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WIRE BENDING AND FORMING MACHINE.

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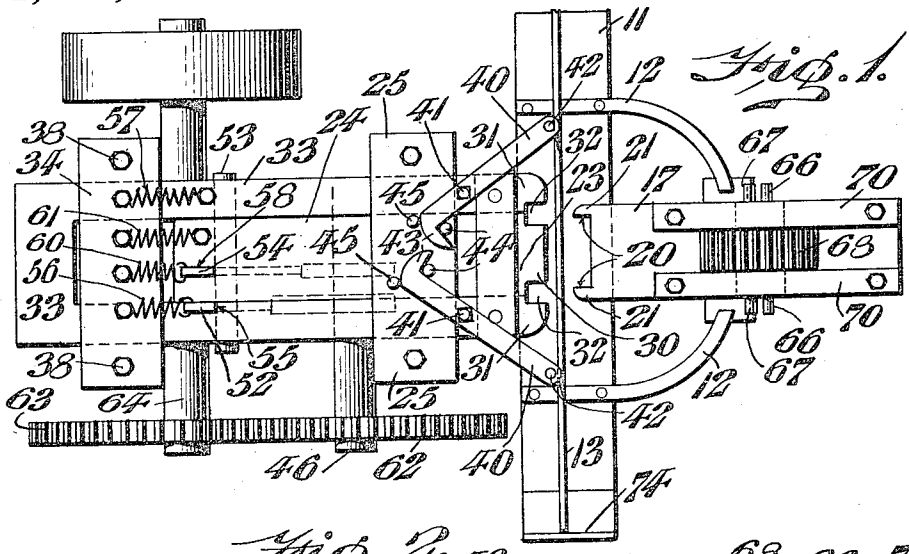


Fig. 1.

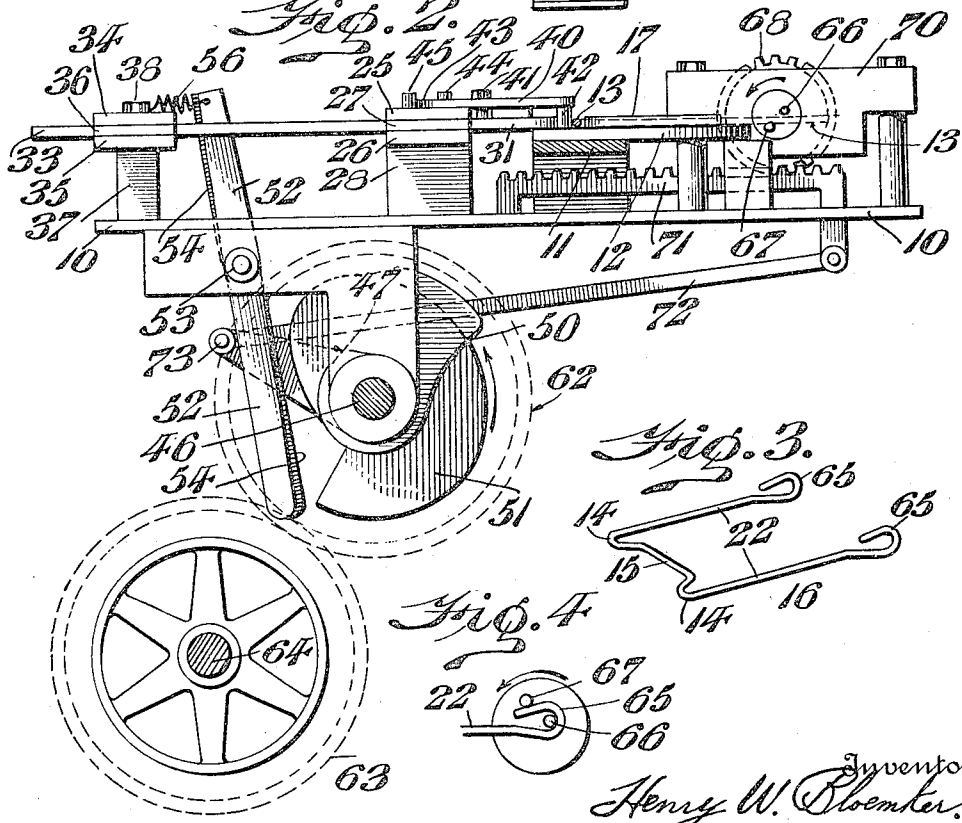


Fig. 2.

Fig. 3.

Fig. 4.

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WIRE BENDING AND FORMING MACHINE.

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To all whom it may concern:

Be it known that I, HENRY W. BLOEMKER, a citizen of the United States, and a resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a certain new and useful Wire Bending and Forming Machine, of which the following is a specification.

Some of the objects of the present invention are to provide a machine for forming a complete wire unit for wire fabrics; to provide a mechanism for bending a length of wire into a predetermined shape; to provide a mechanism for automatically bending and forming a length of wire into a wire fabric unit of predetermined shape; to provide a mechanism for simultaneously forming and stretching a length of wire and to provide other improvements as will hereinafter appear.

In the accompanying drawings, Figure 1 represents a plan of one form of a wire fabric bending machine embodying the present invention; Fig. 2 represents a side elevation of the operating parts of the same; Fig. 3 represents a perspective of the wire fabric unit formed by the machine; and Fig. 4 represents a detail of a portion of the bending and stretching mechanism.

Referring to the drawings, a main frame 10 forms a fixed substantial support for the parts of the bending mechanism and carries a transversely arranged fixed arched bed 11 having a pair of laterally disposed projecting guide arms 12 secured thereto in a rigid manner and which curve toward each other but are suitably spaced apart at their opposed free ends for a purpose as will later appear. These guide arms 12 serve together as a support for the wire 13 when it enters the machine and during the shaping and bending operations.

For the purpose of bending the wire 13 to initially form a substantially U-shape in the wire and providing a pair of loops 14 in the transverse bridge piece 15 as shown in the fabric unit 16 of Fig. 4, there is a disk 17 provided which is bolted or otherwise fixedly secured to the frame 10 and has one end suitably located on the bed 11, in juxtaposed relation to the length of wire inserted for bending purposes; and having a recess 20 of a depth and length sufficient to form the reëntrant bridge piece 15 in the wire. The die recess 20 with respect to the sides of the die forms a pair of loop formers 21 of a size and shape to give the desired loops 14 to the wire when the legs 22 are bent to the finished position of Fig. 3.

In order to shape and bend the wire about the fixed die 17, there is a movable die 23 secured to or integral with a reciprocable member 24 which is guided and slides freely between a pair of transverse strips 25 and 26 arranged in superposed relation but suitably spaced by liners 27 to permit free movement of the member 24 between the said strips. Suitable supports 28 are bolted with the strips 25 and 26 to the frame 10 to bring the die 23 into proper alinement with the die 17 and with the bed 11 upon which it is adapted to slide into and out of operative relation to the die 17. The forming end of the die 23 is provided with a tongue 30 adapted to enter the recess 20 of the fixed die but having a width less than the length of said recess 20 by an amount substantially equal to twice the diameter of the wire used in the fabric so that the wire can be pressed by the tongue 30 into the recess 20 to be given the desired contour.

For the purpose of completing the initial forming and bending operation, there are a pair of fingers 31 provided respectively at the sides of and in the plane of the die 23, each of which terminates substantially beyond the base part of the tongue 30 to form recesses 32 respectively opposed to the loop formers 21 whereby as the fingers 31 move forward to straddle the die 17 the wire 13 is bent at each end into abutting relation with the sides of the die 17 while the formers 21 enter the recesses 32 and form the loops 14. The fingers 31, in the present instance, are integral with a U-shaped element 33 which is guided by and between the strips 25 and 26 and likewise supported and guided at its outer end by transverse strips 34 and 35 spaced in superposed relation by liners 36 and fixed at the proper height above the frame by supports 37 and bolts 38 joined to said frame 10.

To maintain the wire 13 in proper position and to prevent kinking thereof during the bending operation, a pair of guide arms 40 are provided which are respectively pivoted at 41 to the movable element 33 and each terminates at one end in a follower 42 in the form of a downwardly projecting lug which is supported by and rides upon the upper surface of the bed 11. These followers 42 are disposed on opposite sides of

the die parts so that each contacts with an end of the wire 13 and follows its movement during the bending together of the parts of the unit forming the legs 22 so that when the legs 22 lie in contact with the sides of the die 17, the said followers 42 have moved toward each other and firmly press the wire against the die 17. This converging movement of the followers 42 is accomplished by providing the arms 40 with cam shaped hook ends 43 respectively, which are arranged to coact with pairs of pins 44 and 45 fixed to the stationary strip 25 and so positioned that one pin 44 of each pair throws the hook end of the adjacent arm 40 outwardly while the other pin 45 of each pair guides the adjacent arm in its movement and serves to return the parts to normal position. The swinging movement of the arms 40 is caused by the movement of the element 33 when the fingers 31 are reciprocated.

Reciprocation of the movable die parts takes place through the operation of a cam and spring mechanism under the control of a rotatable shaft 46 mounted in bearings 47 fixed to the frame 10, said shaft carrying cams 50 and 51 which are fixed to rotate therewith. The cam 50 is positioned to engage one end of a lever 52 pivoted upon a spindle 53 transversely disposed on the frame 10 and which also pivotally carries a second lever 54 having one end in the path of movement of the cam 51. The arrangement is such that the cam 51 contacts with and shifts the lever 54 in advance of the engagement of the cam 50 with the lever 52. The lever 52 projects beyond its pivotal point or fulcrum and passes through the frame 10 where it seats with a snug fit in a recess 55 of the element 33. A coil spring 56 is secured at one end to the upper projecting part of the lever 52 and at its other end is fastened to the fixed strip 34 so that after a movement of the lever 52 in one direction, caused by the cam 50, the parts will be returned by the spring 56 and the lower end of the lever 52 will also be returned to position to be moved by the control cam 50. A second coil spring 57 connects the opposite side of the element 33 with the fixed strip 34 to prevent binding of the slidable element 33 and to insure prompt action of the parts. The lever 54 is also pivoted upon the spindle 53 and extends upwardly through the frame 10 where it fits snugly in a recess 58 of the movable die part 24 while a coil spring 60 which is connected to the end of the lever 54 and to the fixed strip 34 insures the lever 54 being returned after the action of the cam 51. A second coil spring 61 is connected between the said fixed strip 34 and the movable die element 24, whereby the latter is returned quickly to its initial position.

For operating the shaft 46, suitable gears 62 and 63 are provided, the former being keyed to the shaft 46 and meshing with the latter, which is keyed to the main driving shaft 64.

In order to form the reversely bent hooks 65 of the fabric unit, the ends of the wire 13, after the bending and forming operation, rest respectively between pairs of pins 66 and 67 laterally projecting respectively from opposite sides of a pinion 68 which is journaled to oscillate in bearings 70 carried by the frame 10. Motion is transmitted to the pinion 68 in proper timed relation by a rack 71 arranged to slide upon the frame 10 or like fixed part and reciprocated by a connecting rod 72 operated by a crank 73 fixed to rotate with the shaft 46. In connection with the pins 66 and 67, it should be noted that the two pins 66 are fixed to the respective sides of the pinion 68 slightly off center by the same radial distance while the pins 67 are fixed to the respective sides of the pinion 68 a greater distance off center, both, however, being the same radial distance from the center of the pinion. The eccentric movement of the pins 67 serves to bend the respective ends of the wire about the respective pins 66 as a center while the eccentric movement of the pins 66 serves to stretch the wire longitudinally of its length a proper amount.

In the operation of the machine, a length of wire sufficient to form the complete fabric unit is placed in position across the arms 12 above the bed 11 as indicated in Fig. 1, with an end abutting the end gage 74 which determines the accurate placing of the wire length. The machine having been started, the cam 51 first contacts with the lever 54 which is then rocked on its pivot 53 to advance the die member 24 toward the fixed die 17 and thus press the wire at its middle portion into the recess 20 of the die 17. During this forward movement of the member 24, the cam 50 has reached a position to engage and rock the lever 52 whereupon the element 33 advances and brings the fingers 31 to a position to bend the wire ends around the formers 21 and while this is being accomplished, the arms 40 are drawn toward each other, owing to the forward movement of the respective fulcrums 41 and the action of the pins 44 in connection with the hook cams 43. While this bending takes place the die 23 is held stationary by the rest portion of the cam and the die 23 remains in this position until the hook ends 65 are formed, though the bending finger element 33 has in the meantime returned to its initial position due to the action of the springs 56 and 61 and the relatively short cam surface on cam 50. The completing of the bending and forming finds the ends of the wire legs 22 respectively between the pairs of pins 66 and 67, indicated in dotted

lines in Fig. 2. In this position, the shaft 46 has reached a point in the revolution where the crank 73 shifts the rod 72 in the proper direction to move the rack 71 to turn the pinion in the direction of the arrow Fig. 2. The pins 67 therefore simultaneously engage the two wire ends and as the turning continues, bend them about the respective pins 66 as a center to the position indicated in Fig. 4. In connection with this bending of the wire ends, it is important to note that the eccentricity of the pins 66 causes the wire to be stretched longitudinally of the legs and drawn out somewhat so that the metal has nearly reached its limit of elasticity when the hooks 65 are completed. This prevents the fabric in assembled condition from stretching further under tension and overcomes the sagging common to wire fabric in general use.

It will now be apparent that I have devised a novel and useful construction which embodies the features of advantage enumerated as desirable in the statement of the invention and the above description and while I have in the present instance shown and described the preferred embodiment thereof, which has been found in practice to give satisfactory and reliable results, it is to be understood that the same is susceptible of modification in various particulars without departing from the spirit or scope of the invention or sacrificing any of its advantages.

What I claim is:

1. In a machine for forming a wire fabric unit, the combination of a fixed die having a recess therein, a movable die adapted to press a portion of a wire into said recess, means to operate said movable die, means operable in timed relation with respect to the movement of said movable die to bend the ends of said wire respectively against the sides of said fixed die and a pair of followers operated by the movement of said bending means adapted to contact with and hold said ends against said fixed die.

2. In a machine for forming a wire fabric unit, the combination of a fixed die having a recess therein, a movable die adapted to press a portion of a wire into said recess, means to operate said movable die, means operable in timed relation with respect to the movement of said movable die to bend the ends of said wire respectively against the sides of said fixed die, a pair of followers operated by the movement of said bending means adapted to contact with and hold said ends against said fixed die and means to bend said ends to form a pair of hooks.

3. In a wire bending machine the combination of means for holding a wire from endwise movement, means for reversely bending the respective ends of said wire and simultaneously stretching said wire in the direction of its length.

4. In a wire bending machine, means for holding a wire from endwise movement, a rotatable member, means to turn said member about its axis, a pair of eccentrically arranged pins secured thereto and adapted to receive the end of the wire between them, one of said pins being off center a distance greater than the other, whereby the turning of said member bends the wire about one of said pins and simultaneously stretches said wire.

5. In a machine for forming a wire fabric unit the combination of a fixed die having a recess therein, a movable die adapted to press a portion of a wire into said recess, means to operate said movable die, means to bend the ends of said wire respectively against the sides of said fixed die, and pairs of pins spaced apart and rotatable about a common axis for bending the respective ends of said wire.

6. In a machine for forming a wire fabric unit the combination of a fixed die having a recess therein, a movable die arranged to press a portion of a wire into said recess, means to operate said movable die, means to bend the ends of said wire respectively against the sides of said fixed die, a rotatable member transversely disposed to the path of movement of said movable die, a pair of eccentric pins projecting from each end of said member and means to turn said member at a predetermined position of said wire, whereby the ends of said wire are bent to form hooks.

In testimony whereof I have hereunto signed my name.

HENRY W. BLOEMKER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."