This invention relates to a wire coiling machine which forms loops of wire on the coil being made.

Wire has been coiled on various types of machines, and particularly that shown in the U.S. patent to Conrad #2,831,370 of April 22, 1958, which serves for making wire coils of varied lengths up to many feet in length. Machines such as described in the patent to Sleeper & Hartley, No. 940,828 of November 23, 1909, have been developed for forming axially projecting loops on the opposite ends of a coil of a short precointed coil of wire, and only after the spring had been removed from the coil zone.

The primary object of this invention is to provide a wire coiling machine which will make loops on the opposite ends of a coil irrespective of their length.

A further object is to provide a wire coiling machine which will form an axial loop on the end of an infed wire, then make a spring coil of a variable length but any required length, and then form a loop on the rear end of the previous coil spring after severing and removing the completed spring from the coiling zone.

A further object is to provide mechanism which serves to form a forward loop on a wire and a desired helix length, then transfer the coil to a second position and form a rear end loop thereon while another coil is being formed, and to perform these operations in a sequence of coordinated stages whereby a coil is automatically formed with loops on its opposite ends. Other objects will be apparent in the following disclosure.

According to this invention, I provide a machine which makes a helical wire coil with a cutter for severing the coil ahead of a convolution on the feed wire, loop forming tools which bend this convolution to form a forward projecting loop for the beginning of a new coil, a transfer mechanism which removes the severed coil to a remote position and forming tools cooperating with the transfer mechanism which bend the rear convolution of the coil to form a projecting loop.

Referring to the drawings which illustrate an embodiment of this invention as applied to a machine of the type shown in said Conrad patent and to which reference may be had for further disclosure:

FIG. 1 is a fragmentary plan view of part of the Conrad machine which shows somewhat diagrammatically the relationship of both loop forming mechanisms and particularly the operating structure which transfers the coil and forms the rear loop; FIG. 2 is a detail in elevation showing portions of the wire coil transfer mechanism; FIG. 3 is an elevation of the transfer device of FIG. 1; FIG. 4 is a fragmentary vertical elevation of the wire feed and coiling mechanism of the general type shown in said patent and showing the forward loop forming tools; FIG. 5 is a detail of the FIG. 4 structure showing the forming tools in their association for both cutting the wire and bending a forward loop on the advancing coil; FIG. 6 is a fragmentary elevation of a modified structure of the cam control mechanism of the Conrad machine which serves to operate both of the coil cutting and loop forming tools of FIG. 5; FIG. 7 is a detail showing in vertical elevation the opened jaws of the coil transfer mechanism and the opened front loop forming tools, which are arranged to sever a fashioned coil from the feed wire and then form a forward loop on the advancing portion of the next helix coil to be made; FIG. 8 is a view similar to FIG. 7 which shows the lower cutter tool and anvil stationary and in position after it has severed the formed coil from the rear feed wire and the upper loop forming tool is about to descend for bending over and making a loop of the forward end of the front coil of wire remaining in the coiler, and wherein the transfer jaws have seized the cut off coil; FIG. 9 is a view similar to FIG. 8 showing both the coil transfer jaws and the front loop forming tools in intermediate positions where the upper forming tool has partially forward the front loop of the wire coil remaining in the coiling machine and the previously formed coil has been transferred toward the right for its rear loop forming operation; FIG. 10 is a view similar to the left hand portion of FIG. 9 showing the forming tools in closed positions where they have fashioned a loop out of the front end of the front convolution in the coiler and with the resilient wire loop bent downwardly beyond a normal position; FIG. 11 is a view similar to FIG. 10 showing that the projecting loop has sprung back into a substantially horizontal position while the cutting and forming tools have retracted to permit the fashioning of a new coil; FIG. 12 is a detail in elevation showing the forming tools of FIG. 1 separated and in position for forming the rear loop on a coil which has been severed from the feed wire in the machine and is held stationary by the transfer jaws; FIG. 13 shows the lower tool or anvil of FIG. 12 in a coil supporting position where it holds the rear convolution spaced from the remainder of the coil and the upper tool poised for its loop forming step; FIG. 14 shows the tool of FIGS. 1 and 13 in final closed positions where they have fashioned the rear convolution into a laterally bent loop; FIG. 15 shows the forming tools again separated, which permits the resilient loop to spring back into a substantially axial position while the coil is still held stationary by the transfer jaws; FIG. 16 is a view of the completed spring; FIG. 17 is a perspective view of the loop forming tool of FIGS. 7 to 11; and FIG. 18 is a perspective view of the anvil and cutter which cooperates with the tool of FIG. 17 to form the front loop.

This invention has been illustrated as applied to the machine of said Conrad patent, but it will be appreciated that the various constructional features may be readily adapted to other standard wire coiling machines. The machine of the patent, and as shown particularly in FIGS. 4, 5 and 6 of the present case, comprises power driven rolls 10 and 11 arranged to feed a wire 12 to the coiling zone where an adjustable movable grooved coiling point 13 forces the wire to form into a coil of a controlled diameter around a suitable arbor 14 in the tool holder, as is understood. The diameter of the coil is controlled by moving the coiling point toward and from the arbor. The pitch or spacing of the coils is determined by a pitch tool 15 (FIGS. 4 and 7) which engages the wire behind the first coil and causes the adjacent coils to be spaced according to the location of that wedge-shaped pitch tool. In the standard machine, or as shown in said patent, the resilient wire coil 16 is severed from the supply feed wire 12 by means of upper and lower cutting tools. In the present construction, the upper coil 17 is not a cutter but...
serves in cooperation with the lower tool 18 as a tool for shaping the forward end loop 20 (FIGS. 11 and 16) of the coiled wire. That lower tool 18 serves both as a cutter and as an anvil for shaping the loop or hook 20. The diameter of the coil is determined by adjusting the coiling point 13 inwardly or outwardly by means of the screw 21 (FIG. 4) in accordance with standard practice. The size of each end loop 20 and 22 is determined by the diameter of the convolution of the coiled wire from which the loop is formed. Hence, if the loop 20, as well as the loop 22 at the other end of the coil, is to be made smaller or larger than the diameter of the main body 16 of the coiled wire, then adjustments will be made automatically as coiling proceeds to provide an inwardly tapering or outwardly flaring shape.

This invention pertains to making the two end loops 20 and 22 on the coil 16. As above indicated, the forward end loop 20 is formed by means of the two rotationally oscillatable tools 17 and 18, which may be made in various desired shapes. The lower tool 18 serves to cut the wire between the next to the last convolution 24 and those in added numbers when especially required. For this purpose, it has a cutting edge 25 (FIG. 18) arranged to cut the wire in the direction of the arrow. Thereafter, a beveled portion 26 of the tool (FIGS. 7 and 18) forms an anvil which supports the wire loop as it is being bent thereover by the upper forming tool 17, as will be explained.

The two tools 17 and 18 are shown as L-shaped members (FIG. 3) respectively mounted to be rocked by means of shafts 30 and 31 (FIG. 6) which are suitably moved by cam controlled mechanism as required for the cutting and forming operations. The construction of FIG. 6 conforms substantially with that of FIG. 5 of the Conrad patent for operating the shafts 30 and 31, except as to the cam control for the forming tools. The shank of the upper tool 17 is clamped on a block 35 rocked by the shaft 30, and the latter is moved by a rock arm 34 (FIG. 6) clamped thereto. Similarly, the lower tool 18 is clamped on a block 35 carried by the shaft 31 and rocked by a rock arm 36 clamped to the shaft.

The lower shaft 31 (FIG. 6) is given an oscillating rotary movement by means of a pull bar 39 of adjustable length which is pivotally connected at its upper end to the rock arm 36 and at its lower end to a rockering 40. This rocking lever carries a roller 42 medially pivotally thereon and which engages a cam 43 having a high elongated cylindrical surface 44 shaped to move the tool 18 abruptly upwardly and then plate manner. The cam 43 is fixedly mounted on the camshaft 45 of the machine which carries the various other control cams, as shown in said patent. When the high portion 44 engages the roller 42 on the lever 40, the pull rod 39 is drawn quickly downwardly and held still, so that the cutting tool 18 remains stationary for a required period of time after it has performed its cutting operation and is then serving as a forming anvil. The various cams may be made for adjustment of the length and shape of the high surfaces.

The upper tool 17 and its associated shaft 30 are operated by means of a swinging bar 48 pivotally connected to the same pivot support 39 as the tool 18 to the rockering 40. The bar 48 carries an intermediate located roller 50 which is engaged by the step surface high point 51 of the cam 52 likewise fixedly mounted on the shaft 45, which is rotated in the direction of the arrow (FIG. 6). The various cam rollers are held against their associated cams by suitable springs (not shown). The under plane surface of the bar 48 engages an adjustable slide 54 mounted on the swinging lever 55 and moved along the latter by means of a rod 56 suitably threaded through a lug 57 on the end of the lever 55 and so arranged that by means of the hand adjustment nut 58 the slide 54 is moved to engage at different locations and so vary the effective length of the lever arm of roller 50. The lever 55 in suitably pivoted at 59 on the machine frame. The slide 54 has a pointed top edge engaging the under side of the swinging lever 48 and thus its position of bearing against that lever may be so adjusted, when moved by cam 51, as to provide a variable throw for the pull rod 60. The latter has an adjustable length and is pivotally connected at 61 to the lever 55.

The upper shaft 30 and its associated upper loop forming tool 17 are rocked by means of a link 64 pivotally connecting the rock arm 34 on the shaft 30 with an L-shaped rocking lever 66 pivotally mounted on a jack shaft 76. The upper tool 17 is moved by means of a cross pin 69 riding in a slot in part 76 adjustable mounted on the top of the pull rod 60. A rod 72 threaded into the part 70 engages the pin 69 and may be rotated by the thumb nut 73 to adjust the position of the pin 69 and thus vary the location of the forming tool 17 relative to the work. When the cam 51 causes the rod 60 to move down, the forming tool 17 will swing downwardly against the coil 16, and adjustment of the slide 54 on the arm 55 will serve to determine the extent of throw of that upper tool.

The cam control mechanism, which is suitably driven by the power drive of the machine, serves to swing the lower tool 18 against a face of the roller. The lower tool 18 is clamped on a block 75 which moves up to engage the lower end of the last turn or helical convolution 24 and hold it in position during the severing and bending operations. It will be noted that the pre-made coil is raised to an axial position above that of the convolution remaining on the feed wire, as will be explained. Also, the pitch tool 15 (FIG. 8) remains at the rear side of the last convolution to prevent its being laterally distorted, so that the bending and forming operations may take place on the end coil which is to form the loop 20.

Although the shapes of the tools 17 and 18 may be widely varied to suit different requirements, I have shown in FIGS. 17 and 18 a shape for each tool which has been found satisfactory for making the front loop 20 before the helical coil is made. The cutting tool 18 has a lower sharp cutting edge 25 which is adapted to be moved up into position and to cut the wire against the bar 14 in front of a full convolution that has been made and is intended to form the loop 20. This wedge-shaped cutting edge 25 is formed on a projection at the front of the tool and it moves with a swinging action relative to the roller in accordance with a dwell slot. The upper tool 17 has a beveled surface 26 against which the end helix convolution is to be bent downwardly and beyond the intended position so that after it has been released it may spring back to the axial or horizontal position of FIG. 11, after the forming tools have moved away. A beveled shoulder 76 at the rear provides space for the cut wire.

The upper tool 17 may have the construction shown best in FIG. 17. As there indicated, the tool has two beveled surfaces 80 and 81 on opposite sides of a knife or sword edge 82. That sword is adapted to pry between the last two convolutions (FIG. 9) remaining on the feed wire, first with the beveled face 80 and then the opposite face 81, as the tool 17 swings downwardly against the sloping surface 26 of the anvil 18. The front loop slips past the edge 82 and against the shoulder 83, and the face 81 completes the loop bending. Thus, the upper tool completes the forming operation by bending the loop end and is pivotally connected at 61 to the lever 55, the tool 18 and beyond its normal position, as is indicated in FIG. 10 which shows the tool jaws 17 and 18 in their final closed positions. When the tools have been removed from the work end, as shown in FIG. 11, then the loop 20 springs back under the natural resiliency of the wire into a substantial axial position. It may be observed that this loop is always horizontal and is not maintained in any particular position whatever may be the length of the coil that is to be formed and its ultimate position relative to the rear.
end coil 22 (FIG. 16) will be determined by the number of full or part turns given to the coil. The production of the rear end loop 22 (FIG. 16) is affected after the lower forming tool 18 has severed the pre-formed coil 16 from the infeeding wire. At this time of severing (FIG. 8), the entire coil 16 is lifted from the position of FIG. 7 to engage an upper depending prong 100 on the arm 101 of a transfer arm 102. This transfer prong is beveled as shown and it is vertically immovable and so positioned that it slips between the last two convolutions of the pre-made coil, as shown in FIGS. 7 and 8. It is intended to hold the coil 16 stationary and the end convolution spaced outwardly to aid in the insertion of the forming tools and to permit the rear loop 22. The severed coil 16 is to be transferred to a second position where it does not interfere with forming a new coil and which provides for forming the end loop 22. For this purpose, a vertically movable clamp arm 102 is provided with an upwardly extending U or V shaped carrier 103 which is lower suppression arm 100. The plates of the forming tool and hold it steady for the loop forming step. Then, by means of the prong 160 and carrier 103, the coil is moved to the right from the position of FIG. 8 to that of FIG. 9 where the outer convolution is freely positioned for the loop forming operation.

The forming loop operation is effected by means of two laterally movable loop forming tools indicated generally by the numerals 106 and 108 (FIGS. 1 and 12 to 15). These tools may be of the general type shown in FIGS. 17 and 18 and which are suitably shaped for forming the rear end loop 22. One tool 108 has a beveled knife 110 (FIG. 12) which is moved laterally into the space (FIG. 13) between the two end convolutions of the coil, which has been initially provided by the beveled prong 100 when it was forced into the coiled spring 16 by the lifting action of the cutter and anvil 18. Thereafter, the beveled sword 112 on the other tool 106 swings laterally into the space between the convolutions as is maintained by the prong 160 and knife 110. A plate 113 on the tool 108 rides with the prong 110 to a position of supporting the front end of the coil 16 against the loop bending pressure. As shown in FIG. 14, the beveled sword 112 bends the front convolution 22 toward the left and over a V shaped part 114 which projects outwardly beyond an inner plate 115 and these two parts are so shaped and spaced that the sword 112 may enter the space opposite the plate 115 while a V shaped forming tool 116 which is attached to the sword 112 strikes the outer convolution and bends it over the part 114 shaped to serve as an anvil (FIG. 14). Because of the resiliently of the wire that is ordinarily employed for the springs, the anvil 114 and the tool 116 are so shaped as to bend the outer loop excessively, as indicated in FIG. 14. After the loop 22 has been released, then it springs back into the axial position of FIG. 15. During this operation, both the prong 160 and the knife edge 110 hold the coil 16 firmly in position on the lower transfer plates of the forming tools 106 may be suitably shaped and secured together as by means of set screws. After the loop 22 has been bent into its lateral or axial position and the jaws 106 and 108 have withdrawn to the position of FIG. 15, then the transfer arms 101 and 102 are separated to the position of FIG. 7 which serve to release the spring.

Varieties of operating mechanism may be employed to move the transfer carriage and its jaws and the forming tools. As shown particularly in FIG. 1, this operation may be effected by fluid pressure mechanism that is electrically controlled by solenoids and switches. The transfer carriage, shown particularly in FIGS. 1, 2 and 3, comprises a plate 120 which slides in underslung gib strips 121 carried by the machine frame. This construction may be supported on suitable arms 122 and 123 carried by the machine frame (FIG. 2) or otherwise mounted.

Mounted on the table of the carriage 120 is an upstanding solenoid 124 whose core or plunger 125 is movable vertically. The core is connected by a link 126 (FIG. 2) with a horizontal arm 127 laterally projecting from a plunger 128 which is suitably mounted in the side ways of a casing 129 extending vertically above the carriage 120. A spring 130 (FIG. 2) is suitably connected between the plunger 128 and a fixed member of the casing, and it tends to move the plunger 128 upwardly and force the transfer carriage arm 102 (FIG. 7) into contact with the spring 130 and hold it there temporarily. The arm 102 is normally in a closed or work gripping position until it is moved downwardly by means of the solenoid 124.

The solenoid 124 is energized by suitable electric current derived from the circuit 132 (FIG. 1), one side of which is connected directly into the main power line 133 and the other through a normally closed switch provided with contacts 155 and a connector arm 136 carried on a cam follower 137. The switch may be of standard construction, and its spring pressed arm 136 remains in a normally closed switch position until moved by the solenoid. The spring 130 (FIG. 2) serves to move the jaw member 102 upwardly and hold the spring coil 16 in a clamped position for transportation to the loop forming zone, but energizing the solenoid 124 releases the jaw from the work. The cam 138 is suitably mounted on a shaft 139 operated in timed relation with the other mechanisms of the machine, and that cam has sufficient effect of low surface so as not to interfere with the spring 130 which holds the carriage arm 102 in a working position until it is to be released by the high portion 140 of the cam serving to open the switch 135. That is, the solenoid is energized all of the time except when the circuit is broken by the cam 138 rotating to a position where its lower surface permits movement of the spring pressed switch follower 137 to open the solenoid circuit, which controls the fluid pressure to the piston cylinders 154 and 157.

The loop forming tools 106 and 108 (FIGS. 12 to 15) are each moved by fluid pressure mechanism governed by the cam 138 of FIG. 1. The loop forming tool 106 (FIG. 1) is suitably carried on a slide 145 which is moved by a pneumatics piston 146 in cylinder 147 against the resistance of compression spring 148 within the cylinder and which tends to return the piston to an uppermost position. An external tension spring 149 may be used to aid in moving the slide 145 and tool 106 to an inoperative position. Likewise, the anvil 108 is carried on a slide 150 which is moved by a pneumatically operated piston 152 against the resistance of an internal spring 153 and/or an external spring 155 connected between a fixed part of the piston casing and the slide 150. The transfer carriage 120 is likewise moved by a piston 156 suitably located within a piston chamber 157 and connected to a lug 158 on the slide 120.

The fluid pressure mechanisms may be of standard construction and involve the use of air or other fluid under pressure. The fluid under pressure is derived from the pipe line 160 and divided between the branches 161 and 163, shown at the bottom of FIG. 1. Further connecting pipe line 164 joins the piston chambers 154 and 157 of the pistons 152 and 156 so that the fluid under pressure is admitted to both of these piston chambers at the same time. The carriage or slide 120 is restrained against movement by a tension spring 166 suitably connected at the left hand end to the machine frame and at the right hand end to an arm 160 projecting from the carriage lug 162. This spring 166 tends to hold the transfer carriage 120 in its left hand position where the transfer tools 101 and 102 are ready to engage the newly formed coil. The spring 166 is much weaker than the spring 155. Consequently, when the valve 179 is opened to admit fluid pressure from the pipe line 161 to the piston chamber 154, the fluid goes first to the table transfer mechanism and causes
the piston 156 to move toward the right and to carry the spring coil 16 with it. When the piston 156 has moved to the right to the limit of its travel, the fluid pressure can then act against the restraint of the strong spring 155 to move the piston 152. This action takes place after the transfer jaw 102 has been lifted by spring 130 to grip the coil. The air or other fluid under pressure thus moves the anvil jaw member 168 to the position of FIG. 13 where it will serve in the loop forming operation and permit release of the work supporting arm 102 by the solenoid 124.

The valve 170 is suitably constructed to admit air to the piston chamber 154, and it is opened by means of a solenoid 172. The stem of valve 170 is fastened on the end of the solenoid core 173 and moved therewith to the right. The solenoid is energized by means of the wiring 174 (FIG. 1) connected to the normally open switch terminals 175 which are to be connected by the cam follower actuated contact bar 156 of the switch. When the cam 138 is revolved to cause its high portion 140 to move the spring held arm 136 to close the normally open switch 175, the circuit is then made to the solenoid 172 which operates to open the valve 170 and admit fluid under pressure to move the table transfer piston 156 against the restraint of its wear ring or seal.

The loop forming jaw 106 is moved by its fluid actuated piston 146 under the control of a solenoid 150 whose core is connected to move a valve 181 for admitting fluid pressure from pipe line 162 to the piston chamber 147. The valve 181 is suitably constructed to admit the fluid pressure to force the piston inwardly against the resistance of spring 148 within the cylinder or an external spring 149, or both. An electric lead line 182 connects through a normally open switch 183 with the solenoid 150. When the circuit is closed, the solenoid core moves to open the valve 181 and admit fluid from the pipe line 162 to thrust the piston inwardly and then move the tool 106 into its loop forming position. This action can take place only after the normally open switch 183 has been closed, when the slide member 150 has reached its innermost position.

When the strong spring 155, however, retracts the anvil 106, then the switch 183 is again opened and the tool 106 is withdrawn by its spring 149.

The sequence of operations of these various pistons and solenoids is such that the cylindrical high portion of the switch controlling cam 138 opens the normally closed switch 135 and causes the switch bar 136 to close the normally open terminals at 175. This breaking the circuit of solenoid 124 releases the spring 130 to clamp the jaw 103 on the work 116. Closing the normally open switch 175 results first in opening the valve 170, which causes the fluid under pressure to go to the transfer carriage piston 156 and move it toward the right and thus move the coil 16 away from the coil-forming zone. Since the normally closed switch is simultaneously opened and solenoid 124 is de-energized, the spring 130 is permitted to hold the transfer jaw 103 clamped against the work. As soon as the piston 156 has reached the end of its travel, the piston 152 is then forced inwardly against the stronger resistance spring 155 to move the anvil tool 108 into position where its ear 109 slips into place behind the end convolution (FIG. 13) and the anvil surface 114 is then ready for action. The inward movement of this anvil tool 108 has closed the switch 183 and this causes the electric current to move the core of the solenoid 180 and open the valve to the chamber above the piston 146. This drives the loop forming tool 106 to its final position and results in the formation of operations 12 to 14. Thereafter, when the low portion of the cam 138 closes the circuit at switch 135, this serves to move the work supporting arm 102 downwardly and release the coil 16. At the same time, the opening of the switch 175 breaks the circuits to the solenoids 172 and 160 and the associated springs 154 and 147 cause the tools 106 and 108 to retreat from contact with the work. At the same time, the carriage 120 is moved toward the left by the spring 166 and the parts are in position for receiving and working on another coil 16. The various valves are suitably constructed to provide for introducing and releasing the fluid pressure.

It will now be appreciated that I have provided a machine comprising a helical wire coil mechanism for forming a loop on both ends of the coil during the coil-making procedure. To form the front end loop, the wire cutter is arranged and timed to sever the coil from the feed wire at a point ahead of a rear convolution of the helix. A forming tool cooperates with an anvil to bend that convolution forwardly to form the loop on the front of the next coil to be fashioned. Prior to the formation of the front loop, a transfer mechanism grips the fashioned coil ahead of said rear convolution and transfers the coil to a position removed from the coiling zone. The transfer mechanism preferably comprises a prong inscribable into the coil ahead of its last loop and which serves to space that loop from the remainder of the coil. This prong insertion is preferably accomplished by the cutter or the anvil which, at the end of the severing operation, moves the coil laterally and causes insertion of the prong. After the transfer mechanism has removed the coil ahead of its rear convolution remaining, the forming tool and anvil enter the space provided by the prong and serve to bend the last convolution rearwardly. Thus, each wire coil is initially provided with a front loop prior to the completion of the coiled operation, and after severance from the feed wire, the fashioned coil is moved to a position where the rear loop is formed.

These sequential stages are coordinated, preferably, by a cam controlled timing mechanism which is associated with the other mechanisms of the coiler. Although the various mechanisms may be directly operated by cams or other power driven constructions, it is preferred to employ fluid pressure operated devices and preferably pneumatically operated pistons which directly connect to move the various operating parts. The valve control of these pistons is preferably effected by a solenoid and electrical switches operated in timed sequence by a timing cam. Hence, the various stages of making a helical coil and bending the end convolutions to form loops are accomplished as a part of the coil-forming procedure and in a time coordinated series of operations.

It will also be appreciated that various modifications may be made in the construction within the scope of the appended claims and that the above described preferred embodiments is not to be interpreted as imposing limitations on those claims.

I claim:

1. A spring wire coiling machine comprising wire coiling tools, feed rolls for forcing a wire to the tools for coiling the same, power mechanism to drive the feed rolls and coil the wire indefinitely, an adjustable, time-controlled cam mechanism driven in association with said power mechanism which stops the wire feed after a predetermined length of coiled spring has been made, a cutter mechanism including a cutter operated in timed relation with said power mechanism which severs the stationary spring in advance of a rear convolution thereof, means including a moveable forming tool driven in timed relation with said cam mechanism and acting when the wire is stationary which bends the convolution remaining on the feedwire and forms a forwardly projecting loop, a transfer mechanism including supporting jaws which engage the severed spring near its rear convolutions irrespective of the length of the spring, means operated in timed relation with said forming tool and cutter mechanism which causes the transfer mechanism to transport the severed spring to a second position remote from said forming tool, and loop forming mechanism including another moveable forming tool operated in time relation with said transfer mechanism which engages a rear con-
2. A machine according to claim 1 in which one of said supporting jaws of the transfer mechanism comprises a prong, said cutter serving to lift the formed spring into contact with said prong whereby said prong is inserted between and spreads apart the two rear convolutions of the formed spring during transfer, and wherein said second forming tool enters the space provided by the prong.

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