WIRE FEEDING AND POSITIONING APPARATUS

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This invention has to do with apparatus for automatically moving the end portion of a length of wire back and forth over a path between a plurality of work stations and for automatically advancing the wire to a predetermined distance during movement of the wire end toward one of the work stations.

The wire is taken from a spool, reel, or other source of supply, and the leading end of the wire is acted upon by mechanisms arranged at the work stations. For example, a forming mechanism may be positioned at one of the work stations and operable when the wire end is positioned in registration with the forming mechanism to form the wire into a predetermined shape. When this formed end of the wire is moved or shifted into registration with another work station, it is acted upon by mechanism at the second station which, for example, may consist of a welding mechanism to weld the formed wire end to another work piece, and severing mechanism to sever the welded wire end from the strand of wire.

The invention has as an object a device of the type referred to as an embodied in a particular compact structural arrangement which is economical to build and which functions with great efficiency over prolonged periods of operation without maintenance, and further embodies means whereby the extent the wire is advanced in each cycle of operation may be readily adjusted.

The invention consists in the novel features and in the combinations and constructions hereinafter set forth and claimed.

In describing this invention, reference is had to the accompanying drawings in which like characters designate corresponding parts in all the views.

In the drawings:

Figure 1 is a side elevational view of a wire feeding and positioning apparatus embodying my invention.

Figure 2 is a top plan view.

Figure 3 is an end elevational view looking to the left in Figures 1 and 2.

Figure 4 is a view taken on line 4—4, Figure 1, illustrating the gripper portions of the wire advancing or feeding mechanism in closed position.

Figure 5 is a view, similar to Figure 4, illustrating the wire gripping portions in open position.

The apparatus consists of a base plate 10 apertured to receive an actuating shaft 11 journaled on a vertical axis in the plate 10 and having attached to its upper end a post 12. The post is fixedly secured to the shaft 11, as by a set screw 13, and the post serves to carry a frame member, here shown in the form of a U-shaped member having legs portions 14, 15. The upper end of the leg portion 14 is fixedly secured to a shaft 16 extending through the post 12 and being fixedly secured thereto by screw 17. The leg portion 15 is positioned in proximity to an arcuate member 18 formed on a radius extending from the axis of the shaft 11, the member 18 being fixedly mounted on the base plate 10, as by screws 20.

Figure 3. The leg 15 is also provided, at its upper end, with a forwardly projecting portion 22 having an enlargement 23 formed on opposite sides with surfaces 24, 25. The portion 22 is arranged in alignment with the shaft portion 16, and these portions are formed with aligned apertures for passage of the wire 26. The inclined surfaces 24, 25, extend in angular relation to the axis of the wire and are engaged by adjustable stop screws 28, 29, threaded into upwardly extending portions 30 formed on the arcuate member 18.

When the shaft 11 is oscillated, the frame member 14—15 is moved back and forth over an arcuate path about the axis of the shaft 11, the extent of this movement being controlled by the setting of the stop screws 28, 29.

A work station A is indicated at 31, and a second work station B is indicated at 32, Figure 2. Forming mechanism may be located at one of these stations, such as station A, and including tools for forming the end portion of the wire 26, as indicated by the 8 formation at 34, Figure 1. Other tooling may be positioned at station B as, for example, a gripping jaw device 35 for gripping and holding a work piece 36 over which the formed end portion 34 of the wire is positioned when the frame is moved to the position shown in Figure 2 against the stop screw 28. At station B, there may be provided a welding electrode 38 for welding the formed portion 34 of the wire to the work piece 36, and with a shear member 39 for severing the welded formed end portion from the wire strand. It will be understood that the tooling at the work stations may be of any type suitable for the particular job and will be operated in timed relation to the operation of the wire feeding and positioning device.

The frame member carries a wire feeding or advancing mechanism which is operable automatically to advance the wire as the frame is moved toward one of the work stations as, for example, toward the forming station A. This mechanism consists of a pair of wire gripping members 42 pivotally mounted on a shaft 43 slidably mounted in aligned apertures formed in the frame member 14, 15, and located below the wire 26. The forward portion of the shaft 43, on which the grippers 42 are mounted, is of reduced diameter, and the grippers are mounted between the resultant shoulder on the shaft and a collar 44 fixedly secured to the shaft. The shaft is yieldingly urged forward with the collar 44 engaging the inner surface of the leg member 15, by a helical compression spring 46 mounted on the rear portion of the shaft and interposed between the leg portion 14 and a collar 47 fixedly secured on the shaft.

The grippers 42 have depending tail portions 50 which straddle a shaft 51 rotatably journaled in the leg portions 14, 15, of the frame, and being restrained against axial movement by collars 52. Opposite sides of the shaft 51 are milled off to provide flat portions 54, see Figures 1, 4 and 5. When these flat portions 54 are positioned vertically, as shown in Figures 1 and 4, the grippers 42 close upon the wire 26, this closing being effected by a spring 55 acting upon the tail pieces 50 of the grippers. When the shaft is rotated to move the flats 54 toward horizontal position, as shown in Figure 5, the tail pieces 50 are engaged by the circular surface of the shaft 51 and are spread apart, effecting a spreading apart of the grippers 42 out of gripping engagement with the wire 26.

The shafts 43, 51, both extend forwardly through the leg portion 15 of the frame member and through a rectangular opening 57, see Figure 3, formed in the arcuate member 18. The forwardly extending portion of the shaft 51 has fixedly secured to it a collar 58, formed...
with a depending portion 59, to which is pivotally mounted a depending pawl member 60, as by a rivet 61, or the like. This pawl member 60 is free to rotate in a counterclockwise direction. Figure 3, rotation in a clockwise direction is imparted to the shaft 41 when the lower end of the pawl engages the pin 63. This movement of the shaft 51 to the position shown in Figure 5 effects opening of the gripper members 42.

As the gripper members 42 are thus opened, the forwardly projecting portion of the shaft 43 engages the cam surface 66 of member 67 mounted for pivotal movement about a screw 68 threaded into a block 69 detachably mounted on the base plate 10, as by screws 70, these screws extending through elongated slots 71 formed in the base portion 72 of the block 69 to permit adjustment of the block toward and from the arcuate member 18.

The cam member 67 is restrained from rotation in a counterclockwise direction, Figure 2, by a stop pin 73, the cam member being thereby urged against the pin 74 by spring 75. Accordingly, as the frame is moved toward the stop screw 29, the end of the shaft 43 engages the cam surface 66 and the shaft is cammed rearwardly. As previously stated, at this time the grippers 42 are open because of the relative position between the pin 63 and cam member 67, and this arrangement is such that when the shaft 43 and the grippers 42 carried thereby have been moved rearwardly a predetermined distance, the pawl 60 passes out of engagement with the pin 63, permitting the shaft 51 to be rotated back into the position shown in Figure 4, whereby the grippers close upon the wire by the action of spring 55. The distance that the shaft 43 is moved rearwardly and accordingly, the distance which the wire is advanced forwardly, can be adjusted by moving the block 69 toward or from the arcuate member 18 and securing the block in such adjusted position by the screws 70. Upon further movement of the frame toward the stop screw 29, the end of the shaft 43 passes out of engagement with member 67 and is urged forwardly by the spring 46 until the collar 44 engages the inner surface of the leg member 15, whereby when the leading end of the wire 26 reaches a position in alignment with the work station A, the wire has been advanced rearwardly a predetermined distance so that it may be operated upon by the tooling at station A.

The shaft 11 is then rotated in the opposite direction to swing the frame against the stop screw 28 and position the forwardly portion of the wire in registration with the frame shown at station B. During this movement of the frame toward the stop screw 28, the end of the shaft 43 engages the rear edge of the cam member 67 and moves the same in a counterclockwise direction, Figure 2, about the mounting screw 68, and the pawl 60 engages the pin 63 but readily swings about its pivot in a counterclockwise direction, Figure 3, whereby the shaft 42, 51, are not actuated upon the return movement of the frame. The mechanism described is particularly compact and functions efficiently to effect precision feeding and positioning of wire especially of very small diameter in the nature of only a few thousandths of an inch.

What I claim is:

1. A device of the character described including a plurality of work stations comprising a base, a support shaft journaled in the base, a frame mounted on said shaft and extending radially therefrom, said frame being movable back and forth over an arcuate path between said work stations upon oscillation of said shaft, said frame being provided with aligned wire guiding apertures for guiding the wire radially from said support shaft, a gripper support slidably mounted in the frame in the movement parallel to the axis of said guiding apertures, a wire gripper mounted on said gripper support and having portions movable into and out of engagement with said wire, actuating means operable upon initial movement of the frame forward one of said work stations to move said portions of the gripper out of engagement with the wire and to move said gripper support toward the axis of said support shaft and, upon further movement of the frame toward said station, to move said gripper into engagement with the wire and to move said gripper support radially outwardly from said support shaft a predetermined distance.

2. A device of the character described including a plurality of work stations comprising a base, a support shaft journaled in the base, a frame mounted on said shaft and extending radially therefrom, said frame being movable back and forth over an arcuate path between said work stations upon oscillation of said shaft, said frame being provided with aligned wire guiding apertures for guiding the wire radially from said support shaft, a gripper support mounted for pivotal movement parallel to the axis of said guiding apertures, a wire-gripper mounted on said gripper support and having portions movable into and out of engagement with the wire, actuating means operable upon initial movement of the frame toward one of said work stations to move said portions of the gripper out of engagement with the wire and to move said gripper support toward the axis of said support shaft and, upon further movement of the frame toward said station, to move said gripper into engagement with the wire and to move said gripper support radially outwardly from said support shaft a predetermined distance.

3. A device as defined in claim 1 wherein said frame is adjustable toward and from the axis of said support shaft.

4. A device of the character described including a plurality of work stations comprising a base, a support shaft journaled in the base, a U-shaped frame member mounted on said shaft with the leg portions of the frame extending parallel to the axis of the shaft, the leg portions of said frame being provided with aligned wire guiding apertures for guiding the wire radially from said support shaft, said frame being movable back and forth over an arcuate path between said work stations upon oscillation of said shaft to position the leading end of the wire in registration with said stations respectively, a gripper support slidably mounted in the leg portion of the frame for movement parallel to the axis of the wire, a wire gripper mounted on said support and having portions movable into and out of wire gripping engagement with the wire, a shaft journaled in said leg portions of the frame and having cam means operable upon oscillation of said shaft to open and close said gripper, means operable upon initial movement of the frame for one of said work stations to effect oscillation of said shaft to move said gripper portions out of engagement with the wire, cam means carried by the base and operable to move said gripper support rearwardly toward the axis of said shaft while said gripper portions are in open position.

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