating jaw members arranged in each of said openings, movable means arranged axially of said head for actuating said jaw members, said head adapted to be rotated intermittently so as to move each set of jaw members successively from a forming station at said forming die to an attaching station, reciprocable punching means arranged in said die block opposite said forming die, means for feeding a continuous length of wire transversely of said die block to a point adjacent and opposite said forming die, said punching means adapted to sever a blank of predetermined length from said wire and in conjunction with said forming die to form a substantially U-shaped stop member and to move it between the jaw members at said forming station, eccentric means arranged adjacent the inner end of said die block for actuating said punching means, for rotating said head and for actuating said jaw actuating means all in timed relation.

3. In a machine for applying end stop members to slide fastener stringers, a rotatable head for transferring the stop members from a forming station to an attaching station, a plurality of pairs of movable cooperating jaw members carried by and arranged around the periphery of said head with each pair of jaw members adapted to hold a stop member therebetween, a forming die arranged opposite the periphery of said head at said forming station, means for delivering stop member blanks of predetermined length to said forming station opposite said forming die, reciprocable punch means arranged opposite said die and said head which co-operates with said forming die to form said blanks into substantially U-shaped stop members and moving the formed member to position between a pair of jaws in said head at said forming station, said head adapted to be rotated intermittently so as to move the formed stop members from the forming station to the attaching station, means arranged axially of said rotatable head for actuating said jaws so as to clamp the U-shaped stop members around the edges of the stringer tapes at the attaching station, a rotatable shaft, and means carried by said shaft for rotating said head for actuating the punch and forming means and for actuating the jaw actuating means all in timed relation.

4. In a machine for applying end stop members to slide fastener stringers, the combination as defined in claim 3, wherein the means for actuating the movable jaw members consists of a ram-like bar arranged axially of said head and being movable radially relative thereto, said jaw members having cam surfaces arranged on the outer sides thereof which co-operate with and slide on cam surfaces arranged on an inner wall of said rotatable head whereby the jaws of each pair are moved toward one another at the attaching station when said ram-like bar is moved radially outwardly thereagainst, and spring means for moving and maintaining normally said jaw members in spaced relation and in their retracted positions in said head.

5. In a machine for applying end stop members to slide fastener stringers, the combination as defined in claim 3, wherein each of the

jaw members has a flange portion carried thereby which is inclined relative to the clamping face portions of the jaws, corresponding inclined cam shoulders carried by said head with which said flange portions co-operate whereby the jaw members of each pair are moved toward one another when the jaw members are moved radially outwardly by said jaw actuating means.

6. In a machine for applying end stop members to slide fastener stringers, a rotatable head for transferring the stop members from a forming station to an attaching station, a plurality of pairs of movable co-operating jaw members carried by and arranged around the periphery of said head with each pair of jaw members adapted to hold a stop member therebetween and to clamp the stop member to the edge of a stringer, a forming die arranged opposite the periphery of said head at said forming station, means for delivering and feeding a continuous length of wire to a point adjacent and opposite said forming die at the forming station, reciprocable punching means arranged opposite said forming die on the side thereof opposite that from said head, said punching means adapted to sever a blank from the end of the wire and in co-operation with said forming die adapted to form the severed blank into substantially a U-shaped stop member and then to position the U-shaped stop member between a pair of jaws of the rotatable head at the forming station, means for actuating said punching means, means for rotating said head intermittently so as to move each pair of jaw members successively from the forming station to the attaching station, and means arranged axially of said head for moving the jaw members of each pair toward one another at the attaching station whereby the stop member is clamped securely to the edge of a stringer.

7. In a machine for applying end stop members to slide fastener stringers, a rotatable head for transferring the stop members from a forming station to an attaching station, a plurality of pairs of movable co-operating jaw members carried by and arranged around the periphery of said head with each pair of jaw members adapted to hold a stop member therebetween and to clamp the stop member to the edge of a stringer, a forming die arranged opposite the periphery of said head at said forming station, said die having a hole arranged centrally thereof, reciprocable punching means arranged opposite the hole in said die on the side thereof opposite that from said head, means for delivering a stop member blank of predetermined length to a point opposite said die, said punching means adapted to move said blank into and through the hole in said die and in co-operation therewith to form the same into substantially a U-shaped stop member and to position it between a pair of jaw members in said head at the forming station, means for rotating said head intermittently so as to move the pairs of jaw members successively from the forming station to the attaching station, means for actuating said punching means, and means arranged axially of said head for actuating said jaw members at the attaching station whereby the jaw members of each pair are moved toward one another to clamp the stop member to the edge of a stringer.

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