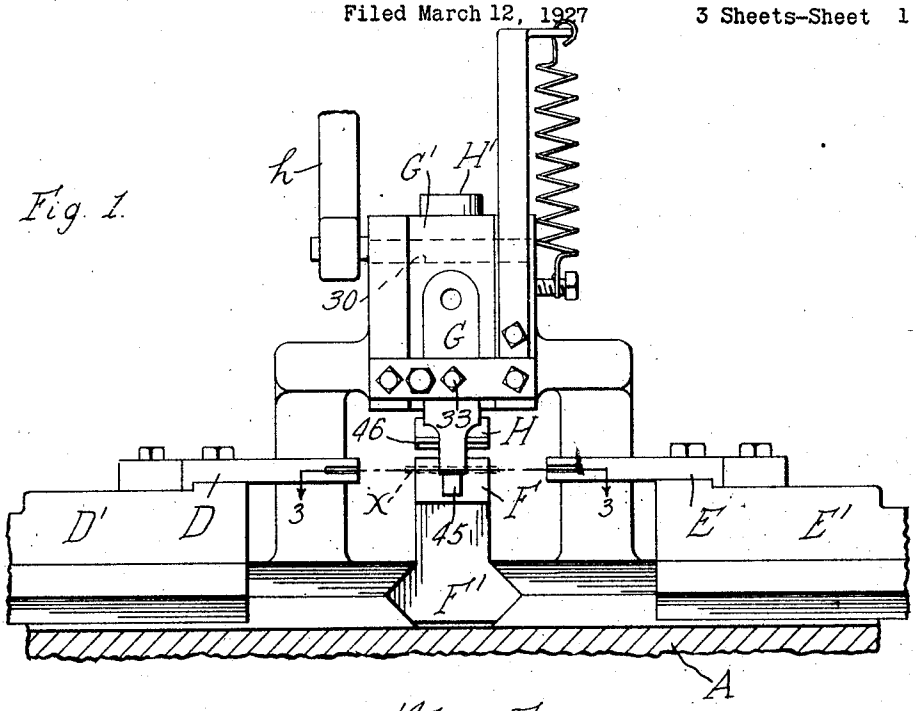
Feb. 12, 1929. 1,701,532

J. M. GLASER

MECHANISM FOR AND METHOD OF FORMING WIRE ARTICLES

Filed March 12, 1927 3 Sheets-Sheet 1

Fig. 1.



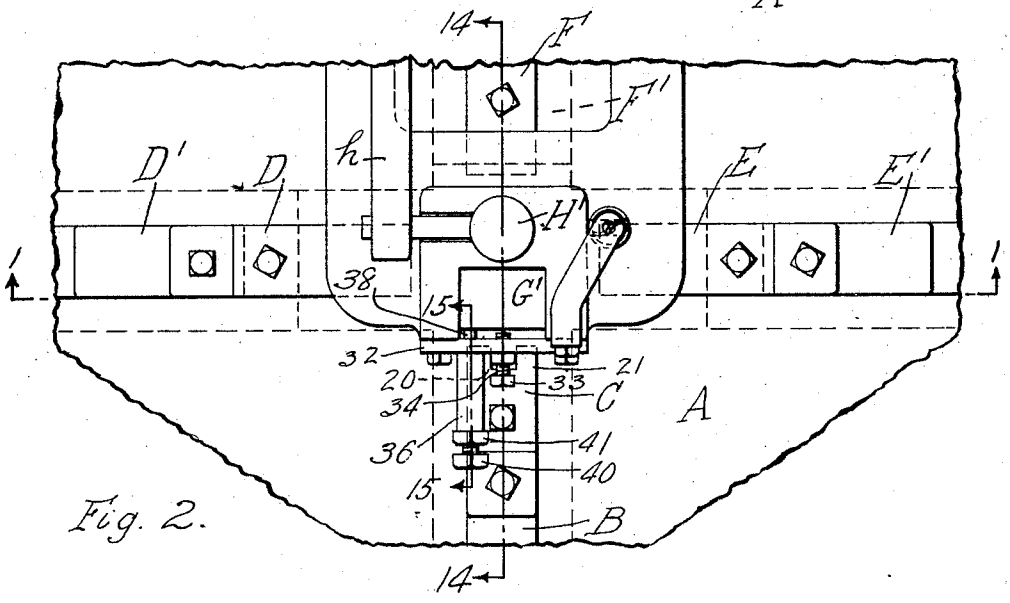


Fig. 2.

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MECHANISM FOR AND METHOD OF FORMING WIRE ARTICLES

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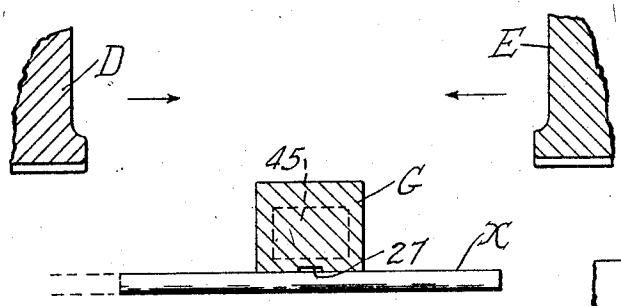
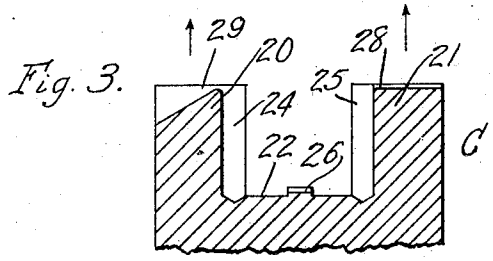
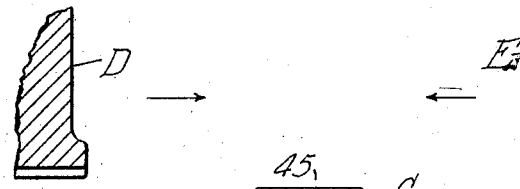


Fig. 3.





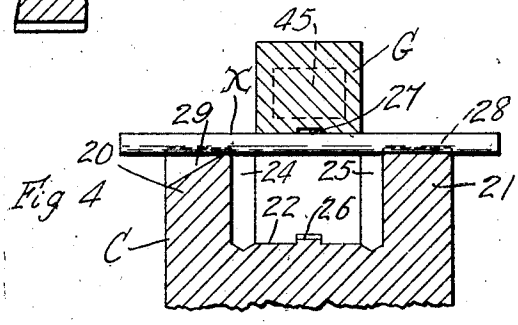


Fig 4

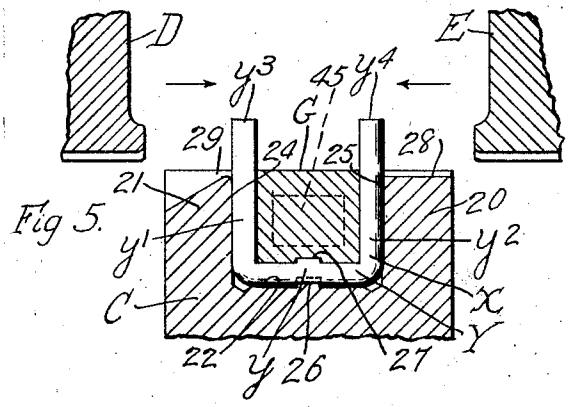


Fig 5.

Fig. 6.

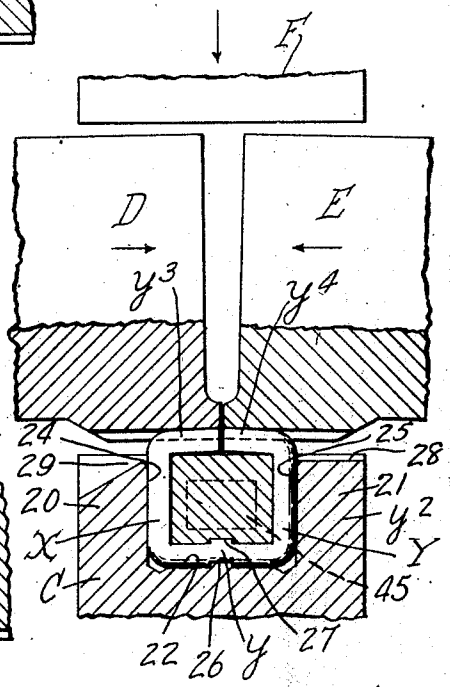
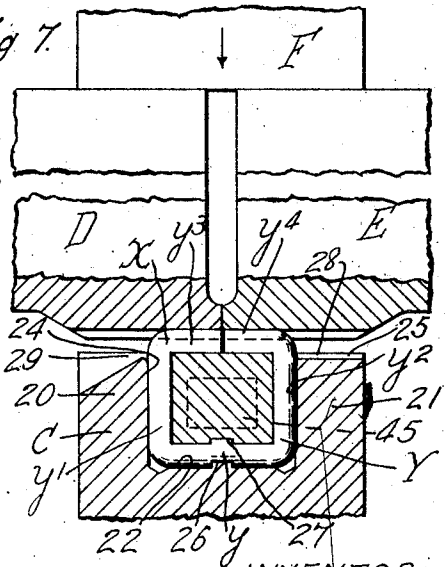


Fig 7.



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MECHANISM FOR AND METHOD OF FORMING WIRE ARTICLES

Filed March 12, 1927 3 Sheets-Sheet 3

Fig. 8.

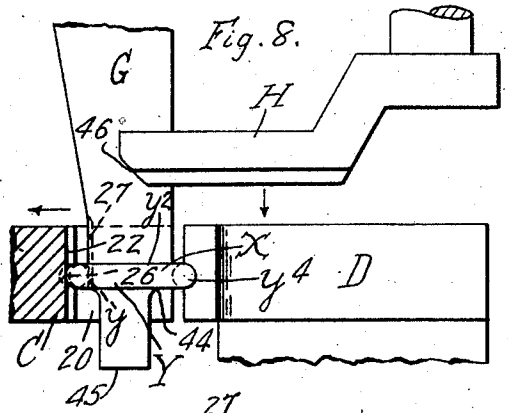


Fig. 9.

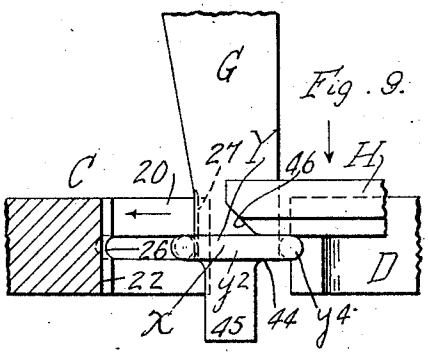


Fig 10.

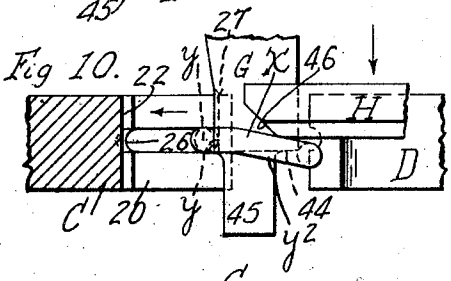


Fig. 11

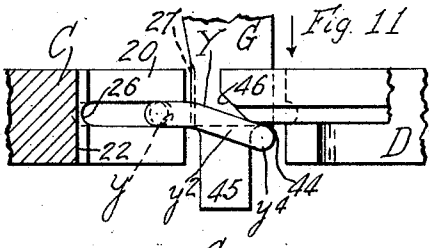


Fig. 12.

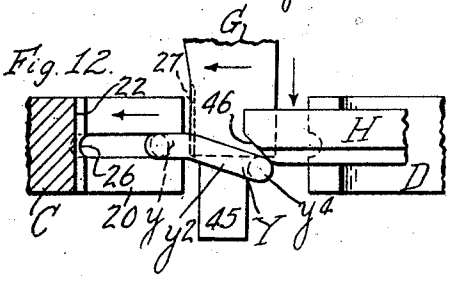


Fig 13.

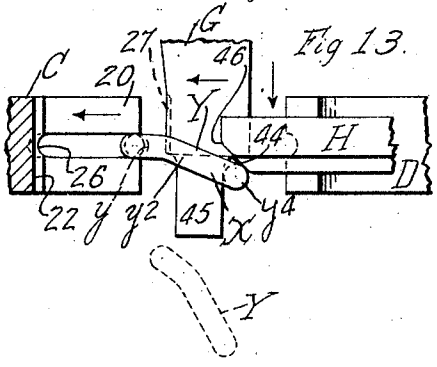


Fig. 14.

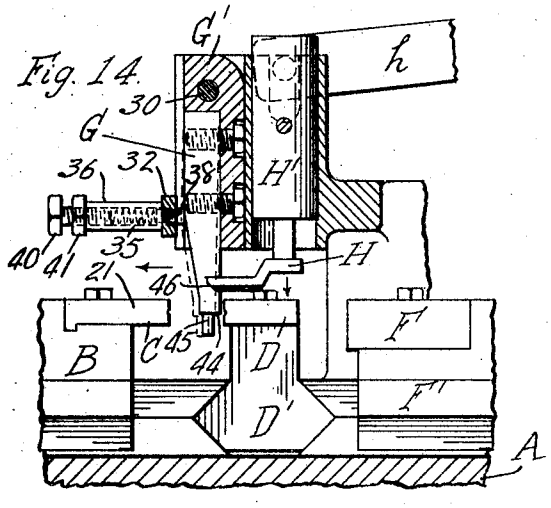
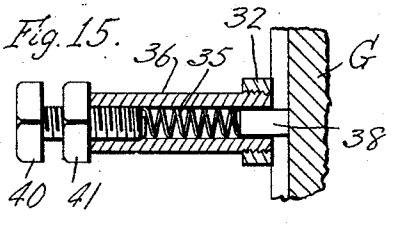


Fig. 15.



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UNITED STATES PATENT OFFICE.

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MECHANISM FOR AND METHOD OF FORMING WIRE ARTICLES.

Application filed March 12, 1927. Serial No. 174,870.

This invention relates to processes and mechanisms for forming wire articles and particularly articles of the kind having a series of angular bends therein, such, for example, as frames, loops and the like.

The mechanism shown in the drawings is intended primarily for forming the body portions or frames of buckles from a straight piece of wire or rod, the frames or body portions being substantially rectangular in form and the sides of the frame or body portion being bent intermediate of the ends thereof so that the body portion of the buckle lies in two intersecting planes. It will be understood, however, that it is not intended to limit this invention for use in connection with the forming of body portions of buckles of this kind since the mechanism disclosed can be used for forming other articles from wire or metal rods.

One of the objects of this invention is to provide a method and mechanism by means of which a length of wire or rod may be bent about a mandrel and in which the ends of the wire are bent toward and into substantial alinement with each other by means of laterally movable dies which are loosely mounted to first bend the ends of the wire approximately into their final position, which laterally movable dies are then engaged by a back die which moves the laterally movable dies at an angle to their lateral movement to press the ends of the wire into their final positions on the mandrel, thereby making it possible to bend the end portions of the wire around the sharp corners of the mandrel and into substantial alinement with each other without nicking or otherwise damaging the wire by the side dies.

Other objects of the invention are to provide a mechanism of this kind with an end die, which presses an end of the frame or buckle against the mandrel and at the same time forms an offset seat thereon on which the tongue of the buckle may be pivoted; also to provide a method of forming looped articles so that the articles are bent to lie in two intersecting planes while the articles are being removed from the mechanism; also to provide a mechanism of this kind with a stripper for removing the formed article from the mandrel and which begins the stripping operation before the dies which hold the sides of the article are entirely out of engagement with the article, thus forming a bend in the sides of the article while the same is being stripped from the mandrel; also to improve the construction of mechanisms of this kind in other respects hereinafter specified.

In the accompanying drawings,

Fig. 1 is a fragmentary, sectional elevation of a wire forming mechanism embodying this invention on line 1—1, Fig. 2.

Fig. 2 is a fragmentary top plan view thereof.

Fig. 3 is a fragmentary, horizontal section thereof on a larger scale on line 3—3, Fig. 1, showing parts of the apparatus in the positions which they occupy when the wire or rod to be bent is fed to the dies of the bending mechanism.

Fig. 4 is a similar sectional view showing the positions of the dies at the beginning of the first bending or forming operation.

Fig. 5 is a similar sectional view showing the positions of the dies at the completion of the first bending and forming operation.

Fig. 6 is a similar view showing the positions of the dies at the completion of the second forming operation.

Fig. 7 is a similar sectional view showing the positions of the dies at the completion of the third forming operation.

Fig. 8 is a fragmentary, sectional elevation of the bending and forming dies, mandrel and stripper, showing the positions which these parts occupy after the completion of the third forming operation.

Fig. 9 is an elevation similar to Fig. 10, showing the stripper in a position to start the combined bending and stripping operation on the formed link or frame.

Figs. 10, 11, 12 and 13 are similar views showing successive steps in the combined stripping and bending operation.

Fig. 14 is a fragmentary, sectional plan view of the forming and bending mechanism on line 14—14, Fig. 2.

Fig. 15 is a fragmentary, sectional elevation thereof on line 15—15, Fig. 2.

This invention is illustrated in the accompanying drawings as applied to a wire bending machine of well known construction, which receives the wire from a coil, straightens the wire and cuts off lengths thereof and feeds them to the bending and forming dies. These wire feeding, straightening and cutting means constitute no part of this invention and are not here illustrated in the drawings. The dies and strippers are moved to-

ward and from the work by means of the cams or other devices of any suitable or usual construction and which also are therefore not illustrated.

A represents a table or plate of the machine which is provided with a series of guideways, one of these guideways serving to guide a slide B on which the front or first forming die C is mounted. The side dies D and E are mounted on slides D′ and E′ respectively, and a back die or presser member F is mounted on a slide F′. G represents a mandrel about which the wire frame or article is formed, the mandrel being mounted on a holder G′ which in turn is mounted on the frame of the machine, and H represents a stripper for removing the formed article from the mandrel, the stripper being secured on a cylinder or movable member H′ actuated by means of an arm h, which in turn is actuated by a suitable movable part, (not shown) of the machine.

For purposes of illustration the mechanism is shown as used for forming a body portion of a frame or buckle, which is illustrated in Figs. 7, 12 and 13, in which the body portion or frame of the buckle is substantially rectangular in shape and is provided at one end thereof with an offset portion which forms a bearing for the usual tongue of the buckle, not shown. The opposite end of the buckle is formed by bending the two ends of the wire toward each other around the mandrel G. The formation of the offset portion y of the frame or body portion of the buckle is preferably effected by means of cooperating parts on the die C and mandrel G and this offset portion is formed simultaneously with the bending of the wire to form the sides y', y^2 of the buckle. For this purpose the die C is preferably of the following construction.

The die C is provided with two arms or projections 20 and 21 adapted to extend toward opposite sides of the mandrel G and a face 22 which is adapted to engage the front face of the mandrel G. The inner faces of the arms 20 and 21 are provided with recesses 24 and 25 of a cross section adapted to receive the wire or rod X from which the frames or body portions of the buckles are to be formed. The face 22 of the die is provided with a projection 26 which is so shaped as to form the offset portion y of the buckle frame by forcing a portion of the straight wire into a vertical slot or recess 27 in the mandrel G. The projection 26 of the front die is so formed as to preserve the circular cross section of the offset portion y of the buckle frame so that this offset portion will constitute a cylindrical bearing for the tongue of the buckle. In Fig. 3 the die C is shown in its receded position and the wire X may be fed to its correct relation to the mandrel by the means usually provided for this purpose. As the die C advances, the wire is received in the shallow recesses 28 and 29 in the ends of the arms 20 and 21 thereof as shown in Fig. 4 and upon further movement of the die C, the wire is bent into engagement with two opposite sides of the mandrel as shown in Fig. 5, and the pressure of the die against the mandrel causes the portion y of one side of the frame of the buckle to be offset. The work at this stage of its formation is of substantially U-shape and the ends of the wire are then bent over toward each other by means of the side dies D and E as shown in Fig. 6. The side dies D and E, or their holders D′ and E′ or both the dies and the holders are more or less loosely mounted in the machine so that there is considerable play in the ends of these dies, as clearly shown in Fig. 6. The ends y^3 and y^4 of the work are not bent into alinement with each other but extend somewhat at an angle to each other. This is an important feature in the manufacture of these buckles for the reason that if the dies D and E were rigidly mounted in the frame of the machine in such a way as to bend these ends y^3 and y^4 of the work into correct alinement with each other, the side dies would have to extend into such close relation to the mandrel that the wire would be nicked or deformed during the bending over of these ends, particularly at the portions of the ends adjacent to the sides y', y^2 of the articles. Consequently the alining of the two ends of the material from which the looped article is made is effected by means of the back die F which moves toward the front die C and forces the ends of the side dies D and E toward the mandrel and thus presses the ends of the work into alinement with each other. This step is clearly illustrated in Figs. 6 and 7, Fig. 6 showing the back die approaching the side dies ready to engage the same, and Fig. 7 showing the back die advanced to press the adjacent ends of the side dies toward the mandrel. During this step of the operation the other parts of the buckle frame are supported by the front die C and mandrel G so that a correct forming of the buckle frame is assured, and, if desired, this last step in the operation may also be used to complete the forming of the offset portion y at the front side of the buckle frame, if for any reason it is found undesirable to partly form or completely form this offset portion during the first step of the operation as illustrated in Fig. 5. With the operation of pressing the ends y^3 and y^4 into alinement, the bending of the work in one plane is completed.

In forming buckle frames it is desirable to bend the sides y' and y^2 of the work in a direction perpendicular to the plane of the work, and this is preferably done during the operation of stripping the work from the mandrel and for this purpose a stripper H of any usual or suitable construction may be em-

ployed, the end portion of the stripper being preferably bifurcated so as to extend toward opposite sides of the mandrel G, the stripper shown being similar in construction to those heretofore employed in connection with machines of this kind. In constructions heretofore employed, the movements of the various dies were so timed that the dies moved completely out of engagement with the work before the stripper engaged the work to push the same downwardly out of engagement with the mandrel G. In accordance with my invention, however, the movement of the front die C out of engagement with the work is retarded, so that the stripper member H moves downwardly and engages the rear side of the work before the front side has been disengaged by the front die. Consequently the stripper presses the rear side of the work downwardly while the front side thereof is still retained in the grooves 24 and 25 of the front die C, thus providing a bend in the work.

Fig. 8 shows the parts in the positions which they occupy when the back die F is withdrawn and the side dies D and E have moved out of engagement with the work and the stripper H is descending to strip the work from the mandrel G. Fig. 9 shows the positions of the parts as the front die C is moving rearwardly out of engagement with the work Y but is still in engagement with the ends of the work up to the point at which the bend is to be made and the stripper H has moved downwardly into contact with the rear side of the work and is beginning to exert pressure downwardly on this end of the work. It will be understood that the front die C is moving in the direction indicated by the arrow while the stripper H is moving downwardly as indicated by the other arrow while the work Y has up to this time been held stationary on the mandrel G. In order to prevent damage to the work and to the die due to the movement of the die C relatively to the work during the bending operation, means are provided to prevent relative movement of the front die C and the work during the bending operation, which means, in addition to preventing the scratching or defacing of the portion of the work, also insure a sharper bend in the work, and prevents a rapid wearing out of the front die which would result if the die were moved relatively to the work while pressure is applied to the work for bending the same. For this purpose the mandrel G is movably mounted so that the mandrel together with the work thereon may move with the front die during the bending operation. In the construction shown for this purpose the holder G′ for the mandrel G is pivoted at 30 so as to permit of a limited movement of the mandrel, for example, from the full line position shown in Fig. 14 to the dotted line position. The forward movement of the mandrel is limited by a stop or cross bar 32 extending croswise of a U-shaped slot in the head portion of the machine in which the mandrel is mounted, and a set screw 33, together with a lock nut 34 may be used for adjusting the stop relatively to the mandrel. The mandrel G may be yieldingly held in its rearward position in any suitable or desired manner. In the particular construction shown a spring 35 is provided for this purpose which is enclosed in a tubular housing 36 mounted on the cross bar 32 of the frame of the machine and a pin or projection 38, see particularly Fig. 15, is pressed by the spring against the front face of the mandrel. The end of the spring opposite to that engaging the pin 38 is engaged by a bolt 40 having a threaded engagement with the end of the tube 36 and a lock nut 41 holds the bolt in adjusted position, so that the pressure with which the spring 35 presses the pin against the mandrel may be regulated as desired.

Consequently the mandrel G is held in its rearward position by the spring during the normal operation of the mechanism. However, when the stripper H descends and engages the work as shown in Fig. 10, the work binds on the mandrel as well as on the die C resulting in a forward movement of the mandrel with the die and thus preventing relative movement between the die and the work during the bending of the work by the stripper H. Consequently while the parts move from the position shown in Fig. 9 to the position shown in Fig. 10 the mandrel G moves forwardly and there is no relative movement between the work and the die C. Upon further downward movement of the stripper H the work passes below a shoulder 44 of the mandrel, as clearly shown in Fig. 11, and thus permits further movement of the work with the die C during the completion of the bending operation, and also permits the spring 35 to again move the mandrel rearwardly. The mandrel may move forwardly with the front die C for the second time during the further bending of the work as shown in Fig. 12, the work at this time engaging a downwardly extending reduced stem or part 45 of the mandrel. The work is then engaged by an inclined or oblique face 46 of the stripper H so that further downward movement of the stripper will effect no bending of the work. During this time the mandrel G having been moved to its extreme front position, the stem or projection 45 of the mandrel will hold the work while the front die C moves out of engagement with the work as shown in Fig. 13, and the work consequently drops out of engagement with the mandrel and front die C.

By means of the construction described all the operations which are performed on the work are completed in a single cycle, so that the wire or rod from which the work is formed is bent in two different planes and the seat for the tongue of the buckle is formed, all of these

steps constituting a single operation of the machine and being effected without any handling of the work by an operative, who merely places a coil of wire in position to be fed to the machine.

I claim as my invention:—

1. The method of forming an article from wire or rod, consisting of bending the wire or rod around a mandrel, holding portions of two sides of said article intermediate of the ends thereof, and pressing a free end of said article away from said mandrel to bend the article while stripping the same from said mandrel.

2. The method of forming looped articles from a straight piece of material, consisting of bending the material around a mandrel by means of dies, holding portions of two sides of the looped article in said dies at distances from the ends of the article, and bending the other portions of the sides while stripping the article from said mandrel, such bending being effected by holding said article in said dies during portion of the stripping operation and then releasing the article from said dies after the bending is completed to permit the stripping operation to be completed.

3. The method of forming looped articles from a straight piece of material, consisting of bending the material around a mandrel by means of dies, holding portions of two sides of the looped article in said dies at distances from the ends of the article, and pressing other portions of said sides in a direction transverse to their plane while said die is moving in a direction to disengage said article, to bend said article into two intersecting planes.

4. The method of forming looped articles from a straight piece of material, consisting of bending the material around a mandrel by means of dies, holding portions of two sides of the looped article in said dies at distances from the ends of the article, pressing other portions of said sides in a direction transverse to their plane while said die is moving in a direction to disengage said article, to bend said article into two intersecting planes, and causing said article to move with said die during said last bending operation.

5. The method of forming looped articles of substantially rectangular form from a straight piece of material, consisting of bending the material to form three sides thereof, pressing the ends of the material toward each other approximately into alinement with each other by dies movable toward each other and having a limited freedom of movement toward and from the work, and then pressing said ends into alinement with each other by applying pressure to said dies to move them in a direction transverse to their previous direction of movement while said dies are in engagement with said ends.

6. A mechanism for forming looped articles from a straight piece of wire, including a mandrel, a die movable into operative relation to said mandrel and having arms adapted to engage the wire to bend the same around two opposite sides of the mandrel, means for completing the bending of said wire into loop form and means for stripping the loop from said mandrel and also bending said loop on said die into two intersecting planes while stripping it from said mandrel.

7. A mechanism for forming looped articles from a straight piece of material, including a mandrel, a die movable into operative relation to said mandrel and having arms adapted to engage the material to bend the same around two opposite sides of the mandrel, cooperating parts on said mandrel and said die for offsetting a portion of one end of the work, side dies which bend the ends of said material toward each other at the side of the mandrel opposite to the side at which said offset portion is formed, and each also movable laterally to a limited extent, and a back die for forcing said side dies laterally toward the mandrel to complete the bending of the ends of said material toward the mandrel and the formation of said offset portion.

8. A mechanism for forming looped articles from a straight piece of material, including a mandrel, a die movable into operative relation to said mandrel and having parts adapted to engage the material to bend the same around the two opposite sides of the mandrel and a part adapted to press the material against another side of the mandrel, said last mentioned part having a protruding portion with a substantially semi-cylindrical concave face, said mandrel having a recess arranged in operative relation to said protruding part, whereby a portion of the material is pressed by said protruding part, into said recess to form an offset bearing portion on said article.

9. A mechanism for forming looped articles of substantially rectangular form from a straight piece of material, including a mandrel, an end die movable into operative relation to the mandrel to bend the material around three sides of the mandrel, dies movable laterally with reference to the direction of movement of said end die and which bend the ends of the material toward each other at the fourth side of the mandrel and which have a limited movement in a direction crosswise of their lateral movement, and means engaging said side dies at the completion of their lateral movement to move said dies in said crosswise direction toward said mandrel to press said ends of the material against the fourth side of said mandrel.

10. A mechanism for forming looped articles of substantially rectangular form from a straight piece of material, including a mandrel, an end die movable into operative rela-

tion to the mandrel and having parts to bend the material around three sides of the mandrel, side dies movable laterally with reference to the direction of movement of the end die to bend the ends of the material toward the fourth side of said mandrel, said side dies being loosely mounted to permit said side dies to move to a limited extent in a direction crosswise to their lateral direction of movement, whereby the ends of the material are bent toward each other but not into alinement with each other by the lateral movement of said side dies, and means for engaging said side dies and moving the same toward said end die to cause the ends of the material to be bent toward said fourth side of the mandrel into alinement with each other.

11. A mechanism for forming looped articles of substantially rectangular form from a straight piece of material, including a mandrel about which the material is formed, a front die for forming the material against three sides of the mandrel, loosely mounted side dies for pressing the ends of the material toward the fourth side of the mandrel, and a presser member adapted to press said side dies after they have completed their stroke toward each other, toward said mandrel for bending the ends of the material into substantial alinement with each other while the work is pressed toward said mandrel by said front die.

12. A mechanism for forming looped articles from a straight piece of material, including a mandrel about which the material is bent, a front die for bending the material partially around the mandrel and having recesses adapted to receive the material, means for completing the bending of the material around said mandrel, and a stripper member which engages the work to strip the same from said mandrel before the work is disengaged from the recesses of said front die and to bend the work while the same is being stripped from the mandrel.

13. A mechanism for forming looped articles from a straight piece of material, including a mandrel, a front die for bending the material partly around said mandrel and having recesses into which the material enters, and a stripper which moves into engagement with said work to strip the same from said mandrel while said work is still in engagement in said recesses, said mandrel being pivotally mounted to move with said die during the bending of the work by said stripper.

14. A mechanism for forming looped articles from a straight piece of material, including a mandrel, a front die for bending the material partly around said mandrel and having recesses into which the material enters, and a stripper which engages one end of said work while the other end is still held in said recesses of said die, for bending the portion of the work engaged by said stripper at an angle to the portion of the work held in said recesses, said mandrel being pivotally mounted to move with said die during the bending of the work by the stripper to prevent relative movement of the work and the die during the bending operation.

15. A mechanism for forming looped articles from a straight piece of material, including a mandrel, a front die for bending the material partly around said mandrel and having recesses into which the material enters, a stripper which moves downwardly during the movement of said die out of engagement with said work and which stripper engages the work before the same has moved out of the recess of said die for bending the portion of the work engaged by said stripper at an angle to the portion of the work held in said recesses, and a portion of reduced cross sectional area at the lower end of said mandrel which engages said work and draws the same out of said recess in said die after the completion of the bending operation.

16. A mechanism for forming looped articles from a straight piece of material, including a mandrel pivoted to have a limited forward and rearward movement, means for yieldingly holding said mandrel against forward movement, a front die for bending the material partly around said mandrel, means for completing the bending of the material around said mandrel, a stripper member for stripping the work from said mandrel and which moves into engagement with said work before said front die is entirely moved out of engagement therewith, to bend the portion of the work engaged by said stripper at an angle to the portion of the work held in said die, said mandrel and the work moving with said die during said bending of the work by said stripper, and means for drawing the work out of engagement with said die after the completion of said bending operation by said stripper.

17. A mechanism for forming looped articles of substantially rectangular form from a straight piece of material, including a movably mounted mandrel, a front die movable into operative relation to said mandrel to form two bends in said material, side dies movable laterally toward and from said mandrel to bend the ends of said material toward each other, said dies having a limited movement relatively to said mandrel in a direction substantially lateral to their paths of movement, a back die adapted to engage said side dies to press the same toward said mandrel after the completion of the working stroke of said side dies, and a stripper movable in a direction to remove the articles from said mandrel, the movement of said stripper being so timed as to cause the stripper to press one portion of the article

out of engagement with the mandrel while a portion of said article is still held by said front die, to bend said first mentioned portion at an angle to said last mentioned portion.

18. A mechanism for forming looped articles from a straight piece of material, including a mandrel, means for bending the article around said mandrel into substantially U-shape with the ends of the U-shaped article projecting beyond a side of said mandrel, dies loosely mounted and movable into engagement with said ends to bend the same toward each other against a side of said mandrel, and pressing means adapted to engage said dies to press the same toward said mandrel to complete the formation of said article.

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