May 1, 1928.

1,667,911

A. VAN VEEN

WIRE BENDING MACHINE

Filed Dec. 19, 1924

3 Sheets-Sheet 1

Fig. 1.

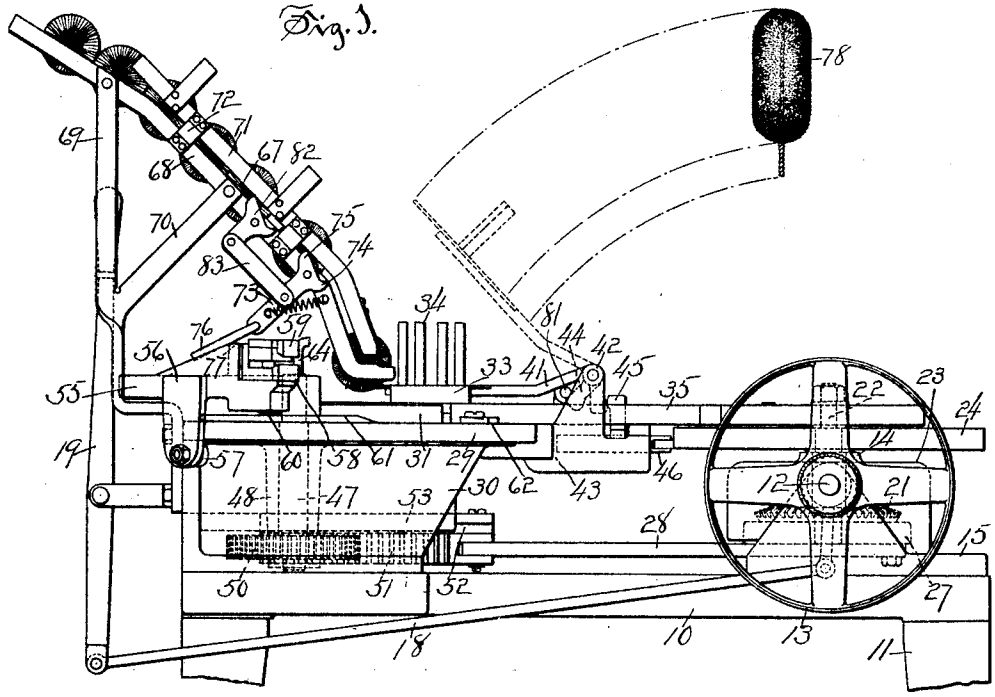
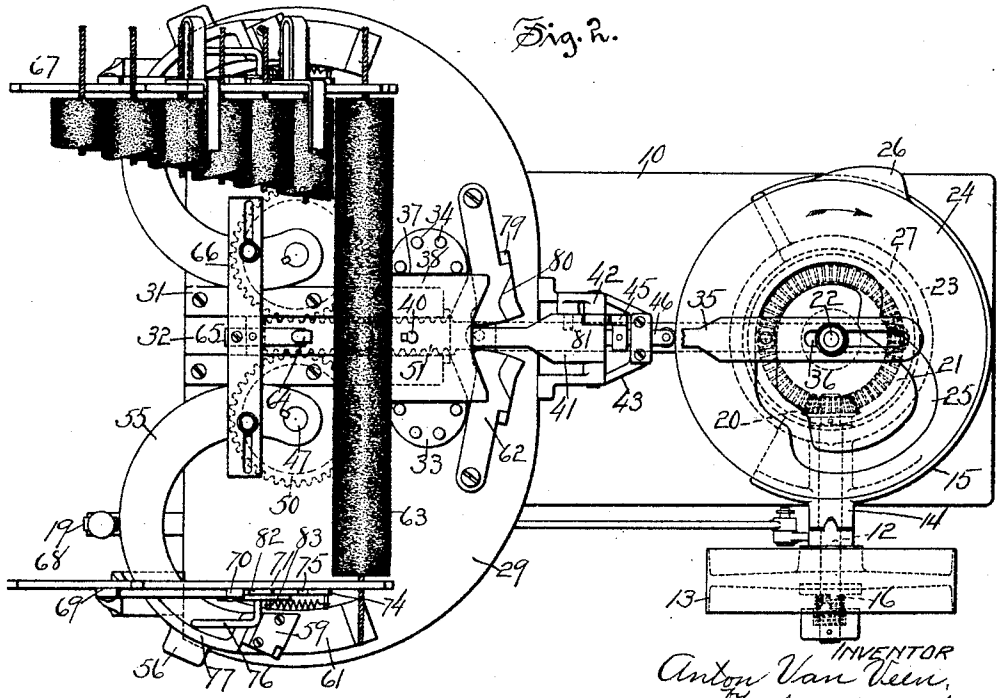


Fig. 2.



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Fig. 3.

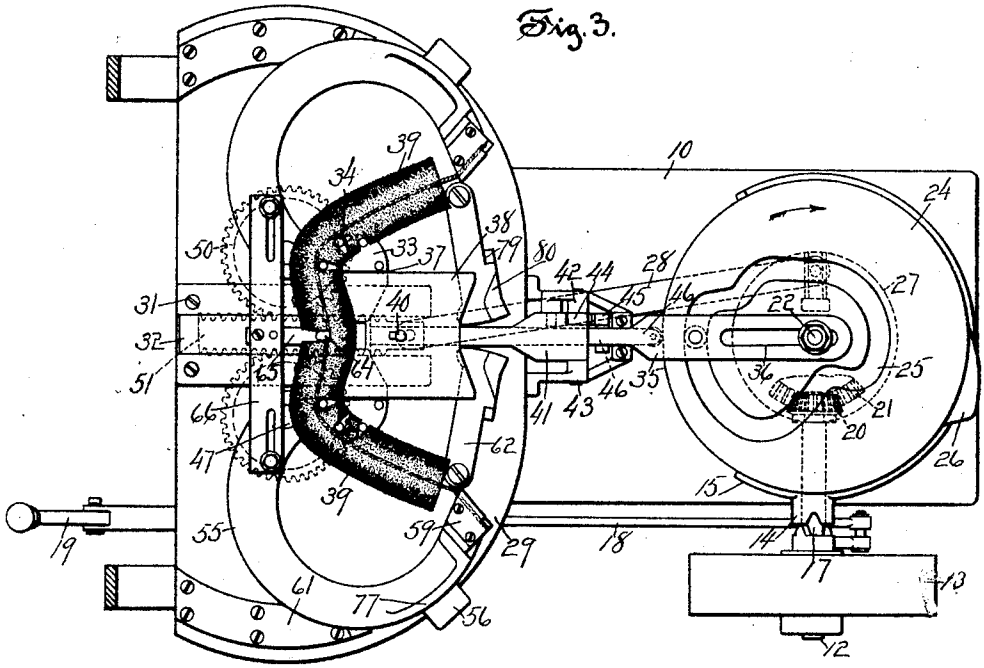
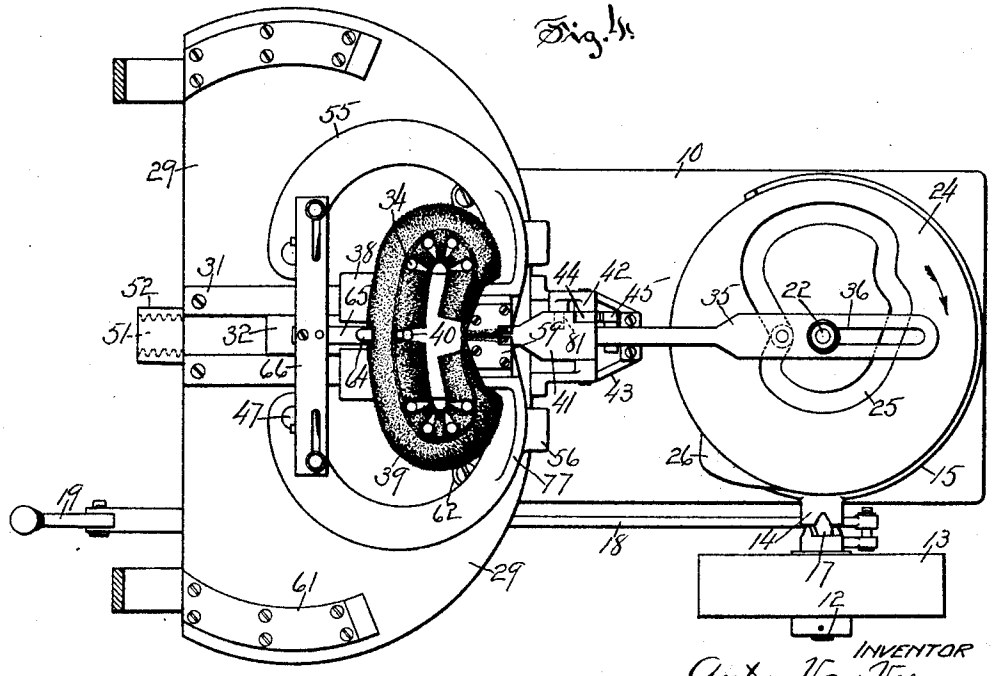


Fig. 4.



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Fig. 5.

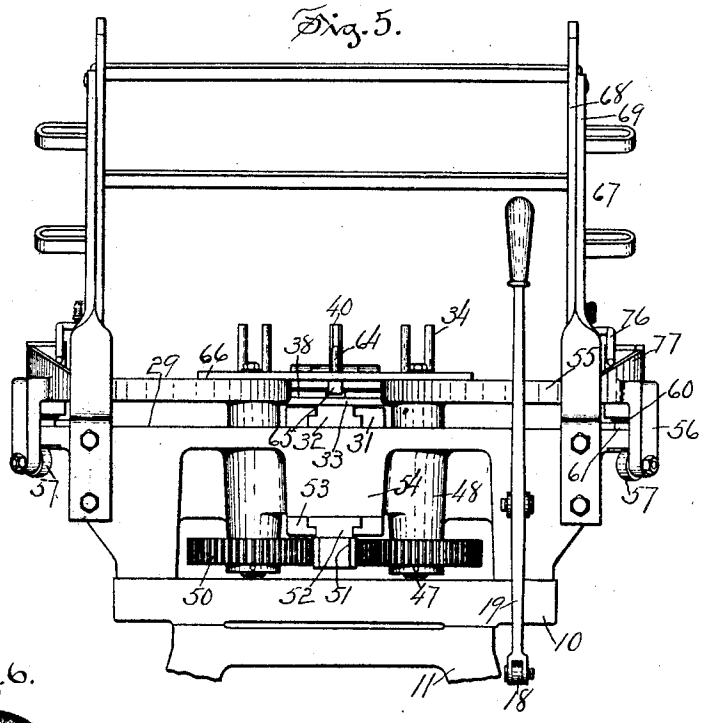
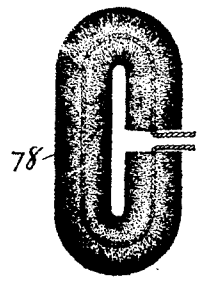


Fig. 6.



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UNITED STATES PATENT OFFICE.

ANTON VAN VEEN, OF WEST HARTFORD, CONNECTICUT, ASSIGNOR TO THE FULLER BRUSH COMPANY, OF HARTFORD, CONNECTICUT, A CORPORATION OF CONNECTICUT.

WIRE-BENDING MACHINE.

Application filed December 19, 1924. Serial No. 756,861.

This invention relates to machines for bending wire structures, more especially in the making of brushes; and an object of the invention, among others, is the production of a machine of this class that shall be simple in construction and particularly rapid and otherwise efficient in operation.

One form of machine embodying this invention and in the construction and use of which the objects herein set out, as well as others, may be attained, is illustrated in the accompanying drawings, in which—

Figure 1 is a view in side elevation of a machine embodying my invention, the legs being broken off and the operation of ejecting a formed brush being illustrated in dotted lines;

Fig. 2 is a top view of the same, some of the brush structures being broken off and other parts of the mechanism being broken away and parts of the runway also being omitted for clearness;

Fig. 3 is a view similar to Fig. 2, but with the feed mechanism removed, and illustrating an intermediate step in the formation of a brush;

Fig. 4 is a view similar to Fig. 3, but illustrating the position of the parts of the machine at the termination of the bending operation;

Fig. 5 is a view in elevation looking from the left of the machine as illustrated in Fig. 1; and

Fig. 6 is a view of a brush structure as formed upon the machine.

While the invention is illustrated and described herein as employed for bending brush structures, as is also included in my copending application filed November 22, 1922, Serial Number 602,503, it will be understood that it may be equally well adapted for bending structures other than those used for brush purposes, and that the invention is not, therefore, limited to the bending of wire structures that may be employed for any specific purpose.

In the drawings the numeral 10 indicates the bed of my improved machine that may be supported in any suitable manner, as upon legs 11, a driving shaft 12 being mounted for rotation upon the bed and having means, as a pulley 13, for rotating it, the bearing 14 for the driving shaft, as herein illustrated, being formed on an extension from a bearing plate 15 secured to the bed, and the pulley being preferably loosely mounted on the shaft and connected thereto as by means of a clutch 16 comprising interengaging members on the pulley and shaft that are engaged and disengaged as by a movement of the pulley lengthwise on the shaft, said pulley being loosely mounted on the shaft for this purpose, and a spring (see dotted lines in Figure 2) forcing the pulley in a direction to disengage the clutch members, and as shown in Figures 3 and 4 of the drawings. This clutch may be operated in any well known manner, as by a clutch operating mechanism 17 controlled in its operation as by a clutch operating rod and lever 18 and 19, respectively, the latter having a handle for this purpose.

A beveled pinion 20 secured to the driving shaft meshes with a beveled gear 21 secured to an actuating shaft 22 mounted in a bearing in a housing 23 projecting from the upper surface of the bearing plate 15, said gear being located within said housing. A cam disc 24 is secured to the shaft 22 above the housing 23 and has a former positioning cam groove 25 in its upper surface and an ejector cam 26 on its periphery. A crank disc 27 is secured to the shaft 22 underneath the gear 21 and within the housing 23, and as shown by dotted lines in Figure 1 of the drawings, and a crank rod 28, in the form of a pitman, is pivotally attached at one end to said gear and at its opposite end said rod is connected with bending mechanism to be hereinafter described.

A table 29 is supported by the bed, as by means of sides 30, there being an open space within the sides and between the table and bed. Guides 31 are secured to the upper surface of said table to receive a former actuating slide 32 mounted for reciprocating movement between said guides and having a former plate 33 secured to it and containing former pins 34 rising therefrom, and as shown in Figures 1 and 5 of the drawings, said pins being disposed to impart any desired shape to a brush structure that is bent around said pins. A former actuating bar 35 is secured to or comprises an integral

projection from said actuating slide and said bar has a stud with a roll mounted thereon located in the cam groove 25, and as shown in Figure 3 of the drawings. This bar also has a guide slot 36 to receive the end of the shaft 22 for imparting steady movement to this end of the bar.

The former plate 33 has a somewhat wide groove 37 in its upper surface to receive an ejector 38 in the form of a plate and upon which the brush structures, as 39, rest during the bending and forming operation. This ejector plate has a post 40 located at about its crosswise center, and an extension 41 from said ejector is pivotally mounted between ears 42 on a bracket 43 secured to the front end of the table 29, a part of said bracket extending under the table and being secured thereto. The extension 41 has an arm 44 located at an angle to the extension with its end in the path of movement of an ejector operating stud 45 on an ejector actuating bar 46 mounted for reciprocating movement in a groove in the bracket 43, the end of the bar having a roller in contact with the edge of the cam disc 24, and in the path of movement of the ejecting cam 26 thereon.

In the operation of the machine after a brush structure has been properly formed thereon and has been released from the forming elements the cam 26 strikes the roller on the end of the bar 46 and thus imparts a quick tilting movement upwardly to the ejector 38 with a result that the brushes are thrown, as clearly shown in Figure 1, from the plate and into a receptacle that may be suitably located to receive them.

Bending arm operating shafts 47 are rotatably mounted in bearings 48 extending downwardly underneath the table 29, the lower ends of said shafts having bending arm operating gears 50 in mesh with the teeth of a rack 51 formed as a part of or secured to a slide 52 mounted for reciprocating movement between guides 53 secured to the lower end of a boss 54 projecting downwardly from the under surface of the table, and as shown in Figure 5 of the drawings. The rack 51 is located between the gears 50, the rack teeth being located on opposite edges of the rack. The crank rod 28 is pivotally attached to the end of the rack, as shown in Figure 1 of the drawings, and by means of this rod the rack is reciprocated to impart an axial movement to the shafts 47 and consequently to the bending arms 55 secured to the upper ends of the shafts 47.

The bending arms are provided with ears 56 located to pass along the edges of the table 29, said ears having rollers 57 traveling in rolling contact with the under surface of said table. The end of each of the arms 55 is formed with a stationary jaw 58 and a movable and clamping jaw 59, the latter being secured to the upper end of a jaw actuating post extending downwardly through the arm and resting upon a ball 60 movable in contact with the upper surface of the table 29, a jaw opening cam 61 and a jaw releasing cam 62, the jaw opening cams being located to open the jaws as the arms are moved backwardly and the jaw releasing cams opening the jaws to release the wires gripped between them when the arms are in their forward positions. The jaw releasing cams are pivotally mounted, as shown in Figure 2 of the drawings, and are each provided with beveled surfaces 80—79. As the arms 55 swing in their bending movement the balls 60 contact with the edges of the releasing cams and swing them out of the way, and after the bending is completed the end of the slide 32 in its forward movement strikes the edges of the cams and pushes them forward underneath the arms, the balls traveling up the beveled surfaces 80, and as the arms are swung backwardly the balls traveling down the beveled surfaces 79.

In order that the brush structure may be properly bent around the pins 34 a retaining and rectifying post 64 is provided to engage the structure during the bending operation and retain a portion thereof in proper position, in the structure herein shown this post extending upwardly from a retaining post support 65 having its end bent to overlie the brush structure to prevent the latter from rising. The support 65 is secured to and extends from a retaining and rectifying post actuating bar 66 attached to the arms 55, and as shown in Figures 3 and 4 of the drawings, said bar having slots to receive pins projecting from said arms.

In the operation of the machine thus far described it will be noted that at each forward swinging movement of the arms 55 the jaws are maintained in their open positions and the ends of the wire cores of unbent brush structures 63 are located in the paths of movement of the arms, and as illustrated in Figure 2 of the drawings, said structures being retained in suitable holders to be hereinafter described. As the ends of the arms sweep forward the brush structure is moved from its holder and is carried forward against the pins 34. Just prior to removal of the brush structure from its holder the lower ends of the posts 60 pass off from the cams 61 and the jaws are, therefore, closed, said jaws being spring actuated for closing movement if desired. The central portion of the brush structure being in contact with the former pins, the ends are carried forward and the structure is bent around the pins, an intermediate position in this bending

operation being shown in Figure 3 of drawings. During this bending operation the former plate 33 is also carried forward under the operation of the actuating bar 35 and the cam slot in the disc 24 and into the position shown in Figure 4. During this movement of the arms the retaining and rectifying post 64 is carried against the brush structure to prevent an outwardly bowing action of such structure, which would otherwise take place. In fact, this post positions the back part of the brush structure in a bent form, this to permit a proper bending of the structure around the pins 34. It will be noted that the ejector 38 is slotted, as shown in Figure 4, to permit the movement just described of the post 64. During the latter part of the bending operation the arms 55 are forced to the position shown in Figure 4, wherein it will be noted that the ends of the wire core of the bent structure are at substantially right angles to that part of said core from which said ends project, and it will also be noted that in this final bending movement of the parts the ejector and the posts 40 and 64 have partially retraced their movements, this being effected by the cam 25 and the arms 55. It will further be noted that the sides of the brush structure are bowed reversely to the bowed form of one side, as shown in Figure 3, but this is not sufficient to "set" the wire and when the structure is released the wire will spring to the form desired, and as shown in Figure 6 of the drawings, wherein the finished structure 78 is shown.

A stop pin 81 projects from the bracket 43 into the path of movement of the arm 44 of the ejector as the latter is swung to remove the bent structures from the former. This movement being somewhat rapid is suddenly stopped, with a result that the forcible throwing of the bent structures from the ejector, hereinbefore referred to, is caused.

As a means for supplying twisted brush structures to the grippers at the ends of the bending arms, a feed runway comprising sides 67 is provided with slots in said sides to receive the projecting ends of the wires, and as shown in Figures 1 and 2 of the drawings. These sides, as shown herein, each comprises two bars separated to create said slots, the underbar 68 being secured to the branches 69—70 of runway supports secured to the table 29, and the upper bars 71 being secured to straps 72 extending from the lower bars.

In order that only a single brush structure shall be in position at a time to be engaged by the grippers, a feed mechanism is employed that comprises a pallet 73 having detents 74—75 that operate alternately upon the projecting wire ends of the brush cores, and in a manner that will be readily understood, to effect a two-step movement of each structure, the last of which movements is a releasing movement by the detent 74 and from which the brush structure falls to the position shown in Figure 1 in the path of movement of the grippers at the ends of the arms 55. In the construction herein shown there is a feed mechanism as just described appurtenant to each side of the runway, and each pallet is operated as by means of an arm 76 located in the path of movement of a detent operating cam 77 on one of the arms 55 and in a manner that will be readily understood, but I do not contemplate it as a necessity that the two mechanisms shall be operated independently.

It may sometimes happen that the bottom brush of the pile held by the detent in the runway will stick or adhere to the brush next above it by reason of intermingling of the brush fibers, with a result that one end of the brush structure may be freed, while the other end will be held. In such an event, and in order to give time for the attendant of the machine to properly free the brush structure, I provide means for positioning such bottom brush spaced apart from the remainder of the pile. In the mechanism herein shown for accomplishing this result I provide a second pallet 82, one on each side of the runway, located above the pallet 73, and this pallet may be connected with the pallet 73 as by means of a link 83, as shown in Figure 1 of the drawings. From this it will be seen that should the bottom brush in the pile be prevented from readily freeing itself from the balance of the pile, as to either or both ends, the attendant may manually separate it and cause it to fall into position against the detent 75, from which point the movement of the brush structure will be free from unintended interruption.

In accordance with the provisions of the patent statutes I have described the principles of operation of my invention, together with the device which I now consider to represent the best embodiment thereof, but I desire to have it understood that the device shown is only illustrative, and that the invention may be carried out by other means and applied to uses other than those above set out.

I claim—

1. A wire bending machine including an actuating shaft, a housing in which said shaft is mounted, a bending mechanism actuating member located within the housing, an actuating member located without the housing, and bending mechanism including members connected with said bending mechanism actuating member and members connected with said actuating member to be separately actuated thereby.

2. A wire bending machine including an actuating shaft, a housing in which said shaft is mounted, shaft driving mechanism located within said housing, a bending

mechanism actuating member located within the housing, an actuating member located without the housing, and bending mechanism including members operatively connected with said bending mechanism actuating member and members connected with said actuating member to be separately actuated thereby.

3. A wire bending machine including an actuating shaft, a housing in which said shaft is mounted, a bending mechanism actuating member located within the housing, a cam disc located without the housing, and bending mechanism including bending arms, a rod operatively connected with said arms and protecting within the housing and operatively connected with said bending mechanism actuating member, said bending mechanism also including a movably mounted former and a bar operatively connected with said former and with said cam disc.

4. A wire bending machine including a movably mounted former around which the wire is bent, oscillating arms for bending the wire around said former, an actuating shaft, a cam mounted on said shaft and operatively connected with said former, a bending mechanism actuating member secured to said shaft, and an operative connection between said bending mechanism actuating member and said oscillating arms for actuating the latter independently of said movably mounted former.

5. A wire bending machine including two oscillating shafts, means for imparting oscillatory movement to said shafts, oscillating bending arms secured to and projecting from said shafts, jaws on said arms to grasp the ends of wires to be bent, means for opening and closing said jaws to grip said wires and to release them, a former around which said wires are bent, and means for presenting wires in the path of movement of said jaws.

6. A wire bending machine including two oscillating shafts, means for imparting oscillatory movement to said shafts, bending arms secured to and projecting from said shafts, jaws on said arms to grasp the ends of wires to be bent, means for opening and closing said jaws to grip said wires and to release them, jaw operating members located in the path of movement of said jaw opening and closing means, a former around which said wires are bent, and means for presenting wires in the path of movement of said jaws.

7. A wire bending machine including two oscillating shafts with gears thereon, a rack extending between said gears and meshing therewith, means for imparting reciprocating movement to said rack, bending arms secured to and projecting from said shafts, jaws on said arms to grasp the ends of wires to be bent, means for presenting wires in the path of movement of said jaws, means for opening and closing said jaws to grip said wires and to release them, jaw operating members located in the path of movement of said jaw opening and closing means, and a former around which said wires are bent.

8. A wire bending machine including two oscillating shafts, means for imparting oscillatory movement to said shafts, bending arms secured to and projecting from said shafts, jaws on said arms to grasp the ends of wires to be bent, means for opening and closing said jaws, a cam located in the path of movement of said opening and closing means to open the jaws as the arms are swung and to release said jaws for closing movement after a wire has been presented between the jaws, means for presenting a wire with its ends in the path of movement of said jaws, a former around which said wires are bent, and means for releasing said jaws after said wire has been bent.

9. A wire bending machine including two oscillating arms, means for imparting oscillatory movement to said arms, jaws located on said arms to grasp the ends of wires to be bent, means for presenting wires in the path of movement of said jaws, means for opening and closing said jaws, means located in the path of movement of said jaw opening and closing means to operate said jaws to open them and to close them for gripping action, means for opening said jaws at the termination of the bending operation, and a form around which said wires are bent.

10. A wire bending machine including a table with a projecting edge, oscillating arms having jaws to receive wires to be bent, means for imparting oscillatory movement to said arms, jaws on said arms to grasp the ends of wires to be bent, means for opening said jaws to grip the ends of wires and to release them, means for preventing wires in the path of movement of said jaws, a former around which said wires are bent, and means projecting from said arms underneath the projecting edge of said table to steady the arms in their reciprocating movement.

11. A wire bending machine including a former, a pivotally mounted ejector plate, means for bending a wire about said former and overlying said plate, and means for swinging said plate, on the upper surface of which the wires are received, to carry said wires upwardly, away from said former and to thereby remove said wires from said plate after they have been bent.

12. A wire bending machine including a former plate, pins projecting from said plate, means for bending a wire around said pins, a pivotally mounted ejector plate underlying the wire during the bending operation, and means for swinging said plate to remove the bent structures from said pins.

13. A wire bending machine including a former plate having a groove, pins projecting from said plate, a pivotally mounted

ejector plate located in said groove, means for bending a wire around said pins, and means for swinging said plate to remove a bent wire from said pins.

14. A wire bending machine including a former, a pivotally mounted ejector plate, means for bending a wire around said former and overlying said plate, means for forcibly swinging said plate to remove wires from said former, and means for stopping the swinging movement of said plate to cause the bent structure to be thrown therefrom.

15. A wire bending machine including a reciprocating former, a pivotally mounted ejector plate, means for bending a wire around said former and overlying said plate, and a cam disc having a cam to reciprocate said former and a cam to operate said ejector plate.

16. A wire bending machine including a reciprocating former, a pivotally mounted ejector plate, means for bending a wire around said former and overlying said plate, a cam disc having a cam groove, a former actuating member engaged with said groove to impart reciprocating movement to said former, a cam located on the periphery of said cam disc, and an operative connection between said last mentioned cam and said ejector plate to impart swinging movement to the latter to remove a bent structure from said former.

17. A wire bending machine including a former, means for bending a wire around said former, a rectifying post, and means for imparting relative movement between the structure being bent and said post sufficient to place said post in a position to cause the latter to engage the bent structure during the bending operation and prevent distortion beyond the limits of its springing capacity.

18. A wire bending machine including a former, means for bending a wire around said former, a retaining post, and means for imparting relative movement between the structure being bent and said post sufficient to place said post in a position to cause the latter to engage a bent structure during the bending operation and prevent distortion beyond the limits of its springing capacity.

19. A wire bending machine including a former, means for bending a wire around said former, a rectifying post to engage one side of the bent structure, a retaining post to engage an opposite side of the bent structure, and means for independently operating said posts to engage said structure as it is being bent.

20. A wire bending machine including a former, means for bending a wire around said former, a rectifying post, and means for moving the bent structure against said post sufficient to place said post in a position during the bending operation and prevent distortion beyond the limits of its springing capacity.

21. A wire bending machine including a former, means for bending a wire around said former, a retaining post movably mounted, means for moving said post into contact with the structure being bent, a rectifying post, and means for moving the structure being bent into contact with said rectifying post.

22. A wire bending machine including a former, an ejector, means for bending a wire around said former and overlying said ejector, a rectifying post secured to said ejector, and means for imparting relative movement between the structure being bent and said rectifying post.

23. A wire bending machine including a former, pivotally mounted bending arms for bending a wire around said former, and a retaining post carried by said arms, independently of the wire being bent, into contact with a structure being bent during the bending operation.

24. A wire bending machine including a movably mounted former, a pair of bending arms, means for delivering wire structures to said arms to be bent around said former, an actuating shaft, a connection between said shaft and said bending arms for operation of the latter, and a connection between said shaft and the former for moving the latter.

25. A wire bending machine including a former, a pair of pivotally mounted bending arms for bending wires around said former, means for operating said arms, jaws located on said arms, means for automatically opening and closing said jaws to release and grip a wire, and a feed device for presenting structures in the path of movement of said jaws and including means for releasing the terminal structure for presentation to said jaws.

26. A wire bending machine including bending mechanism, a feed device including a runway for a pile of structures to be bent, means for completely controlling movement of said pile of structures, and other means for controlling movement of one of said structures in a position separated from the balance of said structures.

27. A wire bending machine including bending mechanism, a feed device including a runway for a pile of structures to be bent, a detent for controlling movement of one of said structures for delivery to the bending mechanism, and a detent for independently and completely controlling movement of the balance of the structures in the runway.

28. A wire bending machine including bending mechanism, a feed device including a runway for a pile of structures to be bent, a detent for controlling movement of one of said structures for delivery to the bend-

ing mechanism, a detent for independently and completely controlling movement of the balance of the structures in the runway, and means connecting said detents for simultaneous operation thereof.

29. A wire bending machine including an actuating shaft, a bending mechanism actuating member secured to said shaft, a cam disc secured to said shaft, bending mechanism including bending arms, a rod operatively connected with said arms and with said bending mechanism actuating member, said bending mechanism also including a movably mounted former, and a bar operatively connected with said former and with said cam disc.

30. A wire bending machine including two oscillating shafts with gears thereon, a rack extending between said gears and meshing therewith, means for imparting reciprocating movement to said rack, bending arms secured to and projecting from said shafts, jaws on said arms to grasp the ends of wires to be bent, means for presenting wires in the path of movement of said jaws, means for opening and closing said jaws to grip said wires and to release them, and a former around which said wires are bent.

31. A wire bending machine including two oscillating shafts, means for oscillating said shafts, bending arms secured to and projecting from said shafts, jaws on said arms, means for presenting wires in the path of movement of said jaws to be swept into the latter in the movement of said arms, means for opening said jaws to receive and to release the wires and for closing the jaws to grip said wires, and a former around which said wires are bent.

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