METHOD AND BLANK FOR MAKING SLIDE FASTENERS

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Filed Aug. 17, 1945

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

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This invention relates to slide fasteners, and particularly to an improved method of making interlocking elements therefor.

It is the primary object of this invention to provide an improved method of making the fastener elements so that a much smoother and cheaper fastener is produced than has heretofore been done, such elements being of the conventional type each having interlocking means such as a projection and recess at one end and a pair of spaced apart legs or fins at the other end for clamping the element to the beaded edge of a tape.

Heretofore, it has been the general practice either to form the fastener elements individually and attach them to a tape by a hopper-type attaching or chain machine, or to form the elements in a continuous strip in one machine by rolling or pressing and then attaching them to a tape by means of an attaching or chain machine. Both of these methods have certain disadvantages which are overcome by the present invention.

While a machine of the same general type as disclosed in the patent to Gideon Sundback, No. 1,467,015, granted September 4, 1923, has been used successfully for making slide fastener stringers, in such a machine it is necessary to provide a wire of a special cross section (substantially Y-shaped). The formed wire is fed into the machine and Y-shaped blanks are sliced successively off the end thereof from which the elements are formed. The wire is formed into such cross section by a series of rolling operations which, of course, requires rolling equipment and other supplemental equipment to perform and condition the wire before the blanks are cut therefrom thereby adding materially to the cost of manufacturing fastener stringers.

According to the present invention, the wire is formed into a Y-shaped cross section progressively by means of a swaging die thereby dispensing with the need of expensive rolling mills and other supplemental preforming equipment.

Accordingly, it is one of the objects of this invention to provide an improved method of forming preformed strip of substantially a Y-shaped cross section by means of a die arrangement which can be easily and conveniently incorporated with existing attaching or chain machines of the type as disclosed in the aforementioned Sundback patent.

It is another object of this invention to provide an improved method of making a preformed strip from which fastener element blanks are cut wherein a strip of wire is progressively formed to a predetermined cross section and at the same time the strip is indented or fluted at points spaced apart substantially the thickness of a fastener element so as to define a series of connected embryo fastener elements having smooth outer surfaces and rounded edges.

It is a further object of the invention to provide an improved method of making a preformed strip from which fastener element blanks are cut wherein a wire is formed progressively in a swaging die to substantially a Y-shaped cross section corresponding to the cross section of a finished fastener element and at the same time forming the outer sides of each fastener element while in strip form so as to provide a series of connected embryo fastener elements having finished outer sides.

It is still another object of the invention to provide an improved method of making fastener elements wherein a wire is progressively formed to a predetermined cross section with the outer sides of the strip being indented at points spaced apart substantially the thickness of a fastener element thereby defining a series of embryo fastener elements connected to one another by a relatively thin wall of metal so as to aid in cutting the elements apart at such indentations and to insure a more uniform element in height.

Various other objects and advantages of the invention will become more apparent during 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.

In these drawings:

Fig. 1 is a perspective view, partly in section, illustrating schematically part of a machine of the Sundback type showing how the swaging die of my invention may be incorporated therewith for forming the strip;

Fig. 2 is a perspective view of the strip as it is formed by the swaging die showing a fastener element blank severed from the formed end thereof;

Fig. 3 is a vertical sectional view through the swaging die showing the strip being formed therein;

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

Fig. 5 is a vertical sectional view through the machine showing how a fastener element blank is cut from the end of the formed strip and formed into a complete fastener element by the punch and die; and

Fig. 6 is a perspective view of one of the completely formed fastener elements.
The machine shown in the Sundback patent includes a series of related mechanisms and since my invention is concerned with only a portion of such mechanisms, the machine will not be described in complete detail. For a full disclosure of the related mechanisms reference may be had to the aforementioned Sundback patent. In the machine shown in this patent the wire of a special cross section is fed upwardly from the underside thereof and blanks are sliced from the upper end of the wire as it is intermittently fed through a cutting die. There is provided means for placing the blanks in a series of dies spaced apart on the upper face of a rotating dial at the circumferential edge thereof, and this dial is intermittently rotated to carry the blanks in turning into line with a punch mechanism and with clamping jaws where they are attached to a tape. The punch mechanism is operated in properly timed relation to form in conjunction with the forming die in which the blank is resting, the interlocking recess and projection of the fastener element. Mechanism is also provided for feeding the tape intermittently between the clamping jaws of the fastener element and side tools are reciprocated at the proper time to clamp the jaw portion of the fastener elements around the edge of the tape.

In the portion of the machine illustrated in Fig. 1 of the drawing, there is shown a rotating dial 3 supported on the upper end of a vertical shaft 7 which is operated by mechanism (not shown). There is arranged on the top of the dial 7, a series of forming dies 4 equally spaced around the circumferential edge thereof for receiving the fastener element blanks B. The face of the dial 3, there is arranged in suitable guides, a movable head 5 on which there is mounted a reciprocating knife 6 having a thickness substantially equal to that of a fastener blank B. Directly below the knife there is carried by the head 5, a cutting or knife die 7 up through which the strip 5 is fed and with which the knife 6 cooperates to cut a fastener blank from the upper end of the strip in a manner hereinafter to be described. The dies 4 in the dial 2 are progressively brought into alignment with the knife 6 to receive the fastener blanks in turn as they are cut by the knife and cutting die and moved into position in the die by the knife. Immediately after a blank is received in one of the dies, a punch 8 is actuated vertically to form the interlocking recess in the fastener element with the metal displaced from the blank into the forming die during the punching time forming the interlocking projection on the fastener element in a well-known manner.

The contour of the cutting end of the knife is substantially U-shaped and adapted to enter the space between the jaw or clamping portions of the fastener blank. The opening in the cutting die 7 is substantially V-shaped in cross section so as to conform to the shape of the formed strip 5 from which the blanks B are cut.

On the side of the machine, diametrically opposite to the blank 8, there is provided a fabric beaded edge tape T to which the fastener elements are attached after they have been completely formed in the dies 4. This tape is moved upwardly intermittently by suitable mechanism (not shown) and is guided in its movement by suitable guides (not shown). The dies 4 each carrying a fastener element are progressively brought into alignment with the edge of the tape and a pair of oppositely disposed side tools 10 bend the jaw portions together around the beaded edge of the tape so as to clamp securely the fastening element thereto in a manner well known to those skilled in the art.

According to the present invention, as shown in Fig. 1, there is provided a pair of friction feed rolls 12 which are rotatably mounted on an arm of a supporting member 14 which in turn is suitably mounted on the base or frame (not shown) of the machine. A round wire W is fed upwardly by these friction rolls and the peripheries thereof are preferably grooved so as to conform to the contour of the wire. One of these feed rolls 12 is driven intermittently by a ratchet 13 mounted on the same shaft upon which the roll is mounted and has teeth spaced around the periphery thereof which cooperate with a pawl 15 carried by the head 5. The ratchet wheel is driven by the pawl so as to rotate the rolls 12 sufficiently to feed the wire upwardly an amount equal to the desired thickness of a fastener blank B.

Above the rolls 12, there is arranged a swaging die including a stationary or female die 16 carried by the supporting member 14 and an oppositely disposed, horizontally reciprocable swaging punch or male die 17 carried by the head 5 which dies cooperate with each other to complete the operation to be described. The working portion of the stationary or female die 17 is substantially semi-cylindrical and smooth-surfaced at its lower end as at 18 with said working portion gradually increasing in size and changing in shape toward the top thereof to substantially a V-shaped conical tour at the extreme top as at 19. The side walls of the working portion of this die 16 are provided with inwardly extending transverse rib-like portions 20 which are spaced apart substantially the thickness of a fastener blank. These rib-like portions are gradually more pronounced toward the upper end of the die. In other words, the height of these rib-like portions increases gradually from the bottom to the top of the die so that those rib-like portions at the top of the die protrude farther than such portions at the bottom thereof. The working surface of the punch or male portion of the die 17 is substantially semi-cylindrical or U-shaped with the radius of curvature of the working surface gradually increasing toward the top of the punch with the working surface being tangent from the top to the bottom of the punch so as to conform to the working surface of the die 16.

There is carried by the die 18 and protruding outwardly from the face thereof four (4) pin members 21 which extend into and through complementary holes 22 arranged in the head 5 for guiding the head in its horizontal movement so as to insure proper alignment and cooperation of the dies 16 and 17. The head is reciprocated horizontally by any suitable means (not shown).

At the lower end of the die 17 there is mounted on the head 5, a combination guide and stripping member 23 through which the wire W passes from the feed rolls 12. Below this guide member 23, there is arranged preferably a reciprocating finger-like member 24 which is adapted in one portion to engage the wire so as to prevent accidental movement thereof and the wire is being worked upon by the dies 16 and 17.

The swaging die functions in the following manner: The wire W is fed upwardly by the rolls 12 by the action of the ratchet 13 and pawl 15, through the guide member 23 and between the dies 16 and 17. The pawl is actuated by the head 5 to which it is attached upon reciprocable
movement of the head. After the wire has been fed into the swaging die, the head which carries the die or punch 17 is operated so as to be moved inwardly toward the die 16 thereby pressing and feeding the strip 19 back and forth disposed therebetween. At the end of each swaging operation, the wire W is moved ahead by the rolls 12 a distance approximately equal to the thickness of a fastener element blank B, thus bringing a fresh section of wire W into the swaging die and moving the pieces of blank B from the strip into the swaging die by cutting off punch 6. It will be seen that the wire shape (cross section) is gradually changed by the swaging die as it is fed stepwise therethrough until it is finally formed into substantially a Y-shaped cross section at the top of the die, as shown in Figs. 3 and 4. As the wire is worked upon by the die, to change progressively the cross section thereof, the rib-like portions 20 simultaneously indent the outer sides of the wire at points spaced apart approximately the thickness of a fastener element blank B. Also, as the wire is being worked it will be seen that the punch 17 acts thereon to form a gradually deepened, longitudinally extending channel on the opposite side of the wire so as to form in conjunction with the die 16, jaw or clamping portions for attaching the elements to the stringer tape. It will be seen that the swaging operation progressively into a strip S having substantially a Y-shaped cross section with spaced flutes or indentations arranged transversely around the outer sides thereof so as to provide a connected series of embryo fastener element blanks, as shown in Fig. 2.

It will be understood that it is the purpose of the rib-like portions 20 of the die to indent the side walls of the strip at points where the blanks are to be cut therefrom thereby aiding materially the cutting of the blanks from the strip by providing a relatively thin section of metal at these flutes or indentations. These rib-like portions 28 also provide round corners and smooth finished surfaces on the outer sides of the blank so as to eliminate the need of any further smoothing operations on the finished fastener elements after they once have been attached to the stringer tapes.

The upper end of the strip S passes through the cutting or knife die 7 arranged above the swaging die immediately after the swaging operation. As has been hereinbefore stated, the wire is fed upwardly after each swaging operation a distance equal the thickness of a fastener element blank. Accordingly, after the strip is fed so that a thickness of one blank protrudes above the cutting knife 7, the knife 6 is reciprocated so as to cut the endmost fastener blank on the fastener strip from the strip at the indentation or transverse fluting and at which point, it is connected to the next formed fastener blank of the strip, as shown in Fig. 5. This is done preferably simultaneously with the next successive swaging operation. The knife 8, after the blank B has been cut from the strip, continues in its movement so as to move the blank into one of the dies 4 of the die 2. After the blank B has been deposited in the dial, the knife 8 is retracted to the position shown in Fig. 1 and the strip is fed uniformly a distance equal to the thickness of another fastener blank due to the retracted movement of the head 5 and the action of the pawl 15 carried thereby. This completes one cycle of operation of the swaging die.

After the blank B has been positioned in the dial 2, the punch 3 is actuated so as to form the recess and projection on the fastener element blank as hereinbefore explained. The dial is then rotated so as to bring the next die in position opposite the knife 6 for the next successive fastener element blank to be cut from the upper end of the strip S. As the dial 2 is rotated by the shaft 3, it will be seen that the fastener elements are intermittently moved to position opposite the tape T on the side of the die opposite that from the blank B. The tape T is then moved between the legs of the fastener element and the side tools 10 are actuated so as to clamp the fastener elements to the beaded edge of the tape T in a well-known manner.

It will be seen by the practice of my invention, that the swaging die progressively forms a strip having a gradually deepened, longitudinally extending channel arranged in one side thereof with the remaining sides of the strip being formed to the outer contour of a Y-shape so as to provide a strip having substantially a Y-shaped cross section from which the fastener blanks are cut. It will also be seen that the sides of the strip are simultaneously transversely fluted or indented at spaced apart points so as to provide relatively thin walled sections at said points whereby a series of connected embryo fastener elements is provided having rounded edges and smooth finished leg and head portions.

As a result of my invention, it will be seen that there is provided a novel and improved method of preforming a strip for use in making slide fastener elements. By this method, it will be seen that the fastener elements are arranged one on top of the other transversely of the strip thereby providing a method in which no scrap is obtained. The indenting or fluting of the sides of the strip at points where the embryo elements are connected together aids materially in the cutting of the element blanks from each other thereby increasing the life of the knife and cutting die. Also these flutes or indentations act to position the strip in the swaging die as the strip is being swaged thereby insuring that the resulting fastener elements are uniform and of equal thickness. Another advantage of my method is that the swaging die for practicing the same can be inexpensively and conveniently incorporated with existing equipment without the necessity of any material changes in the design or construction thereof.

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. The method of making slide fastener elements which comprises forming a strip of material into a cross section conforming substantially to the contour of an individual fastener element, transversely fluting the side walls of the strip at spaced apart substantially the thickness of an individual element, successively cutting blank members from the end of the strip at said fluting, and forming interlocking surfaces on each of said blanks.
2. The method of making fastener elements which comprises passing a strip of material through and between swaging dies so as to form progressively and gradually the strip into a predetermined cross section in conformance.
with the outer contour of an individual fastener element, simultaneously fluting the sides of said strip transversely therearound, successively cutting blank members from the end of the strip at said fluting, and forming interlocking surfaces on said members.

3. The method of making slide fastener elements which comprises passing a strip of material through and between swaging dies so as to form progressively and gradually the strip into a substantially V-shaped cross section, simultaneously fluting the outer side walls of said strip transversely therearound, successively cutting blank members from the end of the strip at said fluting whereby the blanks each have a head portion and diverging leg portions with the outer sides of said head and leg portions being rounded as a result of said fluting, and forming interlocking surfaces in the head portions of each of said blanks.

4. The method of making slide fastener elements from a metal strip which comprises partially forming the strip while in a unitary form to correspond to a desired shape of the individual elements by passing the strip through and between swaging dies whereby the strip is progressively and gradually worked as it passes therebetween so as to provide finally a cross section conforming substantially to the contour of an individual fastener element, simultaneously indenting the sides transversely of said strip in the vicinity of said formed section so as to provide substantially a V-shaped cross section at the extreme end thereof so that the end of the strip corresponds to the contour of an individual fastener element, indenting the outer sides of the formed portion of the strip transversely thereof at points spaced apart substantially the thickness of an individual fastener element, cutting blank members successively from the formed end of the strip at said indentations, and forming an interlocking projection and recess in each of said blanks.

5. The method of making slide fastener elements which comprises forming a metal strip so as to provide a longitudinally extending, gradually deepened channel in one side thereof adjacent one end of the strip and to provide substantially a V-shaped cross section at the extreme end thereof so that the end of the strip corresponds to the contour of an individual fastener element, indenting the outer sides of the formed portion of the strip transversely thereof at points spaced apart substantially the thickness of an individual fastener element, cutting blank members successively from the formed end of the strip at said indentations so as to provide blanks each having a head portion and diverging leg portions, and forming an interlocking projection and recess in the head portion of each of said blanks.

6. The method of making slide fastener elements which comprises progressively and gradually swaging a round metal strip so as to provide adjacent one end thereof a longitudinally extending, gradually deepened channel in one side of the strip and to provide substantially a V-shaped cross section at the extreme end thereof so that the end of the strip corresponds substantially to the contour of an individual fastener element, simultaneously forming indentations in the outer sides of the formed portion of the strip transversely thereof at points spaced apart substantially equal to the thickness of an individual element, cutting the blank members from the formed end of the strip at said indentations so as to provide blanks each having a head portion and diverging leg portions, and forming an interlocking projection and recess in each of said blanks.

7. A strip for use in making slide fastener elements of the type having a head portion at one end and a jaw portion at the other end, the strip having a longitudinally extending channel in one side thereof and an outer contour corresponding to the outer surfaces of an individual fastener element so as to provide substantially a V-shaped cross section the outer sides of the strip being indented transversely therearound at spaced points substantially equal to the thickness of an individual fastener element so as to provide a series of embryo elements arranged laterally of the strip one next to the other successively connected to one another at said indentations by a relatively thin web of material along the walls of the channel at which web the elements are adapted to be separated from one another.

8. A strip for use in making slide fastener elements of the type having a head portion at one end and a jaw portion at the other end, the outer sides of the strip having transverse indentations arranged transversely therearound at points spaced apart substantially the thickness of an individual fastener element so that the outer sides conform to the outer portions of the outer surfaces of the head and jaw portions of the elements thereby providing a series of embryo elements arranged laterally of the strip one next to the other successively connected to one another at said indentations at which points the elements are adapted to be separated from one another.

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