June 1, 1943. N. J. POUX 2,320,651

SLIDE FASTENER MANUFACTURE

Filed Feb. 24, 1940

Fig. 1.

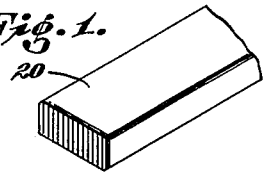


Fig. 2.

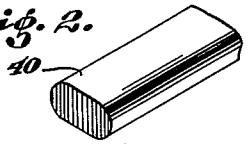


Fig. 4.

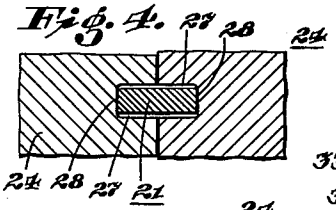


Fig. 3.

Fig. 5.

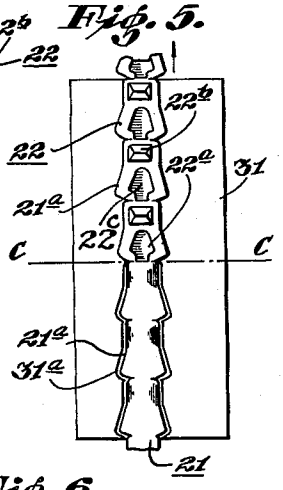


Fig. 6.

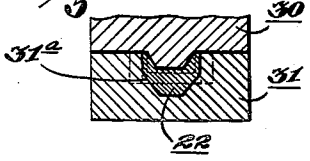


Fig. 9.

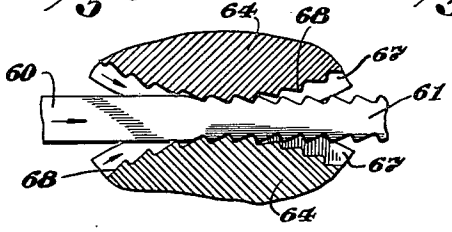


Fig. 8.

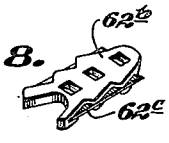


Fig. 7.

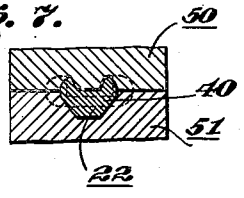


Fig. 10.

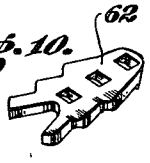


Fig. 11.

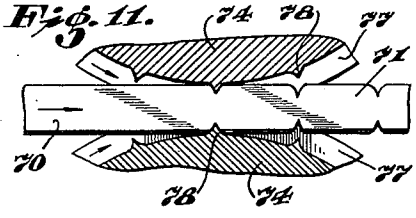


Fig. 12.



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SLIDE FASTENER MANUFACTURE

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Application February 24, 1940, Serial No. 320,628

5 Claims. (Cl. 80—27)

This invention relates to the manufacture of slide fasteners and, in particular, to the formation of interlocking fastener members in strip form.

It is an object of this invention to provide an improved method of forming interlocking fastener members in strip form by die-rolling or roll-coining, wherein the fastener members are formed from continuous wire of rectangular or rounded edge form; wherein the formed fastener members are substantially perfectly filled out; or wherein the falling away of localized portions of the fastener members, such as is generally found at the leg portions thereof, is substantially completely obviated through improved filling of the die cavities of the die rolls or coining rolls in the die-rolling or roll-coining of the strip.

It is a further object of this invention to reduce scrap to a minimum and totally to eliminate the formation of webs, burrs, or flashes on the exterior surfaces of the interlocking fastener members in the strip.

It is a further object of this invention to utilize a preforming or compression of the lateral surfaces of the strip (preferably beyond the ultimate position taken by them after the die-coining) whereby readily to achieve accurate fitting of interlocking fastener member-forming elements in the die cavities of the die rolls or coining rolls.

It is a further object of this invention to prevent deviation of interlocking fastener member-forming strips from a predetermined accurate path through the die-rolling or roll-coining elements whereby a straight strip comprising joined substantially perfectly formed fastener interlocking members is formed by the die-rolling or roll-coining elements.

It is a further object of this invention to provide a method of manufacturing slide fastener interlocking elements in strip form wherein the lateral surfaces, which are most difficult to form, are formed initially, prior to and independently of the formation of the other surfaces, and thereafter predeterminedly located (by the coining die surfaces) during subsequent formation of the other surfaces by roll coining.

These and other objects and advantages of the invention will appear from the following description taken in conjunction with the accompanying drawing which forms a part thereof, and will be pointed out in the appended claims.

In the drawing:

Fig. 1 is a fragmentary enlarged view, in perspective, of one form of rectangular wire stock adapted for use in my invention;

Fig. 2 is a view similar to Fig. 1 of one form of rounded edge continuous wire stock adapted for use in my invention;

Fig. 3 is a view, in perspective, and partly in section, illustrative of apparatus according to this invention, parts being omitted in interest of clearness;

Fig. 4 is an enlarged section taken substantially on the line 4—4 of Fig. 3;

Fig. 5 is a fragmentary top plan view of the lower coining roll shown in Fig. 3, illustrating the interfitting of the fastener member-forming elements in the die cavities of the coining rolls;

Fig. 6 is an enlarged section taken substantially on the line 6—6 of Fig. 3;

Fig. 7 is a view similar to Fig. 6, but illustrating modified coining-roll elements adapted for use with rounded edge wire stock, as shown in Fig. 2;

Fig. 8 is a fragmentary view, in perspective, of a known form of fastener member-forming strip showing the webs or flashes on the lateral surfaces of the strip, which are obviated by me according to this invention;

Fig. 9 is a top plan view, in section, of apparatus for preforming the lateral edge surfaces of a strip such as that shown in Fig. 8 to eliminate the webs and flashes therefrom;

Fig. 10 is a view, similar to Fig. 8, of a fastener member-forming strip according to this invention, wherein the webs or flashes on the lateral surfaces have been obviated by the step illustrated in Fig. 9;

Fig. 11 is a view similar to Fig. 9, illustrating the preforming of the lateral surfaces of a modified form of strip comprising joined interlocking slide fastener members joined together with their legs closed, instead of open as in those forms illustrated in Figs. 3, 5, 8 and 10; and

Fig. 12 is a fragmentary plan view of the strip of Fig. 11 in its final form.

Formerly, strip rolling of interlocking members for slide fasteners was accomplished in a single pass, step, or rolling operation. In such single step or pass, the requisite flow of metal for complete filling of the roll die cavities was not achieved. The greatest deficiency in the completeness of flow generally occurred at the corners and rear of the leg portions of the interlocking elements in the rolled strip.

According to this invention, the die-rolling or roll-coining is accomplished in two steps or passes. In the first step or pass, the lateral or side surfaces of the fastener elements in strip

form are, at least substantially, completely preformed, preferably by opposed side die rolls operating on the opposite sides of the strip stock. This initial pass, of course, causes localized thickening of the strip adjacent those portions which are most deeply indented by the side dies. The transverse reduction of the strip in the initial pass is preferably such that the width of the finally preformed surfaces is less than the width of the die cavities in which they are to interfit in the second or coining pass.

In the second or coining pass, as shown in Fig. 5, the preformed side surfaces interfit with, though they be spaced slightly inwardly of, the side surfaces of the cavities in the coining rolls (Fig. 5). The interfitting relationship is preferably sufficiently snug to secure the desired alignment and guiding of the strip through the second or coining pass or step.

The side surfaces of the die cavities in the coining rolls enclose the preformed lateral surfaces of the strip, while the coining rolls exert pressure in the direction of the thickness of the strip in forming the nose and pocket at the head portion of the strip. The fully preformed surfaces of the strip are then moved outwardly into snug engagement with the side walls of the die cavities provided by the coining rolls, but no substantial change in the preformed lateral surfaces of the strip is accomplished in the second pass or step.

In other words, in the second step, the preformed surfaces are moved out into de-limiting engagement with the side wall surfaces of the coining roll die cavities, while the other portions and surfaces of the interlocking members of the strip are formed by compression exerted in the direction of the thickness of the strip, with consequent flow of metal.

As will be readily understood from Fig. 5, the only possible overflow of metal from the respective coining roll die cavities must take place longitudinally of the strip. However, any tendency for other relative longitudinal movement between the die cavities and the fastener member-forming elements of the strip is prevented by the interlocking relationship between the preformed lateral surfaces in those portions of the strip, which have been subjected to the first step and which have not yet reached the second, or coining, step of the process (see Fig. 5).

The preforming of the lateral strip surfaces in the first step also, by cold-working the adjacent metal, causes these marginal portions to become harder and more resistant to metal flow than the other portions of the strip in the second, or coining, step of the process. By the consequent addition of resistance to metal flow in these marginal portions, the tendency toward flash and longitudinal metal flow is reduced and the concentration of the metal in the coined interlocking member-forming elements in the strip, or denseness of the metal therein, is substantially increased. In other words, the strip is, in effect, casehardened at its marginal portions in the first step of the method and this casehardening increases the normal resistance of the metal of these portions of the strip stock to distortion and deformation in the second step.

Referring to the drawing and in particular to Fig. 3, the strip stock **20** is of substantially rectangular section, as shown in Fig. 1. This strip stock **20** is subjected to the first step or pass of the forming process by passage between a pair of synchronously driven side die rolls **24**. As shown, the side die rolls **24** are each provided with integral intermeshing gears **25** and are supported for suitable adjustment by shafts **26**.

At their upper ends, the die rolls **24** are provided with annular grooves **27** having substantially flat annular side walls and having the inner walls thereof formed by annular series of die members **28** which are adapted to cooperate upon rotation of the side die rolls **24**, and passage of strip stock **20** therebetween, to indent and substantially fully preform the side surfaces of the strip stock **20** and form the intermediate strip portion **21**, as shown in Figs. 3 and 5. Suitable means, not shown, is provided for adjustment of the side die rolls **24**, both axially and toward and from one another.

As shown in Fig. 4, the spacing of the flat side walls of the grooves **27** is preferably greater than the thickness of the strip stock **20**. This permits of the necessary localized thickening of the strip stock adjacent each indentation placed in the strip stock portion **21** by the die members **28**. The action of the die members **28** upon the side portions of the strip stock **20** work hardens the preformed side surfaces **21***a* which are preferably compressed inwardly beyond their ultimate position in the first pass when they pass between the side die rolls **24**.

The hardness of the side portions of the strip portion **21** adjacent the side surfaces **21***a* is preferably such as substantially to inhibit or prevent metal flow between the coining rolls in the second pass of the process and consequent formation of "flash" or lateral webs or, in other words, to prevent distortion of the preformed side surfaces **21***a* in the second pass or step of the process.

After the formation of the preformed side surfaces **21***a* on the intermediate strip portion **21** in the first pass by the side die rolls **24**, the intermediate strip portion **21** enters the second pass or step of the process where it passes between a pair of complementary superposed coining rolls or coining die rolls **30** and **31**. These coining rolls **30** and **31** are supported for synchronous rotation by shafts **32** and **33** respectively, which are spaced from and disposed substantially at right angles to the above-described shafts **26**.

The upper coining roll **30** is provided with an integral gear **34** which meshes with a similar gear **35** which is integral with the lower coining roll **31**. Suitable means, not shown, is provided for adjustment of the coining rolls **30** and **31**, both axially and also toward and away from one another.

In the arrangement shown in Fig. 3, the upper coining roll **30** is provided with a cylindrical surface engaging a similar surface on the lower coining roll **31**. The lower coining roll **31** is provided with a series of female die members or recesses **31***a*, each having a smaller recess complementary with the form of the crown or projection of an interlocking fastener member. The upper coining roll **30** is provided with a series of hob-like male die members adapted to form the portions **22***a* and **22***b* of the interlocking fastener members in the strip portion **22**.

The portion **22***a* of each interlocking member includes the spread legs of the interlocking member between which is formed a thin web **22***c*. This web may be punched out in suitable manner before attachment of the severed interlocking fastener members to the supporting stringer tapes. The portion **22***b* comprises the nose por-

tion of the interlocking fastener element and comprises a projection at one side of the interlocking member and a complementary pocket at the other side thereof.

As is clearly shown in Fig. 5, the intermediate strip portion 21 interfits loosely in the recesses 31*a* of the lower coining roll 31 until the compression of the thickness of the strip, beginning at the line indicated diagrammatically as C—C, causes such metal flow as to cause the preformed side surfaces 21*a* to be moved outwardly into close engagement with the side surfaces of the recesses 31*a* during which movement the other surfaces of the interlocking elements are formed by cooperative action of the male die members on the upper coining roll 30 with the female die members on the lower coining roll 31.

As is shown in Fig. 6, the junction between the upper coining roll 30 and the lower coining roll 31 occurs at the upper surface of the strip. This arrangement may be used only where the upper corners of the strip stock are well defined or, in other words, where the strip stock is of substantially rectangular section, as shown in Fig. 1.

Where the strip stock is of rounded edge section, such as 40 shown in Fig. 2, then the main female die recesses must be divided substantially equally between the upper coining roll 50 and the lower coining roll 51, as shown in Fig. 7.

While the structure illustrated in Figs. 3, 4, 5, 6 and 7 is adapted for production of strip such as 22, wherein the legs of the interlocking elements are spread, it is, of course, to be understood that the principles of this invention are applicable to the rolling of fastener strips of widely varying forms such as the "fishbone" type of strip illustrated in Fig. 8. The "fishbone" strip 62*b* illustrated in Fig. 8 is a known form of so-called "scrapless" strip wherein, however, an exterior web or flash 62*c* occurs during rolling. It is necessary, in the manufacture of slide fasteners from such strip, that this web or flash 62*c* be removed from the interlocking fastener elements either before or after their attachment to stringer tapes. This is an extremely undesirable feature of such strip inasmuch as removal of the flash or web 62*c* is extremely difficult, expensive, and time-consuming.

By the application of the principles of this invention to such strip, as shown in Fig. 9, the side surfaces are formed prior to the formation of the other surfaces of the strip by a pair of side die rolls 64, generally similar to the above-described side rolls 24, and provided with grooves 67 corresponding to the grooves 27 and having their inner surfaces formed by annular series of die members 68 corresponding with the above-described die members 28. The strip stock 60 shown in Fig. 9 is generally similar to the strip stock 20, shown in Fig. 1 and described above, and after its formation by the side die rolls 64, to the intermediate strip form 61, it is subjected to superposed coining rolls generally similar to the coining rolls 30 and 31 or 50 and 51 thereof, though somewhat modified, to form the final strip 62 shown in Fig. 10. Comparison of Figs. 8 and 10 will clearly show that by application of the preforming step of this process, the undesirable exterior web or flash 62 formerly formed on the side surfaces of the strip is totally obviated, thus producing a truly "scrapless" strip of the "fishbone" type.

As illustrative of a further application of the principles of this invention, I have shown in Figs. 11 and 12 the application of the first step or pass of the process to strip stock 70. The strip stock 70 is generally similar to the above-described strip stocks 20 and 60, and has its side edge surfaces preformed between side die rolls 74 corresponding with the above-described side die rolls 24 and 64. The side die rolls 74 are provided with grooves 77 corresponding with the above-described grooves 27 and 67, having their inner surfaces formed by series of die members 78 corresponding with the above-described die members 28 and 68. After the preforming of the side edge surfaces of the strip stock 70 by the side die rolls 74, the intermediate strip portion 71 is subjected to coining action by superposed coining rolls generally similar to the above-described coining rolls 30 and 31 and 50 and 51 in order that the final strip 72, shown in Fig. 12, may be formed.

This form of strip differs from that form shown in Figs. 4 to 7, mainly in that the leg portions 72*a* are unspread. The webs 72*c* formed between the legs of the leg portion are thereafter punched out before the interlocking fastener elements are severed from the strip and their legs spread prior to attachment to stringer tapes.

It is, of course, to be understood that the above-described structure is merely illustrative and in nowise limiting and that I desire to comprehend within my invention all modifications included within the scope of the appended claims.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a method of die rolling strips of interlocking slide fastener members, the steps of die rolling the lateral strip edges substantially to finished form while reducing the strip width to less than the width of the finished strip, then roll-coining the partially preformed strip to form the other surfaces thereof while bringing the preformed lateral surfaces firmly against the walls of the coining die cavities.

2. In a method of die rolling interlocking slide fastener members in strip form, die rolling the lateral surfaces of wire stock substantially to the outline of the finished strip form while compressing the strip to less than finished width, guiding the partially preformed strip through the coining die cavities of coining rolls through engagement of the formed surfaces with surfaces of the die cavities, and compressing the strip in the direction of its thickness in the coining roll die cavities to bring the formed lateral strip surfaces firmly outwardly against the die surfaces of the coining rolls for complete filling of said die cavities.

3. In a method of die rolling interlocking slide fastener members in strip form, die forming the lateral surfaces of wire stock substantially to the outline of the finished strip form while compressing the strip to less than finished width, guiding the partially preformed strip through the coining die cavities of roll coining apparatus through engagement of the formed lateral surfaces with surfaces of the die cavities, and compressing the strip in the direction of its thickness in the coining die cavities to cause lateral expansion and bring the formed lateral strip surfaces into firm delimiting engagement with the die surfaces of the coining rolls for complete filling of said die cavities.

4. In apparatus for die rolling interlocking fastener members in strip form, in combination, edge-forming means including a pair of opposed

die rolls for forming the side surfaces of the strip while reducing the strip width to less than its ultimate value, and coining means including a pair of opposed coining rolls having coining die cavities for receiving strips from said die rolls and guiding said strips by engagement of the coining die cavities with the preformed side surfaces of the strip, said coining rolls compressing the thickness of the strips received from the first-named opposed die rolls for completely filling the coining die cavities of said coining rolls.

5. In apparatus for die rolling interlocking fastener members in strip form, in combination, a pair of opposed die rolls for forming the side surfaces of the strip while reducing the strip width to less than the ultimate strip width, and a pair of opposed coining rolls arranged at ninety degrees to said first-named die rolls for receiving strips therefrom and guiding said strips by loose engagement of the coining die cavities with the preformed side surfaces of the strip, said coining rolls compressing the thickness of the strips received from the first-named opposed die rolls for increasing the strip width while completely filling the coining die cavities of said coining rolls and the volume of each die cavity of said coining rolls being no greater than the displacement of each element forming unit received thereby from said first-named opposed die rolls.

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