Aug. 14, 1923. 1,464.505

G. FUMAGALLI ET AL

WIRE BENDING MACHINE

Filed Nov. 2, 1921 3 Sheets-Sheet 1

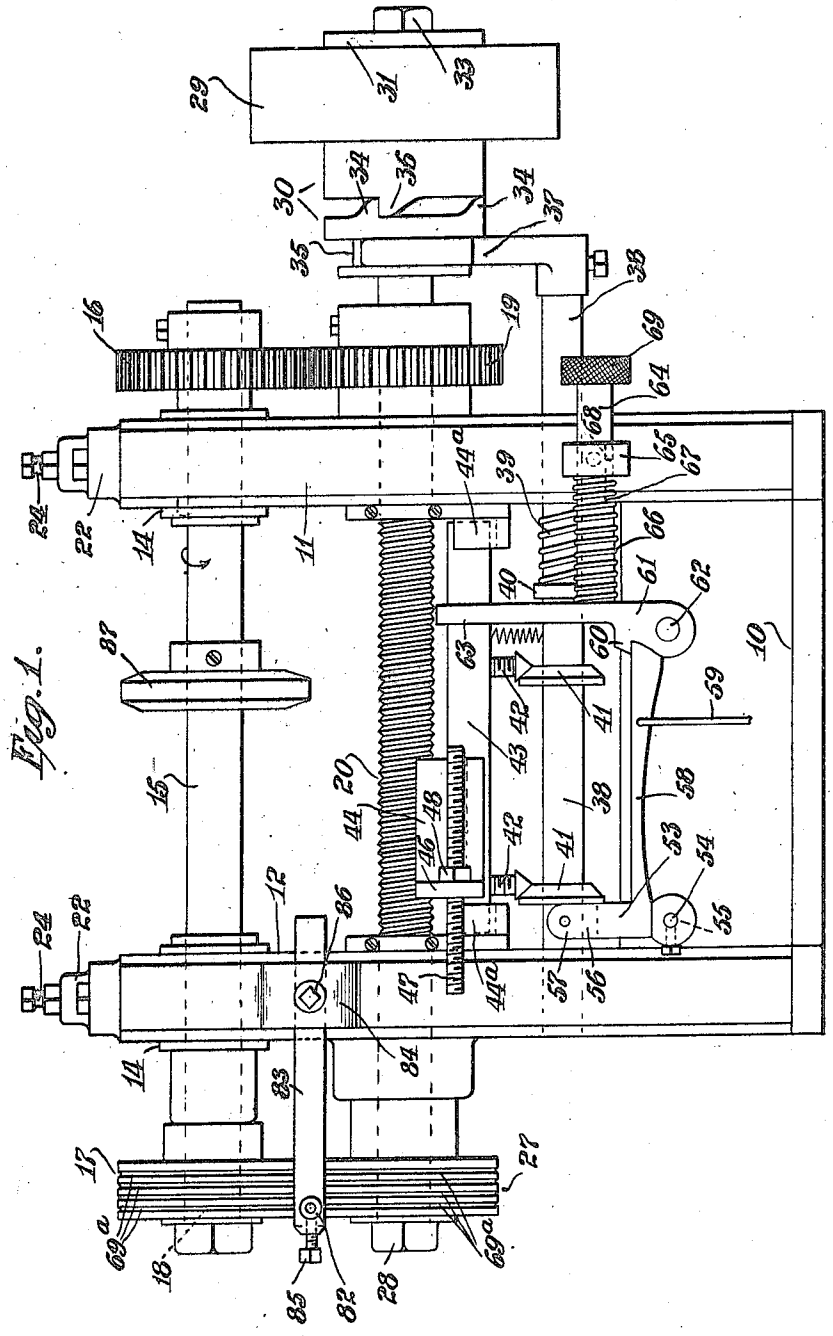


Fig. 1.

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WIRE BENDING MACHINE

Filed Nov. 2, 1921 3 Sheets-Sheet 2

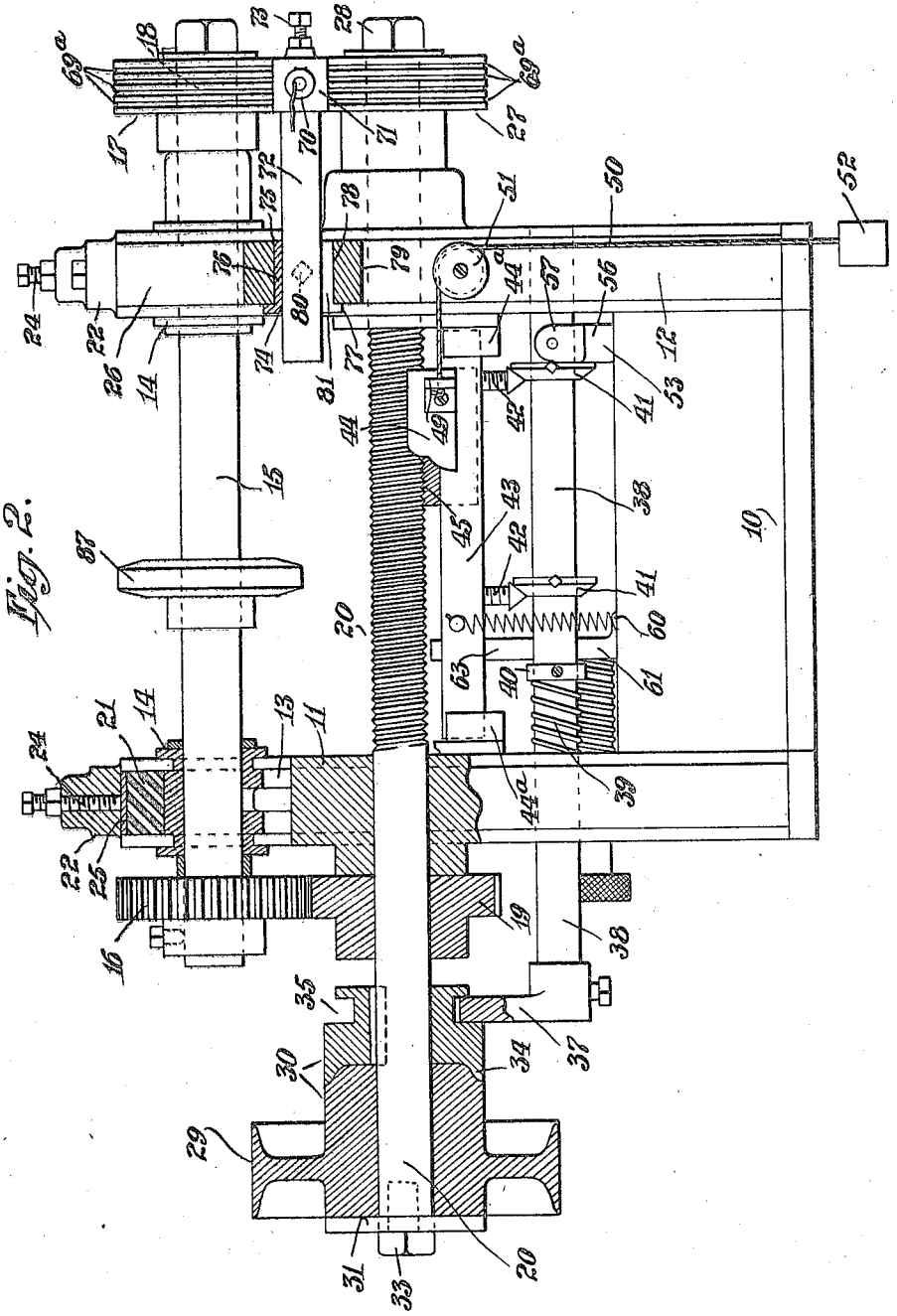


Fig. 2.

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Fig. 4.

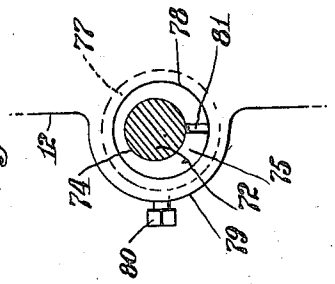
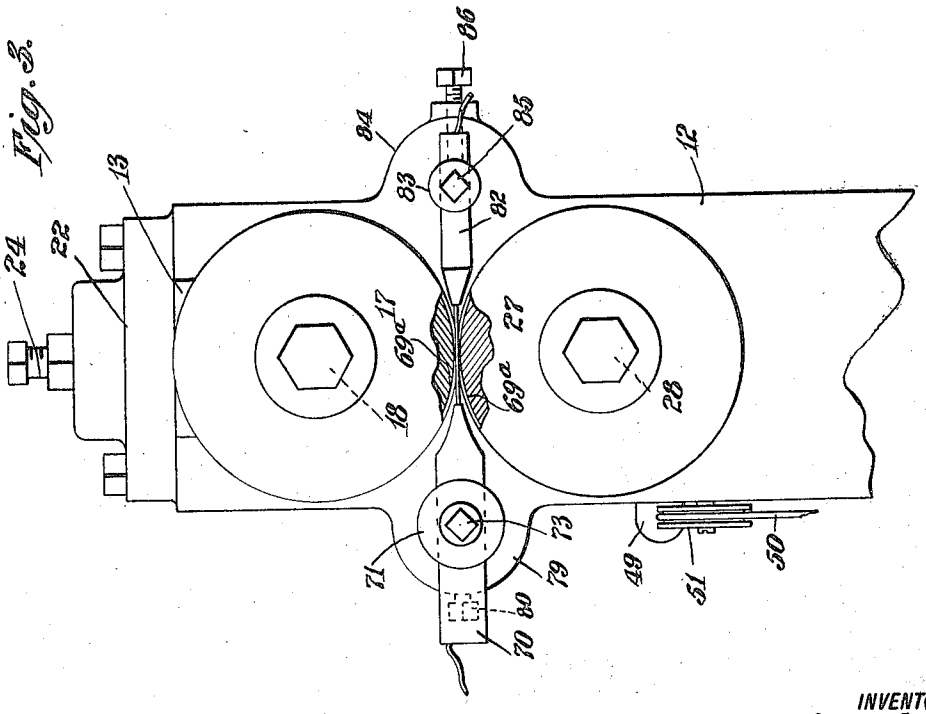


Fig. 3.



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UNITED STATES PATENT OFFICE.

GIACOMO FUMAGALLI, PAOLO CARDONE, AND CARMINE SURICO, OF NEW YORK, N. Y.

WIRE-BENDING MACHINE.

Application filed November 2, 1921. Serial No. 512,179.

To all whom it may concern:

Be it known that we, GIACOMO FUMAGALLI, a subject of the King of Italy, PAOLO CARDONE, a United States citizen, and CARMINE SURICO, a subject of the King of Italy, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Wire-Bending Machines, of which the following is a specification.

The present invention relates to wire bending machines and has reference more particularly to certain improvements in the construction and arrangement of an automatically controlled clutch releasing mechanism and an adjustable mounting for a wire bending mandrel, all of which improvements are substantially co-related to the machine proper.

The invention is especially applicable to such wire bending machines as are used to bend spring wire into strips or lengths of helical form to be used in the manufacture of bed springs.

The machines of this character, as they are now constructed, generally feed a continuous length of wire through the mandrel in which it is bent to proper form and then by a manual operation a clutch is thrown out to bring the machine to rest, and thereafter the bent wire is cut to desired lengths. The operators encounter considerable difficulty in measuring the lengths of bent wire for cutting, either while the wire is leaving the mandrel or after the machine has been brought to rest. This is due partly to the resilient nature of the strand after having been bent. It is therefore, the object of this invention to provide clutch operating means cooperating with the movable parts of the device whereby a predetermined length of bent wire may be projected from the mandrel whereupon the clutch operating means is actuated to bring the machine to rest. The bent wire may then be cut and a subsequent strip of the same length fed forward.

Owing to the general arrangement of parts of existing machines and particularly the feeding mechanism for the wire, it is the usual rule to regrind the feeding wheels after they have become worn and in doing this the diameters are necessarily reduced after which the wheels must be reset so that the peripheries contact with each other. It has then been found that with the level of the point of contact of the two wheels changed the receiving end of the mandrel is off center, i. e., the axis of the latter is above this contacting point, in which case the wire does not feed properly. It is, then, a further object of the invention to provide an adjustable supporting means for said mandrel whereby the latter may be moved relatively with respect to the feeding wheels so that the axis of the mandrel itself may be set to extend outwardly on a plane level with the point of contact of the two feeding wheels and at substantially right angles thereto.

Other objects and advantages of the invention and novel features of construction will be pointed out in the specification and set forth in the appended claims, reference being had to the accompanying drawings, wherein

Fig. 1 is a front elevational view of the wire bending machine embodying the improved clutch releasing mechanism, showing the parts in engaged position.

Fig. 2 is a substantially longitudinal sectional view looking from the rear of the machine and showing the eccentric supporting means for the mandrel.

Fig. 3 is an end elevational view with parts broken away to show the eccentric bushing for the mandrel.

Fig. 4 is an elevational view of one end of the eccentric collar supporting the spindle of the wire bending mandrel.

Referring to the drawings, 10 denotes a substantially U shaped frame supporting the operative parts of the machine and having upstanding parallel standards 11 and 12 provided with divided upper end portions. These divided portions comprise open ended slots 13 adapted to receive suitable bearing blocks 14 which are capable of vertical adjustment in said slots. Mounted in the bearing blocks 14 and extending axially of the frame 10 is a shaft 15, the outer end of which, extending beyond the standard 11, carries a spur gear 16 and the opposite end of which is squared and which extends beyond the standard 12 to receive a feeding wheel 17. A tapped opening extends axially of the squared end of the shaft 15 and receives the threaded portion of a bolt 18 the head of which holds a washer against the face of the wheel 17.

The gear 16 is of a slightly smaller diameter than the diameter of the feeding wheel 17 and is in mesh with a similar spur gear 19 carried by a drive shaft 20 extending paral-

lel to and below the shaft 15. Due to the distance between the centers of the two shafts 15 and 20 being substantially greater than the combined diameters of the gears 16 and 19 the teeth of the latter are loosely engaged so that the feeding wheels may receive considerable wear and the shaft 15 moved towards the shaft 20 a substantial distance before it will be necessary to grind the gears themselves. In order to provide additional adjustment of these gears 16 and 19 a piece of semi-hard rubber 21 is introduced between the upper face of the block 14, in the standard 11, and a cap member 22 secured to the upper face of the divided portion of the standard. This cap 22 comprises a rigid metal bridge spanning the slotted opening 13 and secured at its opposite ends by means of bolts to the standard. An adjustable screw 24 is mounted intermediate the length of the bridge portion and engages with a plate 25 resting above the rubber member 21. It will be noted that as the screw 24 is moved against the plate 25 the latter will tend to compact the rubber block 21 between the bearing block 14 and the plate itself so that any irregularities in the adjustment of the two shafts 15 and 20 will be taken care of by the more or less resilient nature of the rubber. A similar cap 22 is used for the other standard 12 and instead of the rubber block 21 a rigid metal block 26 is carried between the adjustable screw 24 and the bearing block 14.

Referring to the drive shaft 20 it will be noted that on the end opposite to the gear 19 is a second feeding wheel 27 having a square opening therein to receive the squared end of this shaft. A threaded opening similar to that in the other shaft is provided in the end of the drive shaft 20 and receives the threaded stem of a bolt 28, the head of the latter adapted to bear against the face of the wheel 27. The intermediate portion of the drive shaft 20 is provided with a continuous thread cut at a very slight pitch and extending from the inner side of the standard 12 to the opposite face of the standard 11. The projected portion of this shaft 20 beyond the gear 19 carries the drive pulley 29 and clutch members 30. The pulley 29 is loose on the shaft and is held against lateral movement in one direction by a washer 31 forming a flange at the end of the drive shaft 20, the former being secured in position by a bolt 33 the stem of which extends into the end of the shaft. Splined to the shaft 20 intermediate the hub of the gear 19 and the opposite end of the pulley hub is the clutch member 30 having axial and rotary movement of the shaft and provided with clutch teeth 34 and an annular groove 35. The teeth 34 of this clutch member 30 are adapted to move into engagement with oppositely disposed teeth 36 projecting from the hub portion of the pulley 29. Power is transmitted to the shaft 20 through the engagement of the clutch teeth 34 with those of the continuously rotating pulley 29.

The clutch operating mechanism, which will now be described, comprises an upright yoke 37 held between the opposite walls of the annular groove 35 and carried by a shaft 38 which extends substantially parallel to the drive shaft 20 and which is movable axially thereof in suitable bearings in the standards 11 and 12. In order to normally hold the clutch members 30 out of engagement with each other a coiled spring 39 is coiled about the shaft 38 so that one of its ends is seated against the inner side of the standard 11 and the other of its ends is seated against a collar 40 fixed to the shaft 38. A pair of cam wheels 41, carried by the shaft 38 and spaced apart from one another a substantial distance, are adapted to move against a pair of pins 42 which are suspended in the path of movement of the two cam wheels 41. These pins 42 have cone shaped contact lower ends adapted to receive the beveled edge of the cam wheels 41 and are provided with threaded upper stem portions adjustably mounted in a longitudinal bar 43. This bar is substantially the length of the space between the two standards 11 and 12 and is supported in slotted brackets 44^a secured to the opposite faces of the standards. The bar 43 is also directly below the shaft 20 so that any vertical movement of the former will be either towards or away from the axis of the shaft itself. Mounted on this bar 43 and adapted to move axially thereof is a carriage 44 having a curved channel 45 provided with slightly pitched grooves adapted to mesh with the thread of the drive shaft 20. Projecting outwardly from the forward face of the carriage 44 is a lug 46 having a threaded opening therein to receive a threaded clutch releasing rod 47. This rod is threaded throughout its entire length and carries a lock nut 48 adapted to be adjusted about the rod and against the surface of the lug 46 so as to lock the rod in any desired position with relation to the carriage 44. The opposite side of the carriage 44 carries a bracket 49, shown in Figure 2, to which one end of a cable 50 is attached, the cable being supported by an idler pulley 51 mounted on the standard 12 and the opposite end of the cable being provided with a weight 52 depending therefrom and adapted to return the carriage 44 to its initial position upon release of the bar 43, as hereinafter described.

The mechanism for moving the shaft 38 axially to set or release the carriage 44 through the operation of the pins 42 and bar 43 is shown in Figure 1, and comprises a

pivoted bell crank 53 mounted on a stud shaft 54 journaled in a bearing 55, the latter being an integral part of the frame 10. The short arm 56 of the bell crank 53 is provided with a yoke 57 at the outer end thereof adapted to project upwardly on both sides of the shaft 38 and against the rear surface of the adjacent cam wheel 41. The other or longer arm 58 of the bell crank projects outwardly substantially parallel with the shaft 38 and is provided with a beveled toe portion at its outer end. In order to rock the bell crank 53 so as to move the shaft 38 axially against the tension of the spring 39 a cable 59 is secured at one end to the arm 58 and at the other end to a foot treadle (not shown). In locked position, as shown in Figure 1, the toe of the arm 58 is engaged beneath a tooth 60 carried by a pivoted lever 61 mounted to move arcuately about a pin 62 projecting outwardly from the frame 10. The pivotal center of this lever is below the tooth 60 and slightly offset from an upwardly projecting portion 63 of the lever which portion is located in the path of movement of the clutch releasing rod 47, so that as the latter travels towards the lever 61 it will reach a point in its travel where the two members will engage and the lever 61 will be forced to swing about its pivot until the tooth 60 has released the toe of the bell crank 53. The normal position of the lever 61, however, is the same whether the toe is engaged or not. This position is made possible by a spring actuated pin 64 projecting rearwardly from the projecting portion 63 of the lever 61 and being supported adjacent its outer end in a bracket 65 mounted on and projecting from the edge of the standard 11. A coiled spring 66 surrounds the pin 64 and its opposite ends engage with the opposite surfaces of the lever 61 and bracket 65 respectively. It will be noted that with this construction the normal tendency of the spring 66 will be to yieldably force the lever 61 towards the arm 58. If it is desired to hold the pin 64 in retracted position the underside of the latter is provided with an elongated flattened surface 67 having a shoulder 68 at the outer end adapted to be moved downwardly over the edge of the opening in the bracket 65. In order to manipulate the pin 64 the end projecting beyond the shoulder 68 is provided with a knurled head 69.

The wire feeding and bending mechanism, shown particularly in Figures 2 and 3, comprises the wheels 17 and 27 which rotate in opposite directions and each of which is provided with a series of V shaped annular grooves 69^a adapted to register with corresponding grooves in the other wheel. The bending device comprising a mandrel 70 of a well known type is supported on a plane substantially level with the contacting point of the two feeding wheels 17 and 27 and in order to adjust the relative position of this mandrel the latter is mounted in the head 71 of an adjustably supported post 72. The mandrel 70 extends transversely of the head 71 through which it is adjustable both axially and rotatably and which carries a set screw 73 adapted to engage the surface of the mandrel to fix the position of the latter in relation to the head 71. The post 72 is also axially and rotatably movable in the bore 74 of an accentric bushing 75 which may be rotated to raise or lower the position of the post 72 and which includes a cylindrical portion 76 and knurled flange 77. The cylindrical portion 76 projects through the bore 78 in a boss 79 projecting from the rearward side of the standard 12 and having a set screw 80 adapted to engage the surface of the portion 76. The bushing itself is provided with a radially disposed cut 81 extending from the inner periphery of the bore 74 to the outside of the member and from one end thereof to the other. It will be noted that as the screw 80 is tightened against the cylindrical portion 76 the cut 81 will permit the former to contract about the post 72, thereby rigidly securing the set positions of the bushing 75 and post 72 to the standard 12.

Wire is guided to the feeding wheels 17 and 27 through a hollow spindle 82 supported in a post 83 mounted in a boss 84 of the standard 12 and at the opposite side thereof from the bending device. The spindle 82 is axially and rotatably adjustable in the post 83 and adapted to be held in adjusted position by means of a set screw 85 extending axially in the end of the post. A second set screw 86 is mounted in the boss 84 and adapted to engage the surface of the post 83 to fix the adjusted position of the latter.

A hand wheel 87 is carried by the shaft 15 to enable the operator to turn the shafts when adjustment or setting of the parts may be necessary.

The operation of the device is as follows: Assuming that power has been turned on and the pulley wheel 29 is continuously rotating about the shaft 20 and assuming further that the end of the wire to be bent is threaded through the spindle 82 and between the feeding wheels 17 and 27 in the grooves 69 and thereafter into the mandrel 70, the foot treadle is then depressed pulling the arm 58 downwardly until the toe of the latter has traveled over the tooth 60. In doing this the toe has rocked the lever 61 rearwardly, or in a direction away from the toe itself, in order to permit the latter to pass the tooth 60 which is then returned to its initial position by the tension of the spring 64. Simultaneously with the setting of the

lever 61 the other arm of the bell crank 53 has been rocked towards the standard 11 and against the rear surface of the cam wheel 41 to move the shaft 38 axially against the tension of the spring 39, whereupon the two members of the clutch 30 will be brought into engagement with each other. With the movement of the shaft 38, in the direction just described, the cam wheels 41 will be moved against the pins 42 lifting them in an upwardly direction and imparting a correspondingly directed movement to the bar 43 and carriage 44 to bring the latter into contact with the threads of the shaft 20. Inasmuch as the engagement of the clutch members is substantially simultaneously effected with the engagement of the carriage 44 and the threads of the shaft 20, the operation of the latter will immediately cause the carriage to travel over the bar 43 towards the opposite side of the machine.

The length of the strands of wire fed with each operation of the machine is determined by the setting of the clutch releasing rod 47 which may be adjusted in the lug 46 to any predetermined distance between the contacting end of the rod and the edge of the carriage. It will be noted however that in order to operate the machine to handle comparatively short strands of bent wire the rod 47 must be projected towards the lever 61 to its maximum length so that the rod 47 will travel but a short distance before releasing the lever 61 and arm 58. The setting of this rod 47 may be carried out according to a fixed scale or by inches depending entirely upon the pitch of the threads of the shaft 20. The releasing of the toe of the arm 58 from beneath the tooth 60 will cause the bell crank 53 to swing backwards away from the standard 11 whereupon the cam wheels 41 and shaft 38 will follow under tension of the spring 39 and the clutch members 30 become disengaged. A downward movement of the bar 43 and carriage 44 as a subsequent step in the operation will disengage the carriage from the shaft 20 whereupon the weight 52 suspended from the end of the cable 50 having been relieved of any resistance will drop and force the carriage 44 to return to its initial position.

Due to the ratio of the gears 16 and 19 the rotary speed of the two shafts 15 and 20 will be exactly the same and consequently the feed wheels 17 and 27 will ride over one another without any appreciable amount of friction or wear. However, in time the grooves 69a become worn and fail to properly grip the wire, so that it becomes necessary to regrind the periphery of the wheels and to cut new grooves therein. In doing this the upper shaft 15 must be moved to a lower level in order to bring the surfaces of the two feeding wheels together. The contact point of the wheels having been lowered it is necessary to likewise lower the mandrel, an operation carried out as follows: Referring particularly to Figures 2 and 3, it will be noted that the mandrel 70 is in its extreme uppermost position with relation to the contacting point of the wheels 17 and 27 and in order to lower the axis of the mandrel to a level equal to a possible change in the contacting point of the two wheels, the set screw 80 is loosened and the knurled flange 77 rotated. This operation will move the bore 74 and cylindrical portion of the bushing 75 so that the axis of the post 72 may be on the same plane as the contacting point of the feeding wheels 17 and 27. The set screw 80 may then be tightened against the split bushing and the latter contracted to grip the post 72. If considerable lowering of the mandrel has been necessary the latter will need to be moved towards or away from the vertical centers of the wheels 17 and 27, which movement is made necessary, due to the lowering adjustment of the mandrel having been made in an arcuate line.

Having thus described the invention, what we claim as new and desire to secure by Letters Patent is:—

1 In a wire bending device, the combination with the feed rollers and clutch therefor, of stop mechanism comprising a longitudially movable carriage provided with an adjustable stop rod disposed axially thereof, and a trip mechanism in the path of said rod and adapted to actuate said clutch.

2. In a wire bending device, as claimed in claim 1, including a loosely mounted vertically adjustable bar supporting said carriage, and means operated by said trip mechanism for releasing the said carriage to permit of the latter being returned to its initial position, substantially as described.

3. In a wire bending device, as claimed in claim 1, including a loosely mounted vertically adjustable bar supporting said carriage, the said adjustable stop bar carried by the carriage comprising a threaded member movable through a projecting portion of the carriage, and in which the said trip mechanism includes an upright lever having a projecting tooth, a rocker arm having one end thereof adapted to engage under said tooth and the other upright arm being provided with a yoke at its end, a shaft for operating the clutch and embraced by said yoke to move the shaft axially thereof, and means carried by the said bar and the shaft for moving bar in a vertical direction to disengage the carriage simultaneously with the release of said clutch, substantially as described.

4. In a device for bending wire for the purpose described, the combination with a pair of parallel rotary shafts, one of said shafts being provided with a continuous thread about its periphery, of a slidably

mounted carriage having a curved depressed portion provided with a series of parallel pitched grooves adapted to mesh with the thread of said shaft, a loosely mounted vertically adjustable bar supporting said carriage, a clutch mechanism carried by said threaded shaft, and means operated by the advance movement of said carriage to a predetermined point for releasing said clutch mechanism and simultaneously moving said bar to drop the carriage away from the thread of said shaft.

5. In a device for bending wire for the purpose described, the combination of a rotary shaft having a threaded portion intermediate the length thereof, a continuously driven pulley loosely mounted on one end of said shaft, clutch mechanism between said pulley and the threaded portion of said shaft, and a clutch operating mechanism including a carriage provided with a curved depressed portion having a series of pitched grooves adapted to mesh with the threaded portion of said shaft, a bar slidably supporting said carriage, said carriage being adapted to first move longitudinally of the bar and then with the latter and radially of said shaft to disengage the carriage from the threads of said shaft.

6. In a wire bending device of the character described, the combination of a rotary shaft having a threaded portion intermediate its length, a loosely mounted continuously rotating pulley at one end of said shaft, clutch mechanism carried by said shaft for imparting rotary movement to the latter, a clutch operating mechanism including a carriage provided with a depressed curved portion having a series of grooves therein adapted to mesh with the threads of said shaft, a loosely mounted slide bar radially disposed below said shaft and adapted to support said carriage, an adjustable engaging member mounted in said carriage and means operated by engagement with said adjustable member through the travel of said carriage to a predetermined point for substantially simultaneously disengaging said clutch and moving said carriage away from said shaft, whereby the former may be returned to its initial position.

7. In a wire bending device of the character described, the combination of a rotary shaft having a continuous thread cut spirally about a portion of its periphery, clutch mechanism operating on said shaft to impart rotary movement to said shaft, a clutch operating mechanism including a carriage provided with means for engaging the thread of said shaft, a bar supported at opposite ends in slotted members and capable of movement in a radial direction towards and away from said shaft, said bar being adapted to support and guide said carriage longitudinally of the shaft, a second shaft parallel to said first named shaft and below the supporting bar and having a clutch actuating member at one end to move said clutch into and out of engagement, means carried by said second shaft to raise and lower said bar by axial movement of the former, and a trip mechanism comprising relatively movable arms adapted to co-act with each other subsequently to the carriage having reached a predetermined point in its travel and tripping one of said arms to move said means, whereby the bar and said carriage may move away from the threads of said shaft.

8. In a wire bending device of the character described, the combination with clutch mechanism for imparting movement to said device, of clutch operating mechanism for automatically controlling the release of said clutch mechanism at set periods, and including a screw actuated carriage provided with an adjustable contact member, a movable slide bar for supporting and guiding said carriage in a longitudinal and vertical direction and having depending members projecting from one edge thereof, a parallel axially movable shaft extending below said bar and having cam surfaces adapted to move in the path of said depending members, a clutch control member carried by one end of said shaft and adapted to operate said clutch mechanism, a pivoted yoke for moving said shaft in one direction to engage the clutch mechanism and having a projecting arm provided with means for moving the yoke and the arm, and a trip lever having a projection adapted to receive the end of said arm to hold the latter in set position and an upstanding portion in the path of movement of said adjustable contact member, whereby the latter will trip the lever at a predetermined stage in the travel of the carriage to release the yoke and permit the shaft to return to its initial position for the purpose of disengaging the clutch and removing the carriage from further longitudinal travel.

9. In a wire bending device of the character described, the combination with a screw actuated carriage tripping device, with a loosely mounted slide bar for supporting, guiding and elevating said carriage, of yieldable bar cooperating with supporting means to elevate the latter, and relatively movable levers co-acting with the carriage tripping device at a predetermined stage in its travel to permit said yieldable supporting bar to return to its initial position, whereby said first named means may be lowered to arrest further travel of said carriage device.

10. In a wire bending device of the character described, the combination with a traveling carriage, of a screw for operating said carriage in one direction, a bar for slidably supporting and moving said car-

riage into and out of engagement with said screw, and a gravity resetting mechanism for said carriage whereby the latter will return to its initial position subsequently to the operation of said bar to move the carriage out of engagement with said screw.

11. In a wire bending device of the character described, the combination with a rotary wire feeding mechanism, with a mandrel for receiving said wire subsequent to its being fed from said feeding mechanism, of a transversely disposed post supporting said mandrel, and an eccentric bushing mounted in said device and adapted to receive one end of said post, whereby rotary movement of said bushing will cause a relative change in the elevation of said mandrel with respect to said wire feeding mechanism.

In testimony whereof we have affixed our signatures.

GIACOMO FUMAGALLI.
PAOLO CARDONE.
CARMINE SURICO.