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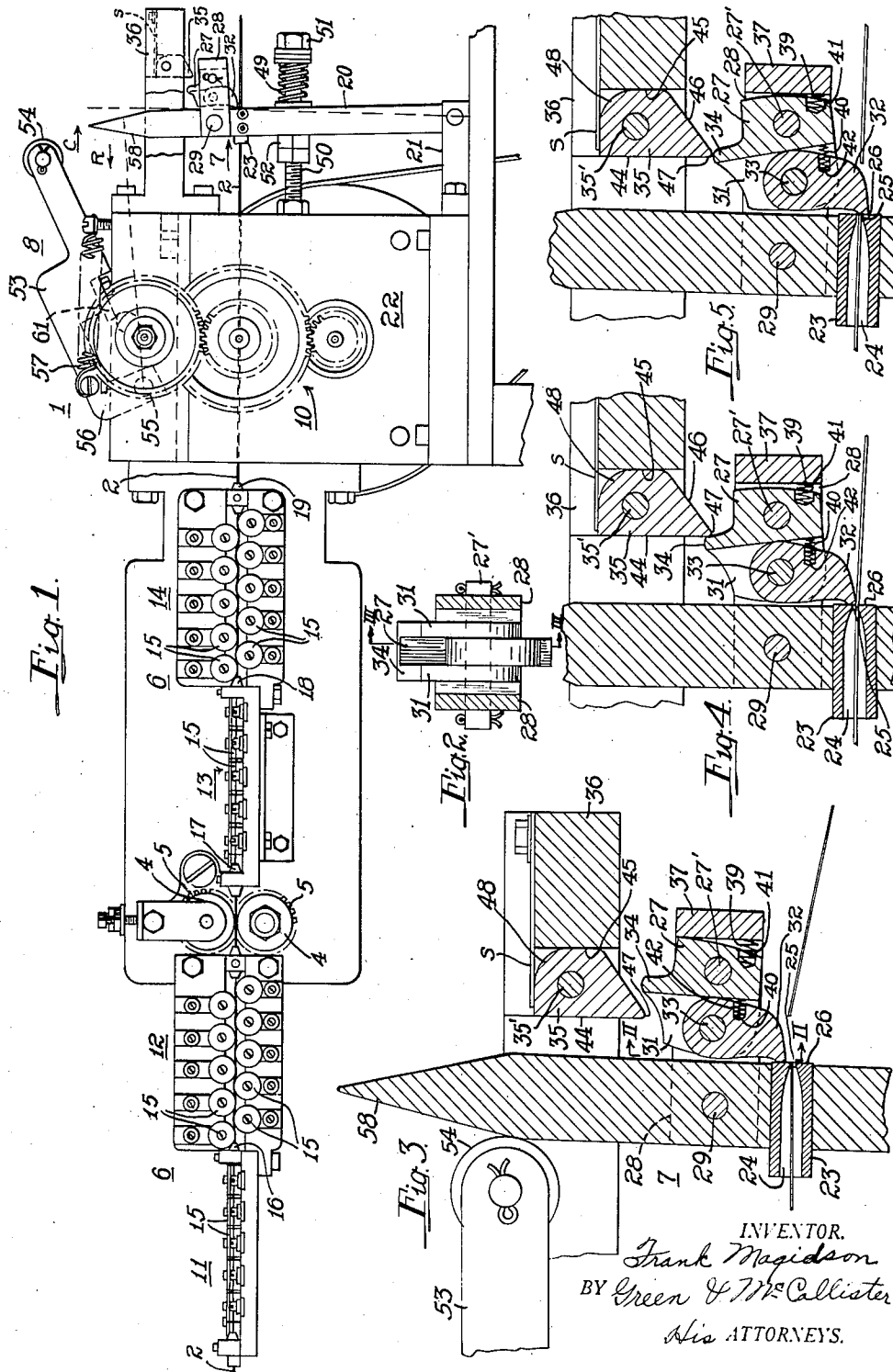
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2,089,564

WIRE CUTTING MACHINE

Filed June 15, 1936

2 Sheets-Sheet 1



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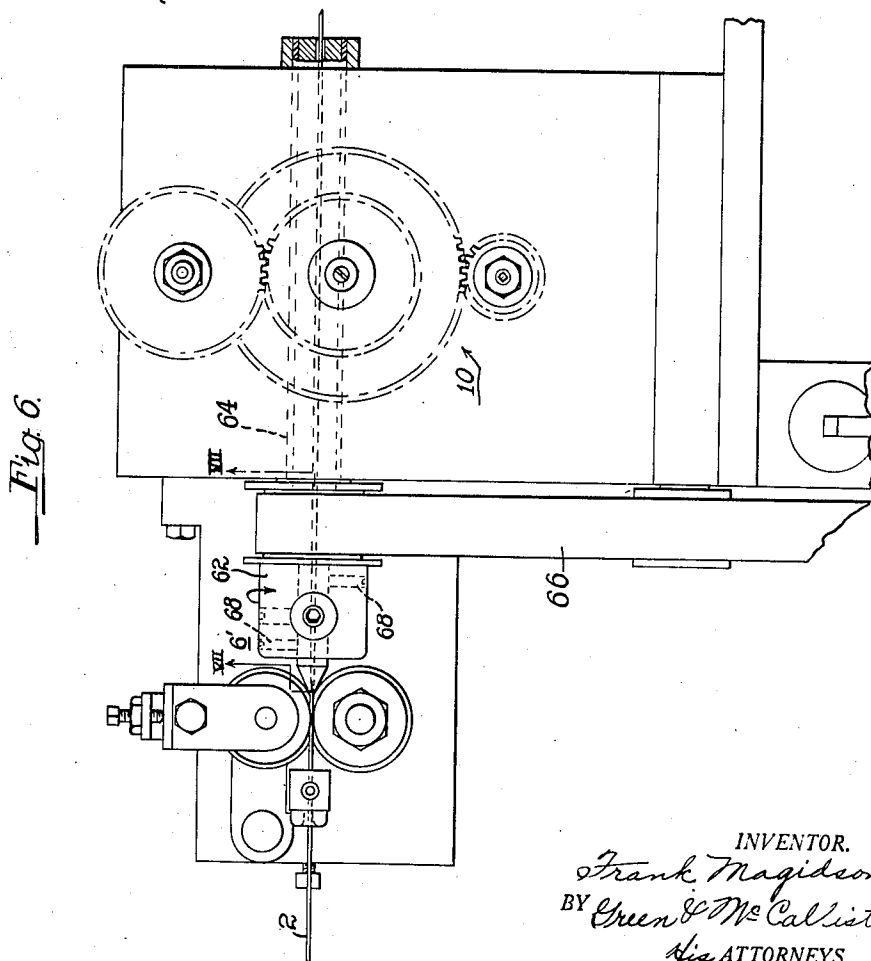
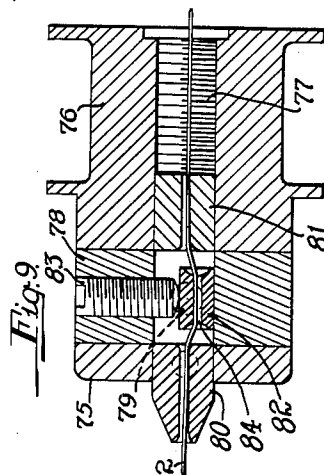
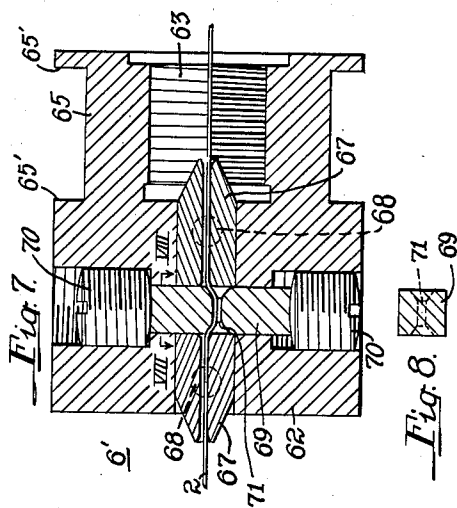
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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WIRE CUTTING MACHINE

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5 Claims. (Cl. 140—140)

This invention relates to wire cutting machines and more particularly to machines designed for straightening and cutting wire to length at a high rate of speed.

An object of this invention is to provide a wire cutting machine that shall be capable of cutting measured lengths of wire from wire stock which is fed at high speed to the cutting mechanism.

Another object of the invention is to provide a machine that will first straighten the wire before it is fed to the cutter mechanism, and particularly to provide a straightener that will straighten small diameter wire of the type known as piano wire.

A further object of the invention is to provide a cutter mechanism that will sever the wire while it is moving at high speeds without causing the wire approaching the cutter to buckle.

Other objects of the invention will in part be apparent and will in part be obvious from the following description, taken in conjunction with the accompanying drawings, in which:

Figure 1 is a general organization view in side elevation of a machine constructed in accordance with an embodiment of the invention;

Fig. 2 is a view in section, taken on the line II—II of Fig. 3, showing a detail of the cutting mechanism;

Fig. 3 is a vertical sectional view taken on a plane corresponding to line III—III of Fig. 2, showing a detailed arrangement of the cutter mechanism, the position of the cutter mechanism being that which it occupies after its cutting stroke has been completed;

Fig. 4 is a view similar to Fig. 3, showing the cutter mechanism just at the beginning of its cutting stroke;

Fig. 5 is a view similar to Figs. 3 and 4, showing the cutting mechanism in the position it occupies at the moment the wire has been cut;

Fig. 6 is a fragmentary view, showing a part of the machine shown in Fig. 1, but provided with a modified form of wire straightening mechanism;

Fig. 7 is a view in longitudinal section of the straightening mechanism, taken on line VII—VII of Fig. 6;

Fig. 8 is a view in section of a detail of the straightening mechanism, the section being taken on line VIII—VIII of Fig. 7; and

Fig. 9 is a view in longitudinal section of a modified form of straightening mechanism of the type shown in Figs. 6 and 7.

Throughout the drawings and the specification, like reference characters indicate like parts.

In Fig. 1 of the drawings, a machine 1 is illustrated which is designed to feed wire stock 2 from a reel or spool, not shown, at relatively high speed and to cut the stock into pieces of

any predetermined length while the wire is moving at such speed through the machine.

The machine, as shown in Fig. 1, comprises feed or pinch rolls 4, both of which are driven through intermeshing gears 5 by a motor, not shown, a straightening device 6 through which the wire stock passes before being cut, a cutter mechanism 7 designed to cut the wire into lengths, and a cutter operating mechanism 8. The operating mechanism is driven by a motor, not shown, (this motor may be the same motor that drives feed rolls 5) through a set of timing gears 10. The timing gears are so selected that for a given rate of wire feed, the wire will be cut into pieces of predetermined length, say into pieces one, two or three feet long, depending upon the particular gear ratios employed. The cutter mechanism is designed to move with the wire at substantially the same speed and in the same direction as the wire is fed through the machine and to cut the wire while moving so as to prevent buckling of the wire stock approaching the cutter mechanism.

The particular form or type of wire straightening mechanism employed with the machine shown herein will depend upon the type of wire stock to be cut. If soft wire, such as used by florists, for example, is being cut, a straightening device of the type shown in Fig. 1 is satisfactory, but if wire, such as piano wire is to be cut, a straightener of the type, such as shown in Figs. 6 to 9, inclusive, would be used.

The wire straightening device, shown in Fig. 1, comprises a plurality of groups 11, 12, 13 and 14 of rollers. Any number of groups of rollers may be used. In Fig. 1, I have shown four groups of rollers, two groups on each side of the feed rolls 4. These groups of rollers are disposed in staggered relation at an angle to each other say 90°. The rollers 15 of each group are disposed in two parallel, but spaced lines, with the rollers of one group staggered with respect to the rollers of another, so that as the wire passes between them, it is bent first in one direction and then the other. The wire passing through group 11 is bent alternately back and forth in a horizontal plane, and as it passes through the rollers of group 12, the wire is bent back and forth in a vertical plane. The wire passes from the rollers of group 12 through a guide nipple 16, thence between the feed rolls 4 and through guide nipple 17 into the straightening rolls of group 13. These rollers are disposed in a horizontal plane like the rollers of group 11 and continue to bend the wire back and forth in a horizontal direction. The wire passes from the straightening rollers of group 13 through a nipple 18 into the rollers of the last straightening group which are disposed in the same plane as the rollers of group 12, and thence through a nip-

pie 19 to the wire cutting mechanism of the machine.

The wire cutting mechanism comprises a bar 20 which is pivotally mounted at its lower end in a bracket 21 secured to frame 22 of the machine. This bar is provided with a cylindrical guide 23 which is fitted into an aperture in the bar. This guide is formed with a bullet-like cavity 24, which terminates at its forward end in a relatively small aperture 25. The forward end of this guide is machined to provide a flat surface 26 about the aperture and to provide a sharp edge at the point where the aperture cuts through this surface. Bar 20 carries a cutter block 27 that is pivotally mounted on a pin 27' extending through a U-shaped bracket 28, which in turn is rigidly secured to bar 20 by means of a bolt 29. The end of the cutter block adjacent bar 20 includes two spaced flanges 31 between which a cutter 32 is disposed, the cutter being pivotally mounted on a pin 33, extending through the blade and the spaced walls of the cutter block. The top of the cutter block is formed with an upwardly projecting lug 34 positioned to cooperate with a one-way stop or pawl 35 pivotally mounted on a pin 35' supported by a bracket 36 secured to the frame of the machine. This pawl is urged to the position shown by a spring S and allows cutter block 27 to move under it when bar 20 moves in the direction of arrow R without actuating the cutter, but when the bar moves in the direction of arrow C, that is, in the wire cutting direction, lug 34 engages stop 35, causing the cutter block and cutter 32 to move in a counter-clockwise direction, whereby the cutting edge of the cutter is caused to move downwardly along the flat surface 26 of guide 23 and sever the wire.

As may be seen in either of Figs. 3, 4 or 5, the back side of the cutter block is cut to such a radius that a relatively large clearance is provided between cross bar 37 of bracket 28 and the lower end of the cutter block, but with substantially no clearance between the top of the cutter block and this cross bar when the cutter block is in the position shown in Fig. 3. Therefore, when the cutter block is in the position shown in Fig. 3, it cannot turn any farther in a clockwise direction because the upper edge of the cutter block strikes the cross bar 37. The cutter block and the cutter are each yieldingly urged in a clockwise direction by means of springs 39 and 40. Spring 39 is carried in a socket 41 formed near the bottom of the back face of the cutter block. This spring projects beyond the socket and against the cross bar 37. Spring 40 is nested in a socket 42 in the cutter 32 and bears against the cutter block.

Stop or pawl 35 is formed with front and back vertical faces 44 and 45, a rearwardly and upwardly inclined face 46, that intersects face 45 at substantially a point 47 and a curved surface 48. The radius of surface 48 is such that the pawl may turn clockwise but not counter-clockwise beyond the position indicated in either Figs. 3, 4 or 5. Since the pawl may turn clockwise, lug 34 on the cutter block may pass freely under it when the cutter support bar 20 turns in the direction of arrow R, but when the bar moves forwardly the pawl forms a rigid stop against which lug 34 strikes. Since the pawl is rigid in this direction, cutter block 27 turns counter-clockwise and moves cutter 32 downwardly through its cutting stroke.

Bar 20 is urged towards the position shown in Fig. 1 by means of a spring 49. This spring is

shown as a compression spring, being mounted on a rod 50, one end of which is threaded into frame 22 of the machine, and which carries on adjusting nut 51 at the other end. Lock nuts 52 are threaded on this rod and fix or limit the travel of bar 20 in the direction of arrow R.

The cutter actuating mechanism comprises a lever 53, having a roller 54 at its forward end, and which is pivotally mounted at its rearward end on a shaft 55, which shaft extends through and is supported by the frame of the machine. The rear or pivoted end of this lever, as may be seen in Fig. 1, has a portion which is of inverted U shape. With this form of lever a crank arm 55' is provided to which tension springs 57, disposed one on each side of the lever, may be connected to urge the lever forwardly into a horizontal position. These springs are each connected at one end to the lever and are anchored at the other to the machine frame and are employed to actuate the lever into its horizontal position at a time when the cutter mechanism is to be brought into operation to sever a length of wire. When this lever is actuated into horizontal position, roller 54 engages an inclined surface 58 on bar 20 and moves the bar forwardly about its pivotal support, whereby the cutter mechanism carried thereby is actuated from the position indicated in Fig. 1 through the positions indicated by Figs. 4, 5 and 3, respectively, in the order named. The cutter actuating lever 53 is operated intermittently to the position indicated in Fig. 1 by means of a cam 59 mounted on a shaft 60 which carries one of the timing gears of the timing gear set 10.

Assuming that lever 53 is in a horizontal position and that the cam shaft is turning in a counter-clockwise direction, as seen in Fig. 1, it will be apparent that when the cam engages a wear plate 61, secured to the U-shaped portion of the lever, that the lever will turn counter-clockwise to the elevated position, shown in Fig. 1, and that the moment the cam slips off the end of the wear plate, springs 57 which have been stretched, will rapidly return the lever to its horizontal position, moving bar 20 in a clockwise direction rapidly and at a rate such that cutter 32 will sever the wire as it moves with the wire in the same direction and at a speed substantially equal to the speed of travel of the wire so that the end of the wire passing through guide 23 cannot strike against the cutter and buckle. When bar 20 has turned to a position, such that lug 34 is directly under point 47 of pawl 35, cutter 32 has reached the end of its cutting stroke, but the instant lug 34 moves from under the pawl, springs 39 and 40 return the cutter block and the cutter rapidly to the position shown in Fig. 3, but at the same time bar 20 is making or completing the end of its cutting stroke. Bar 20 is held in the position shown in Fig. 3 by lever 53 until this lever is raised by cam 59. The period of rise and fall of lever 53 for any given speed of wire feed determines the length of the pieces of wire cut by the cutter mechanism. The faster the rise and fall of lever 53, the shorter the pieces will be or the slower the rise and fall, the longer these pieces will be. By selecting the proper timing gears any length of pieces may be obtained.

The straightening device 6' shown in Fig. 6, as stated previously herein, is employed when wire such as piano wire is to be straightened and cut to predetermined lengths. In Fig. 6 the cutter mechanism and the actuating mechanism have been omitted as these would be the same as

shown and described in connection with Figs. 1 to 5 inclusive. Device 6' comprises a block 62 having a threaded socket 63 at one end by means of which the block can be threaded on the end of a drive shaft 64 which is connected by suitable gearing to the timing gears 10. The inner end of this block is turned to a smaller diameter to provide a portion 65 of reduced diameter having shoulders 65' at each end so that the reduced portion may serve as a pulley for a drive belt 66.

Block 62 is provided with a bore which is concentric with its axis of rotation to receive nipples 67 that serve to guide the wire stock into and out of the same. These nipples are secured to the block with set screws 68. The block is also provided with a transverse bore to receive a plug 69 that may be shifted along the same and locked in any desired position with countersunk screws 70. Plug 69 is preferably square in section and formed with an aperture 71 through which the wire passes. The plug is so positioned that aperture 71 is offset with respect to the axis of rotation of the block and the amount of offset is adjusted until the wire passing through the cutter mechanism is straight. When block 62 is rotating at high speed and wire is passing through it, successive incremental lengths of the wire stock are bent at slightly different angles and the compound effect of this bending accomplishes the desired straightening action. The amount by which the aperture in plug 69 is offset to accomplish the desired straightening function is dependent on the metallurgical composition and physical properties of the wire and the diameter of the wire. In any case the straightening is the result of offset spinning at high speed.

In Fig. 9, a modified form of straightener of the rotary or spinner type is illustrated. This straightener comprises a cylindrical body or block 75 having a pulley portion 76. The pulley portion has an internal threaded cavity 77 by means of which the block may be secured to a shaft such as shaft 64 for example. Block 75 has a transverse bore in which a plug 78 is disposed for adjustment along the bore, the plug being locked in position by means of a set screw 79. Plug 78 has a bore disposed in alignment with wire guide nipples 80 and 81 in which a spinner block 82 is mounted and locked in place with a set screw 83. Block 82 has a bore or passageway 84 chamfered at opposite ends through which the wire to be straightened passes. Passageway 84 is offset with respect to the axis of rotation of block 75 to accomplish the incremental offset bending of the wire as it is fed to the cutter mechanism. The amount of offset can be adjusted by shifting plug 78 along its bore, or by employing spinner blocks of different diameters, or both. In operation, the straightener shown in Fig. 9, functions on the same principle as the straightener shown in Fig. 7, so that no further detailed description of the operation of device 75 is believed necessary.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A machine for cutting wire into lengths while in motion comprising means for feeding wire stock, a cutter for severing the wire into lengths, said cutter comprising a lever mounted for oscillatory movement, means urging said

lever to a starting position, a guide carried by the lever through which the wire passes, said guide terminating in a cutting edge, a trigger pivotally mounted on the lever, a cutter pivotally mounted on the trigger, means normally urging said trigger and cutter to a position in which the cutter is held out of contact with the wire and in cutting position with said cutting edge, means for actuating the trigger to move the cutter through its cutting stroke when the lever is moving in the direction of wire travel, means for delivering substantially instantaneous intermittent blows on said lever to actuate it rapidly in the direction of wire travel to cause the wire to be severed into lengths as it passes through the guide, the lever being returned after each working stroke to its starting position by said lever urging means.

2. A machine according to claim 1 characterized by the fact that the intermittent blow-delivering means comprises a lever fulcrumed with one end in position to strike said oscillating levers, a cam disposed to turn said lever in a direction to move said end away from said oscillating lever, and then to abruptly move out of contact with the lever, and a spring for pulling said lever into striking engagement with the oscillating lever when the cam moves out of contact with the same.

3. A machine according to claim 1 characterized by the fact that the intermittent blow-delivering means comprises a lever fulcrumed with one end in position to strike said oscillating lever, a cam disposed to turn said lever in a direction to move said end away from said oscillating lever, and then to abruptly move out of contact with the lever, and a spring for pulling said lever into striking engagement with the oscillating lever when the cam moves out of contact with the same, and means for controlling the periodicity of said striking lever to thereby control the length of the pieces cut from said wire stock by said cutter.

4. A wire cutting machine comprising means for feeding wire stock, means for cutting said stock into pieces as the stock moves, and means for rapidly operating the cutter mechanism, characterized by the fact that the cutter mechanism comprises a lever mounted for oscillatory movement, a guide carried by the lever through which the stocks pass, said guide terminating in a cutting edge, a pivotally mounted trigger carried by the lever, a cutter pivotally mounted on the trigger, means urging the cutter towards the shearing plane of the cutting edge, a trip for moving the trigger in a direction to move the cutter through its cutting stroke when the lever is turned in a direction to carry the cutter mechanism in the direction of wire feed, and means for turning the lever in the opposite direction when the cutting stroke has been completed.

5. A machine according to claim 4 characterized by the fact that the cutter operating means comprises a spring actuated striker for driving the oscillatory lever through its cutting stroke to effect substantially instantaneous cutting action and cause the lever to carry the cutter in the direction of wire feed at a speed greater than the speed of the wire, and that the striker is cocked and tripped by a cam.

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