

Dec. 6, 1960

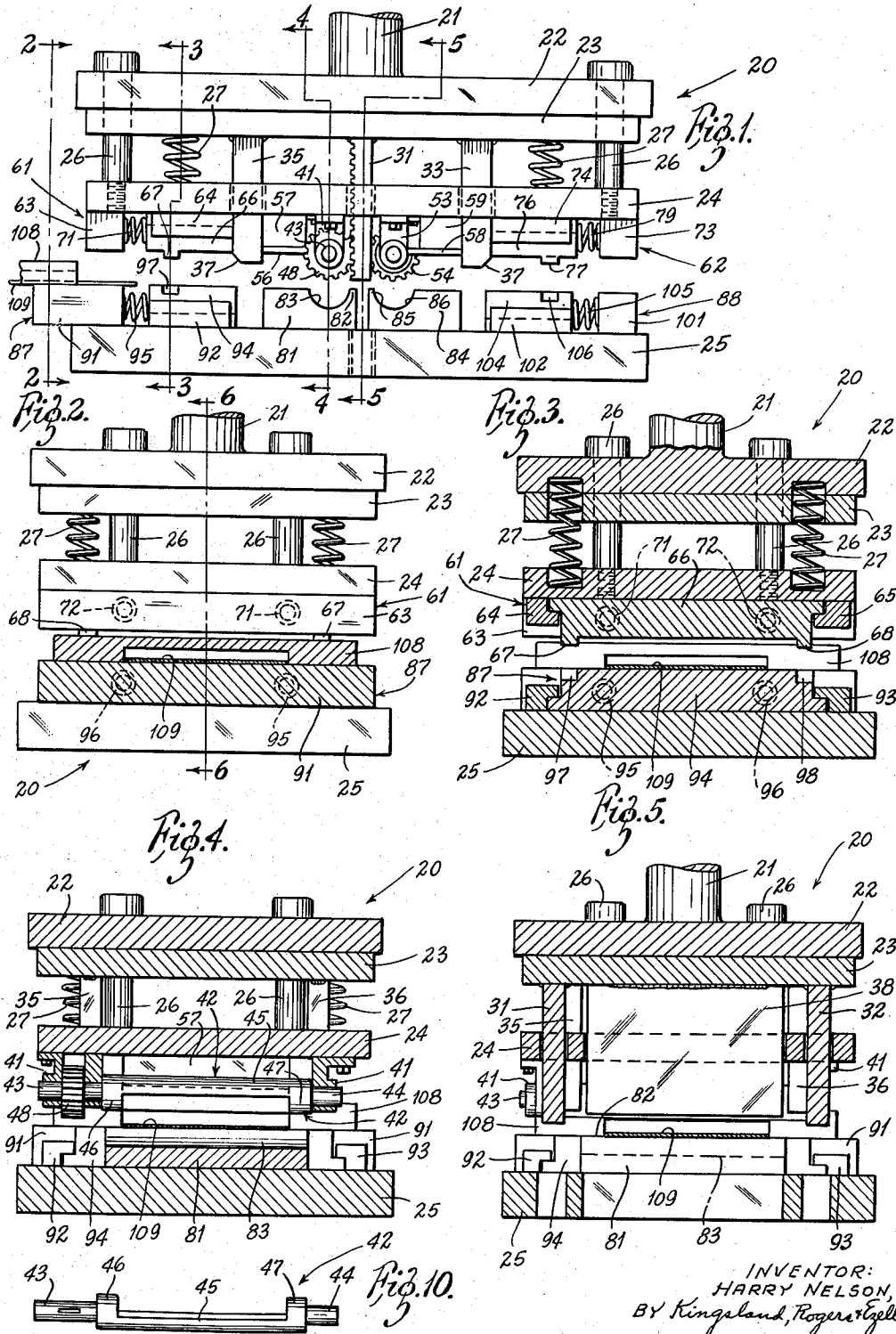
H. NELSON

2,963,066

APPARATUS FOR CUTTING AND BENDING STRIP MATERIAL

Filed Sept. 14, 1955

2 Sheets-Sheet 1



INVENTOR:
HARRY NELSON,
BY Kingsland, Rogers & Egell
ATTORNEYS

Dec. 6, 1960

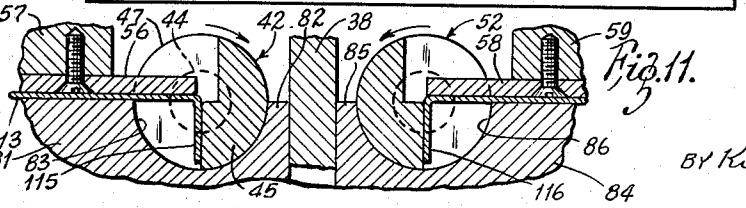
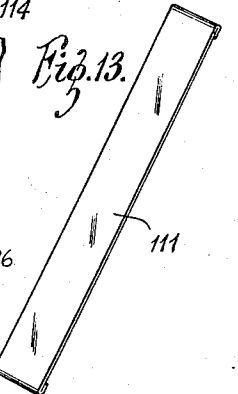
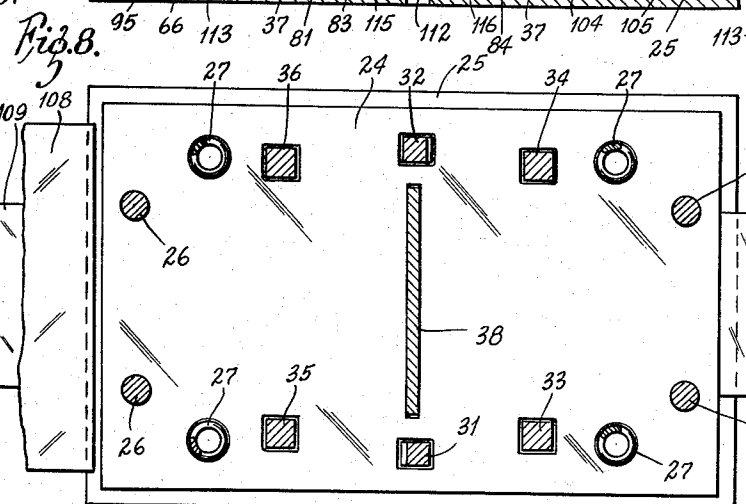
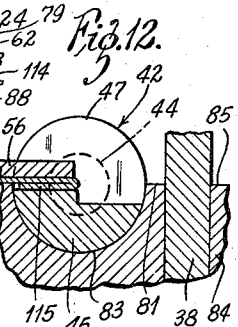
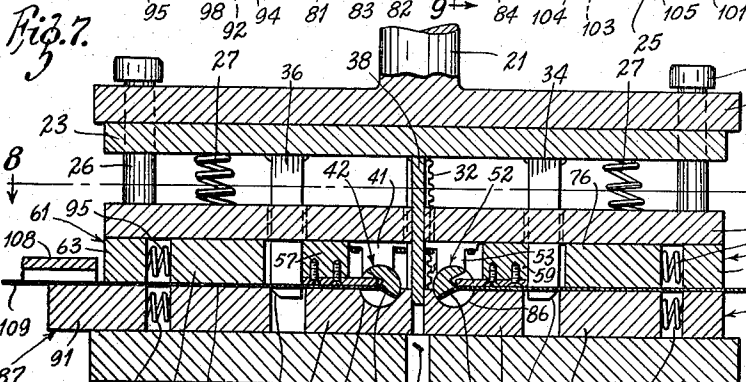
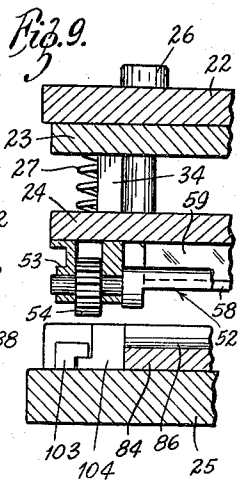
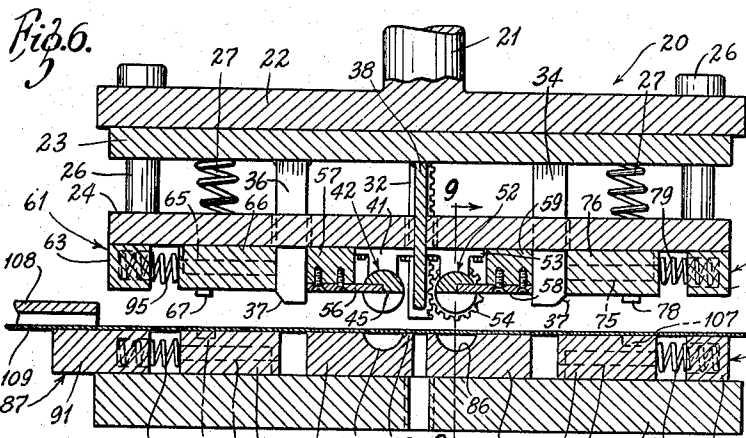
H. NELSON

2,963,066

APPARATUS FOR CUTTING AND BENDING STRIP MATERIAL

Filed Sept. 14, 1955

2 Sheets-Sheet 2



INVENTOR:
HARRY NELSON,
BY Kingsland, Rogers & Egell
ATTORNEYS

1

2,963,066

APPARATUS FOR CUTTING AND BENDING STRIP MATERIAL

Harry Nelson, McKeesport, Pa., assignor to Arcraft Venetian Blind Manufacturing Company of St. Louis, St. Louis, Mo., a corporation of Missouri

Filed Sept. 14, 1955, Ser. No. 534,418

10 Claims. (Cl. 153—16)

This invention relates to apparatus for cutting and bending strip material and in particular is concerned with a die and forming apparatus for cutting and bending strip material of metallic or plastic construction.

This invention provides apparatus which can receive strip material, cut it into two pieces and then clamp the pieces and bend over the adjacent ends of each piece against the separated strips so as to provide a completely rounded edge. This obviates the sharp edge normally produced in cutting off thin gaged strip material, such as thin gaged aluminum, steel or plastic slats. In addition, for painted strip material there is no need for touching up or painting the ends and corrosion is avoided as the folded over ends do not have the cut and exposed edge at the end of the strip. Further, reinforcing of the end is made possible so that strip materials are not easily kinked or knocked out of shape.

The strip material of this invention with the doubled over ends finds further utility in that crimping or locking of the strip or slat is made more secure and excessive play normally prevalent is obviated. The strip material may be easily cut and bent by use of the apparatus of this invention with a minimum of time and expenditure of labor. All of this may be accomplished without the necessity of using a mandrel or like device on the interior of the bends.

By means of this apparatus there is provided a punch which is adapted to cut a strip into two separate pieces. As the strip is cut a clamp seizes the adjacent ends of each strip and by means of an associated cam draws them slightly apart. When this operation is completed a folding bar at each end of the two pieces of strip material contacts the free end and doubles it over against an anvil without any possibility of kinking. All this apparatus is connected and operated by reciprocal movement of a punch plate so that the entire operation proceeds through a simple reciprocal movement from a prime moving element.

The apparatus of this invention is easy to operate and functions in a simple and efficient manner. It is constructed of rugged materials and may be easily maintained and operated by relatively unskilled workmen. It operates without any complicated mechanism and through the provision of rugged and efficiently operating components serves to accomplish the function of bending over and doubling over the edges of strip material in a most advantageous manner.

Accordingly, it is an object of this invention to provide an apparatus for cutting a strip material into two pieces and doubling over the adjacent ends of each separated piece of material.

It is a further object of this invention to provide an apparatus for cutting strip material into two pieces and doubling over the ends without any possibility of kinking, in which the entire operation may be effected by application of a reciprocal force.

Yet a further object of this invention is to provide an apparatus for cutting strip material into two pieces and

2

doubling over the adjacent ends in which the doubling over is effected without any possibility of kinking the strips by a folding bar which rotates closely within the walls of a folding groove and against an anvil.

5 Still another object of this invention is to provide an apparatus for cutting a strip material and doubling over the ends in which the two separate pieces of material are adapted to be clamped and drawn apart by cams before the doubling over operation takes place.

10 Still another object of this invention is to provide an apparatus for cutting strip material into two pieces and doubling over the adjacent ends against the strip material in which a cutting operation, a drawing apart of the two pieces of material, and the doubling over of the ends is accomplished by a single reciprocal force applied to the apparatus.

Still another object of this invention is to provide an apparatus for cutting strip material into two pieces, drawing apart the two pieces and doubling over the two ends, 20 in which a cutting element is mounted to a first support and the drawing apart means and doubling over means are mounted to a second support which is movable with respect to the first support and the aforementioned operations take place in sequential order through the application of a reciprocal force applied to the first support.

It is still another object of this invention to provide an apparatus for cutting strip material into two pieces, drawing apart the two pieces and doubling over the adjacent ends by means of an apparatus which is rugged in 30 construction and easy to maintain and in which the desired operation takes place in a minimum of time and with no complicated operation required by an operator.

Further objects of this invention will appear in the detailed description which follows and will be further 35 apparent to those skilled in the art.

Reference will now be had to the accompanying drawings in which a preferred embodiment of this invention is illustrated for the purpose of example. It is to be understood that the invention is not limited to the drawings as shown and that these are for the purpose of illustration only. In the drawings:

Figure 1 is a view in front elevation of the apparatus in a rest position;

Figure 2 is a view taken on the line 2—2 of Figure 1 showing strip guide means;

Figure 3 is a view taken on line 3—3 of Figure 1 showing the clamp and guide means therefor with the clamp in the non-operating position;

Figure 4 is a view taken on the line 4—4 of Figure 1 showing the folding bar and supporting mechanism;

Figure 5 is a view taken on the line 5—5 of Figure 1 showing the punch;

Figure 6 is a view in sectional elevation taken through the axis of the apparatus with the machine shown in a rest position, taken on the line 6—6 of Figure 2;

Figure 7 is a view similar to Figure 6 but showing the apparatus at the beginning of the operation;

Figure 8 is a view taken on the line 8—8 of Figure 7 showing the structural relationship between the various operating components and the mounting plate;

Figure 9 is a fragmentary view in section taken on the line 9—9 of Figure 6 showing the mounting means at one end of one of the folding bars;

Figure 10 is a detailed plan view of one of the folding bars;

Figure 11 is an enlarged fragmentary view in section taken along the axis of the machine showing the position of the folding bar as the operation of the machine progresses further from the position shown in Figure 7;

Figure 12 is a fragmentary view taken in section of one of the folding bars and similar to Figure 11 but show-

ing the further positioning of the folding bar at a later stage in the operation of the apparatus; and

Figure 13 is a pictorial view of a finished strip material having doubled over portions at both of its ends made through the operation of this apparatus.

The apparatus of this invention is generally indicated at 20 in Figures 1 and 6. The apparatus comprises as its main component an operating shaft 21 which is designed to be connected to a prime moving source of reciprocating power, a support plate 22 extending from the shaft and a punch plate 23, a mounting plate 24 supported by the support plate 22 and adapted for reciprocating motion with respect thereto, and an independent base plate 25. All of the operating elements of the apparatus are connected to one or another of the punch plate, the mounting plate and the base plate as will be described below.

The support plate 22 and the punch plate 23 are secured to one another and are both provided with a plurality of openings which receive tie rods 26 in slidable relation. The tie rods are flanged at their top and are secured at their bottom to the mounting plate 24. Compression springs 27 are positioned between the mounting plate and the punch plate to bias the latter and the support plate against the heads of the tie rods as shown in Figure 1 for the rest position.

Secured at both sides of the mounting plate at the central portion are gear racks 31 and 32. The punch plate also provides a base for cam bars 33 and 34 on the right hand side of the apparatus as viewed in Figure 1 and cam bars 35 and 36 on the left hand side. All of the cam bars are provided with a cam surface 37 with the surfaces of cam bars 33 and 34 being on opposed sides of those of the cam bars of 35 and 36. The last element secured to the punch plate is the punch 38 which is best shown in Figures 6 and 7.

The structure of the mounting plate is portrayed in Figures 1, 2, 6 and 8 and as has been mentioned above this plate is secured to the tie rods 26. Appropriate openings are provided for the passage through the plate of the cam bars, the gear racks and the punch, as is evident in Figure 8. The mounting plate functions as a base for mounting two sets of elements comprising a folding bar and associated pinion gear, and an anvil as the first set and a slidable strip clamp as the second set.

The folding bar and gear assembly at the left hand side of the machine includes a pair of bearings 41 supported by the mounting plate and a folding bar 42 supported by said bearings. The folding bar as shown in detail in Figure 10 includes a front-keyed spindle shaft 43 and a rear spindle shaft 44. The folding bar construction between these shafts comprises a die 45 which is an approximate half section of a cylinder constituted by offset faces. The die 45 is integrally connected to cylindrical hub elements 46 and 47. The spindle shafts 43 and 44 are journaled in the front and rear bearings respectively. A pinion gear 48 is keyed to the spindle shaft 43 and is so positioned as shown in Figure 1 as to mesh with the teeth of the gear rack 31.

On the right hand side of the apparatus there is a folding bar 52 which is supported in bearings 53 with a pinion gear 54 cooperating with the gear rack 32 in a similar manner to the left hand assembly as just described. It will be evident, however, that there is a mirror image relationship between the two because of the opposing relationship and the separate gear racks 31 and 32 which provide for separate operation of these assemblies in a reverse manner.

The left hand side of the apparatus also supports an anvil plate 56 which is secured to an anvil block 57 mounted on the mounting plate. In like manner an anvil plate 58 is secured to an anvil block 59 mounted on the right hand side of the mounting plate.

A strip clamp assembly generally indicated at 61, is mounted at the left hand side of the mounting plate

while a clamp assembly 62 is mounted at the right hand side. The clamp 61 comprises an anchor block 63 secured to the bottom end of the mounting plate, two opposed guide tracks 64 and 65 and a slidable upper clamp block 66 positioned between the two guide tracks in sliding relationship. The upper clamp block 66 is provided with openings to receive the cam bars 33 and 34 in sliding relation and has two locking studs 67 and 68 for a purpose to appear below. Biasing springs 71 and 72 are seated within the anchor block 63 and urge the clamp block against the side of the cam bars as shown in Figure 6. Similarly, the right hand clamp assembly 62 is comprised of an anchor block 73, guide tracks 74 and 75, and an upper clamp block 75 with locking studs 77 and 78 together with biasing springs 79 which are positioned together in a similar fashion to that for the assembly 61 but as a mirror image. The block 76 is further provided with openings to receive the cam bars 35 and 36 in sliding relation.

A punch guide block 81 is mounted on the base plate 25 underneath the anvil 56 and adjacent the left side of the punch 38. A die lip 82 is positioned at the upper right end of the top of the block adjacent the punch and adjoins an arcuate recess 83 which is of a radius substantially equal to that of the folding bar die, so as to provide a sliding fit. This recess permits the end of a separated piece to be folded over in it and against the die block as shown in Figure 7, without kinking the thin strip between the recess and the die of the folding bar. The left end of the die block 81 bears against a side of a cam bar and serves as a guide therefor. A right hand die block 84 is spaced from the left hand die block 81 a distance sufficient for the punch to pass therebetween. This die block is also provided with a die lip 85 and a recess 86, and is positioned adjacent to a right hand cam bar in a similar manner to that described for the former die block.

A lower clamp assembly on the left hand side of the apparatus is generally indicated at 87 while a lower right hand clamp assembly is generally indicated at 88. The left hand clamp assembly includes a lower anchor block 91 and guide tracks 92 and 93. A lower clamp block is shown at 94 and is positioned away from the anchor block by two springs 95 and 96. The top edges of the lower clamp block 94 are provided with two grooves 97 and 98 which are adapted to receive the studs 67 and 68 respectively for locking engagement of the upper and lower clamp blocks.

In similar manner the right hand lower clamp assembly 88 is provided with an anchor block 101, guide tracks 102 and 103 and a lower clamp block 104, separated from the anchor block by springs 105. Likewise, locking grooves 106 and 107 are provided for locking engagement with the locking studs 77 and 78 of the upper clamp block 76 for the right hand assembly in a similar manner to that just described for the left hand assembly.

A strip guide 108 is secured to the top of the left hand anchor block 91 so as to receive a strip material designated at 109 and guide it into the apparatus.

Operation

In the apparatus of this invention, the strip material 109 is desired to be cut into separate lengths and have the ends bent over to produce a finished strip 111 as indicated in Figure 13. This is accomplished by feeding the strip material 109 into the apparatus 20 from left to right as shown in Figure 1. The feeding is accomplished by conventional feeding mechanism (not shown) and the leading end of the material will pass through the machine until it abuts against a stop switch at the right side of the machine (not shown). Conventional actuating means can be energized by the contact of the stop mechanism to apply a downward force to the power shaft 21. As the power shaft 21 is lowered from the rest posi-

5

6

tion shown in Figure 1 and Figure 6, the entire top portion of the apparatus including the fixed punch plate and the movable mounting plate will move downward as a unit without any relative movement therebetween at the start of this operation. As the apparatus is lowered, the punch 38 will contact the strip material first since its lower end is situated beneath the cam bars and the upper clamp locks. This causes a piece of strip material 112 to be punched out as shown in Figure 7. Next the locking studs of the two upper clamp blocks 66 and 76 will engage their mating grooves in the lower clamp locks 94 and 104 as the apparatus continues to move downwardly. This will cause the two mating upper and lower clamp locks of the left hand clamp assembly and also the right hand assembly to lock together so that no relative lateral movement between the upper and lower clamp locks is possible. When the upper and lower clamp locks have been brought together, the strip material 109 is clamped therebetween and the camming surfaces 37 of the left hand cam bars 35 and 36 will bear against the right hand end of the lower clamp 94 and urge it to the left against the force of the biasing springs 95 and 96. This will urge the cut strip material 113 designated in Figure 7 slightly to the left so that it moves away from the die lip 82. This brings the right end of the strip 113 over the cavity 83. In a similar fashion the cam bars 33 and 34 will urge the right hand clamp assembly 62 to the right.

After the clamp assemblies have been locked together, the continued downward movement of the apparatus causes the bottom of the upper clamp assemblies on both the left hand and the right hand sides and the anvils 56 and 58 to contact the top of the two pieces of strip material 113 and 114 on the left hand side and the right hand side, respectively. This blocks any further downward movement of the mounting plate 24. However, continued downward movement of the power shaft causes a further downward movement of the punch plate and the support plate with a closing of the space between them and the mounting plate as shown in Figure 7. As is evident in Figure 7, the top heads of the tie rods 26 have just started to break away from the support plate which indicates the closing together of the space between the mounting plate and the punch plate.

This relative movement between the mounting plate and the punch plate will cause the moving gear racks 31 and 32 to rotate, in opposed rotary directions, the associated, and now stationary, pinion gears 48 and 54. The motion of the gear 48 will be in a clockwise direction and since it is keyed to the shaft 43 of the folding bar 42 it will cause it to move in a clockwise direction as shown in Figure 7. As the die 45 of the folding bar contacts the free end of the strip 113, continued downward movement will, as shown in Figures 11 and 12, cause the end to be doubled over and back against the underneath side of the strip material. Since the radius of the folding bar die and the recess within which it moves are substantially equal, there is no possibility for the end of the strip to kink or become wedged between the die and the recess. The bent-over end is indicated at 115 and is equal in length to the distance between the right end of the anvil plate 56 and the end of the cut material after it has been drawn apart by the movement of the clamp assembly. In a like manner, the folding bar 52 for the right hand side of the apparatus bends over the end piece 116 of the strip material 114 at the right side of the apparatus.

The spacing between the mounting plate and the punch plate is such that the complete downward movement of the power shaft and the relative movement between the punch plate and the mounting plate will cause the gear racks to rotate the pinion gears and their associated folding bars about 180° from the position shown in Figure 6 to that shown in Figure 12. The partial closing of the gap between the mounting plate and the punch plate thereby completes the doubling over operation.

The apparatus is now ready for retraction and this is effected by reciprocating the power shaft 21 upwardly. As this is done, the springs 27 will maintain the mounting plate in contact with the strip material on the base plate and the associated apparatus at the start of the return operation. This relative movement causes the gear racks to reverse the rotation of the gear pinions and break apart the die from the underneath side of the doubled over end portions of the two strips. With continued operation in this reverse direction of the power shaft, the mounting plate will be separated from the punch plate by the continued biasing action of the springs 27 until the limit is reached by contact of the upper heads of the tie rods 26 with the top of the support plate 22. When this occurs and with continued upward movement of the power shaft, the anvils are lifted off the strip material and the locking studs unlock the upper clamp locks from their associated lower clamp locks while the cam bars are retracted. When this occurs the upper and lower clamp locks for both the right hand and left hand sides of the apparatus are free to return to their original positions by the actions of their associated biasing springs. This completes the operation and sets up the apparatus for a repetition of the operation above described.

Various changes and modifications may be made in the components of the apparatus as will be apparent to those skilled in the art. Such changes are within the scope of this invention as defined by the claims appended hereto.

What is claimed is:

1. Apparatus for forming strip material comprising a base for receiving said strip, a member reciprocally movable with respect to said base, means for reciprocating said member, strip cutting means secured to said member for cutting said strip into at least two pieces, and means for folding the adjacent cut ends against the cut strips, said last named means including a mounting element carried by said member in movable relation thereto and adapted to exert a substantial pressure upon said strip by the downward movement of said member, an anvil fixed to said element and adapted to bear against the upper surface of a cut strip, the bottom surface of said strip at said end being free from engagement with said apparatus, a rotary folding bar supported by said element and including a die rotatable within a hemispherical folding recess in the base which is adapted to engage the top end surface of a cut strip and double it over against the strip material, and means for imparting rotary movement to said folding bar after the strip material has been cut.

2. Apparatus for forming strip material comprising a base for receiving said strip, a member reciprocally movable with respect to said base, means for reciprocating said member, strip cutting means secured to said member for cutting said strip into at least two pieces, and means for folding at least one of the ends of the cut strips against one of the cut strips, said last named means including a mounting element carried by said member in movable relation thereto and adapted to exert a substantial pressure upon said strip by the downward movement of said member, and anvil fixed to said element and adapted to bear against the upper surface of a cut strip, the bottom surface of said strip at said end being free from engagement with said apparatus, a rotary folding bar supported by said element and including a die rotatable within a hemispherical folding recess in the base which is adapted to engage the top end surface of a cut strip and double it over against the bottom of the strip material, and means for imparting rotary movement to said folding bar after the strip material has been cut, said last named means including a pinion gear connected to the folding bar in fixed relation to said mounting element and a meshing gear rack fixed to said member, whereby relative movement between the member and the mounting element after the strip material has been cut effects the rotary movement of said folding bar.

3. Apparatus for forming strip material comprising a base for receiving said strip, a member reciprocally movable with respect to said base, means for reciprocating said member, strip cutting means secured to said member for cutting said strip into at least two pieces, and means for folding at least one of the ends of the cut strips against one of the cut strips, said last named means including a mounting element carried by said member in movable relation thereto and adapted to exert a substantial pressure upon said strip by the downward movement of said member, an anvil fixed to said element and adapted to bear against the upper surface of a cut strip, the bottom surface of said strip at said end being free from engagement with said apparatus, a rotary folding bar supported by said element and including a die rotatable within a hemispherical folding recess in the base which is adapted to engage the top end surface of a cut strip and double it over against the bottom of the strip material, said die comprising a segment of a cylinder and having a strip material contact surface which is flat and rotatable through substantially half a revolution, and means for imparting rotary movement to said folding bar after the strip material has been cut.

4. Apparatus for forming strip material comprising a base for receiving said strip, a member reciprocally movable with respect to said base, means for reciprocating said member, strip cutting means secured to said member for cutting said strip into at least two pieces, and means for folding at least one of the ends of the cut strips against one of the cut strips, said last named means including a mounting element carried by said member in movable relation thereto and adapted to exert a substantial pressure upon said strip by the downward movement of said member, an anvil fixed to said element and adapted to bear against the upper surface of a cut strip, the bottom surface of said strip at said end being free from engagement with said apparatus, a rotary folding bar supported by said element and including a die rotatable within a hemispherical folding recess in the base which is adapted to engage the top end surface of a cut strip and double it over against the strip material, said die comprising a part of a cylinder, said die having a face serving as a contact face and which is rotatable through substantially half a revolution from an initial horizontal position.

5. Apparatus for forming strip material comprising a base for receiving said strip, a member reciprocally movable with respect to said base, means for reciprocating said member, strip cutting means secured to said member for cutting said strip into at least two pieces, said strip cutting means comprising a punch having a cutting surface positioned beneath said member and adapted to engage a punch die mounted on said base, said base being further provided with a hemispherical strip end folding recess spaced adjacent the punch die, means for withdrawing the end of a cut strip away from the punch and into registry with the folding recess, the bottom surface of said strip being free from engagement with said apparatus over the folding recess, and means for bending the end of the cut strip material into said recess and back against itself, said last named means including an anvil adapted to be positioned over a portion of said recess in strip overlying relation.

6. Apparatus for forming strip material comprising a base for receiving said strip, a member reciprocally movable with respect to said base, means for reciprocating said member, strip cutting means secured to said member for cutting said strip into at least two pieces, said strip cutting means comprising a punch having a cutting surface positioned beneath said member and adapted to engage a punch die mounted on said base, said base being further provided with a strip end folding recess spaced adjacent the punch die, means for withdrawing the end of a cut strip away from the punch, said strip withdrawing means including an upper clamp piece mounted

on an element supported by said member in movable relation thereto and a lower clamp piece mounted on said base with locking means for engaging said clamp piece and the cut strip material in bending engagement, said upper clamp piece being carried by the member in a manner to exert a substantial pressure on the strip when said member is lowered, means for moving the clamp pieces and the strip material away from the punch die to position the end of the cut strip over the folding recess comprising a cam carried by the reciprocable member which is adapted to engage said clamps and urge them in a lateral direction, and means for bending the end of the cut strip material down into said recess and back against itself.

7. Apparatus for forming strip material comprising a base for receiving said strip, a member reciprocally movable with respect to said base, means for reciprocating said member, strip cutting means secured to said member for cutting said strip into at least two pieces, said strip cutting means comprising a punch having a cutting surface positioned beneath said member and adapted to engage a punch die mounted on said base, said base being further provided with a strip end folding recess spaced adjacent the punch die, means for withdrawing the end of a cut strip away from the punch, said strip withdrawing means including an upper clamp piece mounted on an element supported by said member in movable relation thereto and a lower clamp piece mounted on said base with locking means for engaging said clamp piece and the cut strip material in bending engagement, said upper clamp piece being carried by the member in a manner to exert a substantial pressure on the strip when said member is lowered, means for moving the clamp pieces and the strip material away from the punch die to position the end of the cut strip over the folding recess comprising a cam carried by the reciprocable member which is adapted to engage said clamps and urge them in a lateral direction, means for bending the end of the cut strip material down into said recess and back against itself, said bending means including an anvil fixed to said element and adapted to bear against a surface of a cut strip, a folding bar supported for rotary movement by said element, and gear means connected to said folding bar and cooperating with gear means fixed to said member.

8. Apparatus for forming strip material comprising a base for receiving said strip, a member reciprocally movable with respect to said base, means for reciprocating said member, strip cutting means secured to said member for cutting said strip into at least two pieces, said strip cutting means comprising a punch having a cutting surface positioned beneath said member and adapted to engage a punch die mounted on said base, said base being further provided with a strip end folding recess spaced adjacent the punch die, means for withdrawing the end of a cut strip away from the punch, said strip withdrawing means including an upper clamp piece mounted on an element supported by said member in movable relation thereto and a lower clamp piece mounted on said base with locking means for engaging said clamp piece and the cut strip material in bending engagement, said upper clamp piece being carried by the member in a manner to exert a substantial pressure on the strip when said member is lowered, means for moving the clamp pieces and the strip material away from the punch die to position the end of the cut strip over the folding recess comprising a cam carried by the reciprocable member which is adapted to engage said clamps and urge them in a lateral direction, means for bending the end of the cut strip material down into said recess and back against itself, said bending means including an anvil fixed to said element and adapted to bear against the top surface of a cut strip, a rotary folding bar supported by said element and including a die which is adapted to engage the top end surface of a cut strip and double it over against the strip

material within said recess, and means for imparting rotary movement to said folding bar after the strip material has been cut.

9. Apparatus for forming strip material comprising a base for receiving said strip, a member reciprocally movable with respect to said base, means for reciprocating said member, strip cutting means secured to said member for cutting said strip into at least two pieces, said strip cutting means comprising a punch having a cutting surface positioned beneath said member and adapted to engage a punch die mounted on said base, strip clamping means including an upper clamp element which is movable against the top of the strip to clamp it against the base, and means for folding the end of said strip back against itself including a flat anvil having a strip contacting surface engageable with a surface of the strip adjacent the strip end portion but terminating in spaced relation from its end, the surface of said strip opposite the anvil being free from engagement with said apparatus, a rotatable folding bar having a die portion forming a continuation of said anvil contacting surface in an unoperated position and being rotatable up to substantially 180° to a position opposite the anvil to bend the end of the strip back along itself between the die and the anvil.

10. Apparatus for forming strip material comprising a base for receiving said strip, a member reciprocally movable with respect to said base, means for reciprocating said member, strip cutting means secured to said member for cutting said strip into at least two pieces, said strip cutting means comprising a punch having a cutting surface positioned beneath said member and adapted to engage a punch die mounted on said base, strip clamping means including an upper clamp element which is movable against the top of the strip to clamp it against the base, and means for folding the end of said strip back

against itself including a flat anvil having a strip contacting surface engageable with a surface of the strip adjacent the strip end portion but terminating in spaced relation from its end, a rotatable folding bar having a die portion forming a continuation of said anvil contacting surface in an unoperated position and being rotatable up to substantially 180° to a position opposite the anvil to bend the end of the strip back along itself between the die and the anvil, said anvil, strip, and the die portion in the unoperated position being in registry with a hemispherical folding recess, the bottom surface of said strip being free from engagement with said apparatus over the folding recess, said die portion being rotatable substantially on the axis of said recess.

References Cited in the file of this patent

UNITED STATES PATENTS

72,478	Glesson	Dec. 24, 1867
317,857	Roberts	May 12, 1885
411,116	Aiken	Sept. 17, 1889
468,586	Walsh	Feb. 9, 1892
594,643	Mehrman	Nov. 30, 1897
611,134	Lewis et al.	Sept. 20, 1898
971,905	Leilich et al.	Oct. 4, 1910
1,096,961	Shelby	May 19, 1914
1,192,797	Solmon	July 25, 1916
1,759,053	Irvin	May 20, 1930
2,283,012	Nightingale	May 12, 1942
2,306,595	Crowell	Dec. 29, 1942
2,371,138	Harrison	Mar. 13, 1945
2,521,840	Fennell	Sept. 12, 1950

FOREIGN PATENTS

17,362	Great Britain	Nov. 1, 1889
--------	---------------	--------------