Oct. 10, 1933. W. VINAR 1,930,329

SPRING COILING MACHINE

Filed March 6, 1933 3 Sheets-Sheet 1

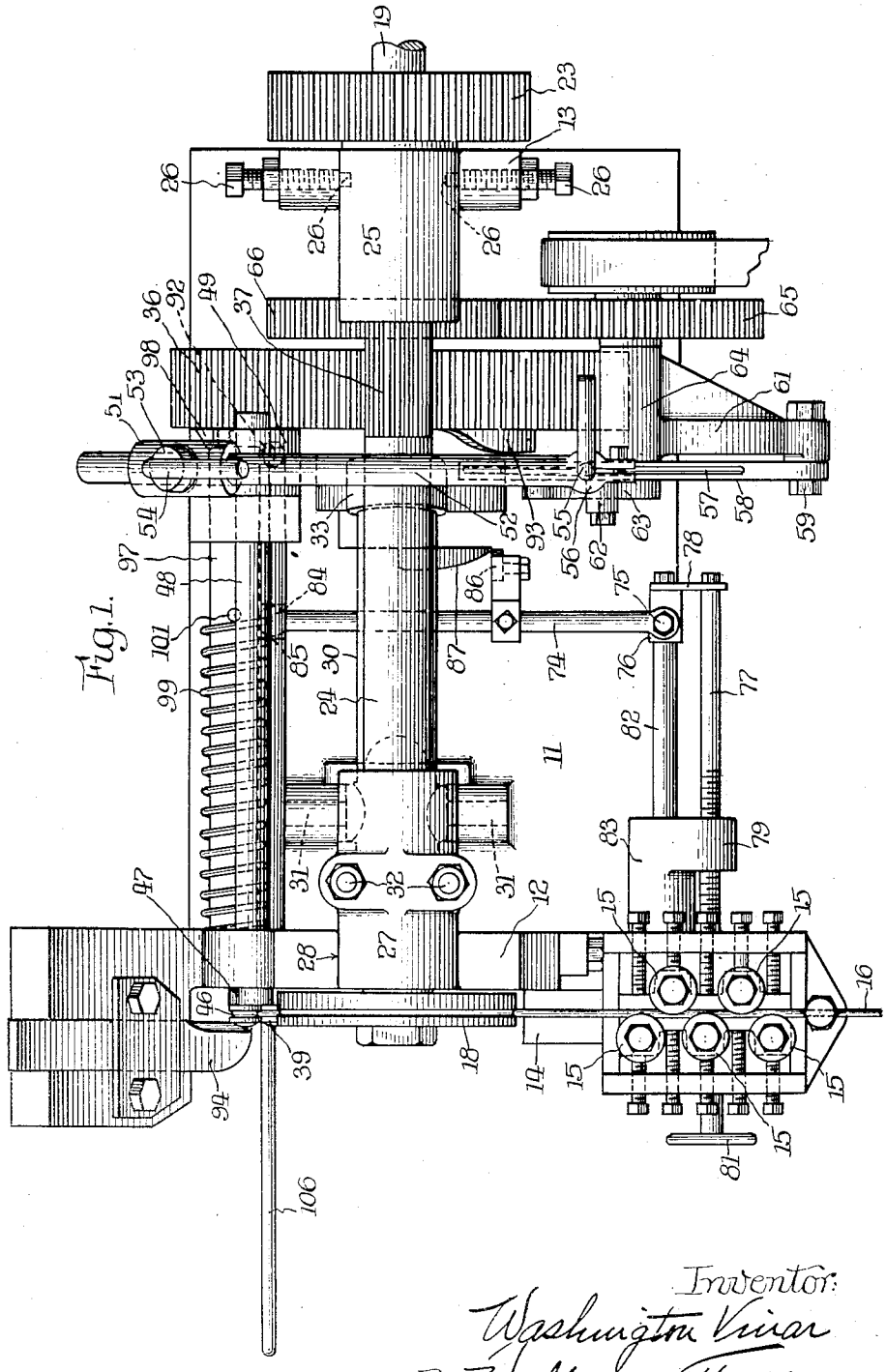


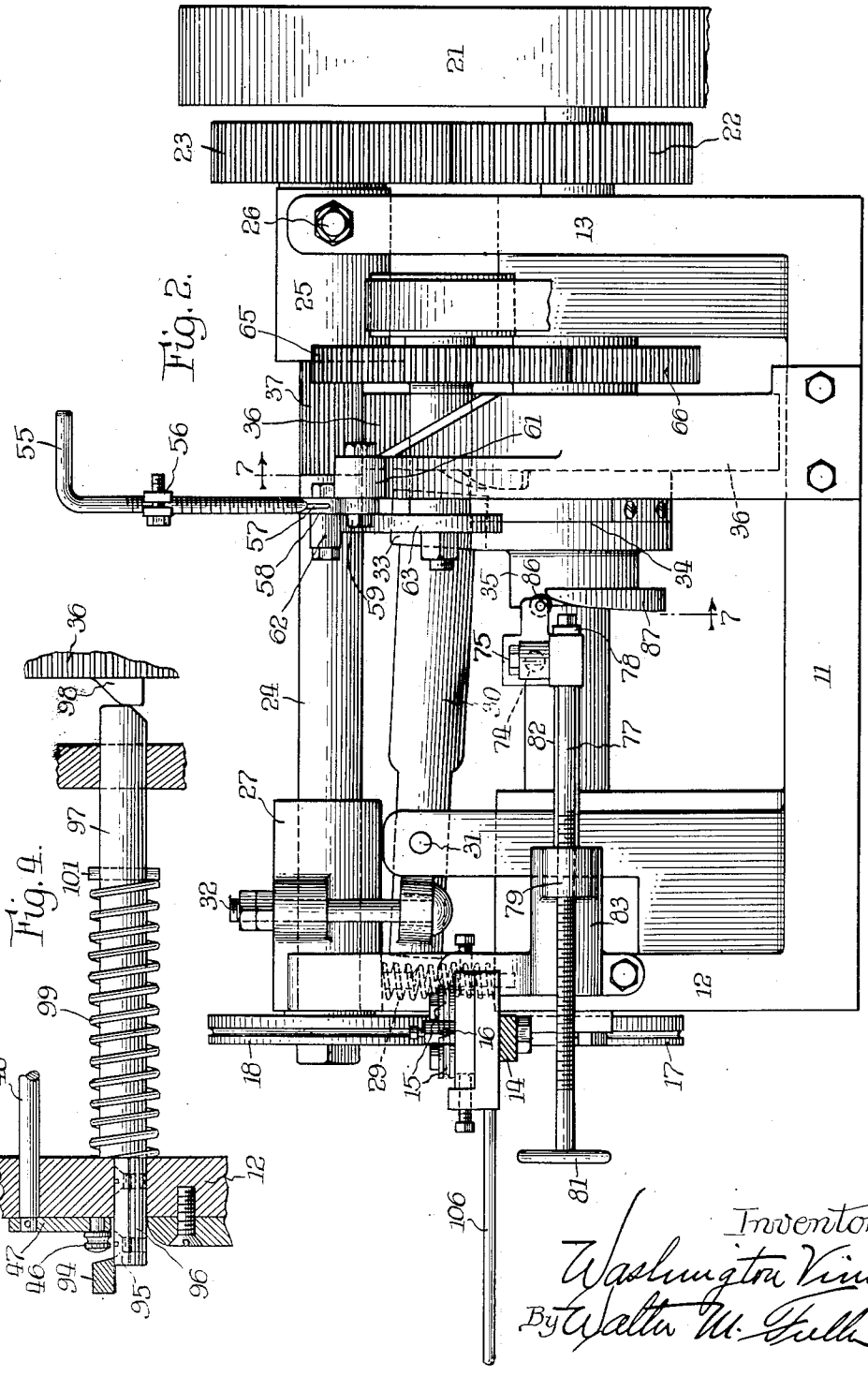
Fig. 1.

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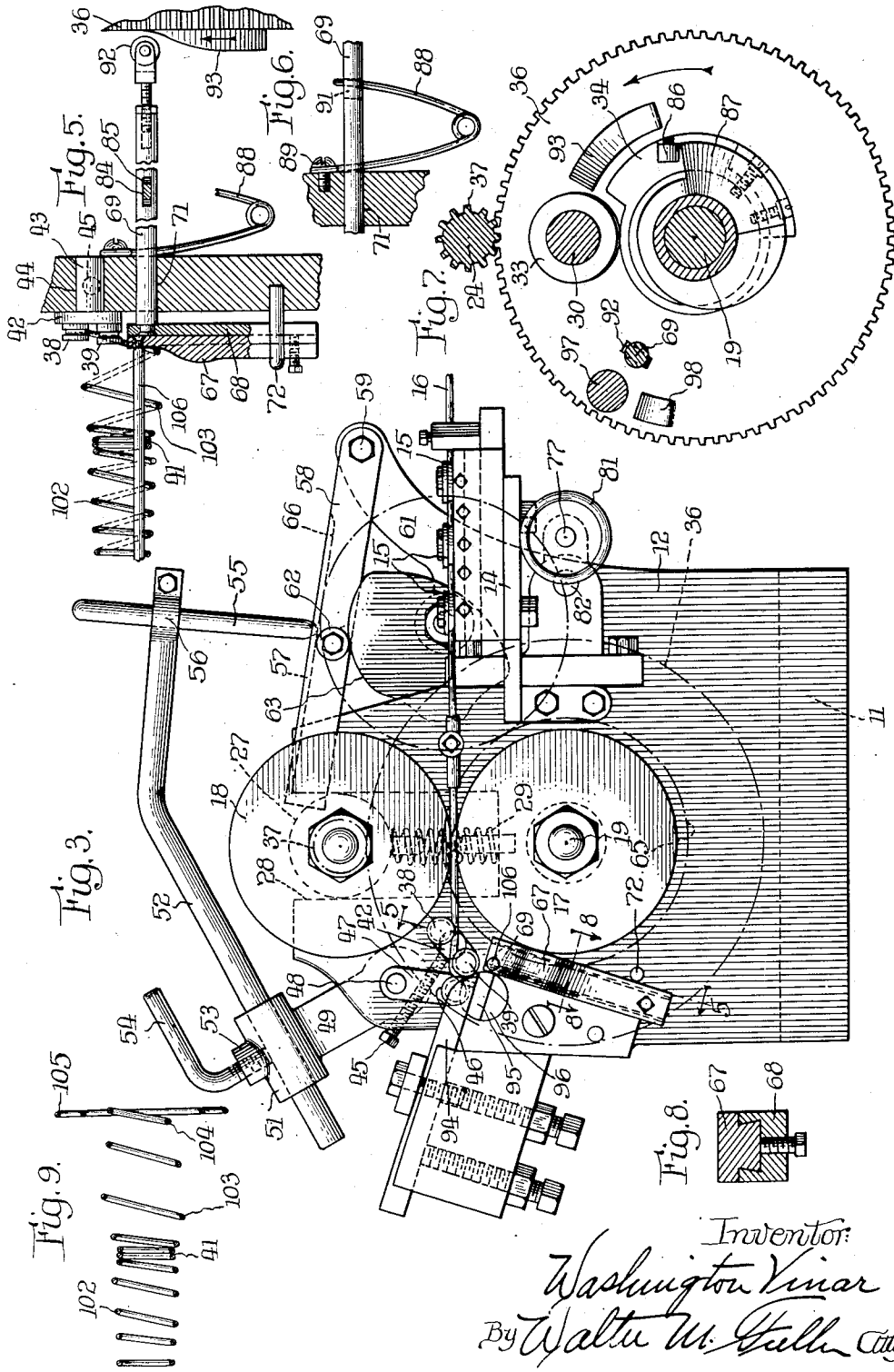


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SPRING COILING MACHINE

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UNITED STATES PATENT OFFICE

1,930,329

SPRING COILING MACHINE

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Application March 6, 1933. Serial No. 659,692

4 Claims. (Cl. 153—65)

My invention relates to machines for coiling or forming wire into spiral-springs and aims more particularly to provide an improved and novel mechanism for making spiral-springs with enlarged flat tops or heads having a plurality of convolutions of the wire in substantially the same plane at practically right angles to the axis of the spring.

In general, one of the leading objects and purposes of the invention is to supply a machine of the character and for the purpose specified, which is relatively simple in structure, which is comparatively economical to make, which performs its work with efficiency and satisfaction, and which is readily adjustable.

To enable those skilled in this art to understand the invention both from structural and operating standpoints, in the accompanying drawings, forming a part of this specification, a present, preferred embodiment of the invention has been shown in detail, and, for simplicity, like reference numerals have been employed to designate the same parts of the mechanism throughout the several views of these drawings.

In these drawings:—

Figure 1 is a plan view of the machine;

Figure 2 is a front view thereof;

Figure 3 is an end elevation;

Figure 4 shows the wire cut-off mechanism;

Figure 5 is a detail, sectional view on line 5—5 of Figure 3 of that part of the appliance governing the pitch of the wire convolutions of the spring;

Figure 6 is a fragmentary view of a part of the same portion of the mechanism;

Figure 7 is a vertical section on line 7—7 of Figure 2;

Figure 8 is an enlarged section on line 8—8 of Figure 3; and

Figure 9 shows the spring produced by the machine in central, longitudinal section, such type of spring being satisfactorily used in bed-springs, spring cushions, and the like.

Referring to the several views of such drawings, it will be observed that the machine incorporates a main frame including a base 11 and end uprights or standards 12 and 13, the part 12 carrying a suitable bracket 14 equipped with a plurality of the usual, adjustable, grooved, wire-straightening rollers 15, 15 between which the incoming wire 16 passes to free it from kinks and bends.

Upon leaving such straightening-rollers 15, 15 the wire travels between a pair of lower and upper, grooved, power-driven feed-rollers 17 and 18, the shaft 19 of such lower roller 17 being revoluble in appropriate bearings and being equipped with a drive pulley 21 and a gear 22 in mesh with an upper gear 23 of like size on the shaft 24 of the upper feed-roller 18, such shaft 24 being rotatable in a bearing 25 adjacent to the gear 23 and mounted for slight vertical oscillation on opposite, aligned pivot-screws 26, 26 carried by the standard 13.

The other or companion bearing 27 of shaft 24 is accommodated in part in an upright guideway 28 in the standard 12, and is normally forced upwardly by an underlying coiled spring 29 but is held down to its work of feeding the wire intermittently or interruptedly by a lever 30 fulcrumed at 31, 31 and to which it is operatively united by a pair of bolts 32, 32, extended through apertured ears or lugs on the two members, all as is clearly and fully shown.

In order to raise and lower the roller-equipped end of shaft 24 to establish and to temporarily discontinue the feeding of the wire between the rollers 17 and 18 to allow for the momentary severance of each spring from the supply-wire as soon as the formation or coiling of the spring has ben completed, it is necessary to rock lever 30 in proper timed relation to the action of the other parts of the mechanism, and this is accomplished by means of a roller 33 on an end of the lever riding on an appropriately-shaped cam 34 on a sleeve 35 rotatable on shaft 19 and fixed to and revolved by an associated gear 36 in mesh with its driving pinion 37, the teeth of which are integral with and cut in the upper-roller shaft 24.

By the means already described, the two wire-feeding rollers 17 and 18 are power-actuated and at the correctly timed intervals the upper roller rises enough to interrupt the wire feed momentarily during the operation of the wire-severing device referred to more in detail hereinafter.

As the wire is advanced by the correlated and complementary feed-rollers 17 and 18, it passes beneath a relatively-fixed, adjustable, revoluble, grooved roller 38 and then over a similar roller 39, the wire-receiving groove of the latter being offset laterally with respect to the like groove of the companion upper roller 38 just enough to deflect the wire the proper amount to form a spring with a pitch between its proximite convolutions such that the adjacent turns of the wire will be in contact with one another, as indicated, for example, in the center part 41 of the spring shown in Figure 9.

A convenient and suitable way of supporting

and mounting the cooperating rollers 38 and 39 is to support them so that they can revolve on their own axes on a block 42 equipped with a cylindrical stud 43 occupying a correspondingly-shaped hole 44 in the standard 12, such stud or stem being supplied with a set-screw 45 (Figure 3) whereby the pair of rollers may be rocked around the axis of the stud to obtain the desired adjustment of the parts involved.

Upon leaving the rollers 38 and 39 the wire enters the groove of a third, adjustable, wire-deflecting, spring-caliber-determining roller 46 on an arm 47 on the end of a rock-shaft 48.

From what precedes, it will be clear that, as the wire-bending-roller shifts or moves in or out, that is toward or away from the other two rollers, the size of the spring formed or the diameter of the convolutions will be varied, and this result is accomplished by providing suitable means for automatically oscillating the shaft 48.

To this end, shaft 48 has an upstanding socket-arm 49 secured thereon in any approved manner, the socket 51 of the arm adjustably receiving a bent rod 52 capable of being locked in the socket in the desired position of adjustment by a set-screw 53 supplied with an operating handle 54.

The other end of the member 52 has a vertical rod 55 adjustably clamped therein at 56, the lower, rounded end of part 55 bearing on the bottom wall of a groove 57 provided in the top surface of an arm 58 hinged at 59 at the upper portion of a standard 61 secured to, and upstanding from, the frame-base 11, such rock-arm 58 carrying a roller 62 riding on the periphery of a cam 63 on a shaft rotatable in a bearing 64, the other end portion of the shaft having a gear 65 in mesh with a gear 66 on, and revolved by, shaft 19, whereby power is derived from such latter shaft to operate cam 63 to rock roller 46 toward and from roller 39 to modify or change the diameter of the spring undergoing manufacture in its various parts.

As the wire leaves the spring-diameter-determining roller 46 it passes in front of a cam or forming bar 67 longitudinally, slidingly, adjustably mounted in any approved manner on a supporting-arm 68 on a shaft or rod 69 reciprocatory in a bearing 71 in the standard 12, the associated or united forming-bar and its supporting-arm being prevented from rotating or shifting angularly out of proper position by a stationary pin 72 mounted on the standard and against which one or both of them may bear.

In order to prevent the spring from unduly wabbling or swaying while it is being coiled and to preclude its enlarged, flat, convolute head or top from becoming disposed at an oblique angle to the axis of the spring, an outstanding retaining rod or bar 106 is used on the forming member 67, as shown perhaps most clearly in Figure 5, such rod being inside of the spring, as illustrated.

To vary the pitch of the forming or winding wire coils or convolutions, two means, in the present instance, are employed.

A lever 74 is fulcrumed at 75 on a block 76, the position of which may be modified or varied by a screw 77 connected thereto at 78 and extended through a stationary screw-threaded bearing 79 carried by the standard 12, and also fitted at its outer end with a hand-wheel 81 by means of which it may be easily turned to bring about the desired position adjustment of the lever fulcrum.

As is presented in Figure 1, fulcrum-block 76 may be equipped with a guide-rod 82 reciprocatory in a bearing 83 to assist in supporting and guiding the block.

The free end of lever 74 is rounded at 84 to supply a suitably-shaped head which fits in a slot 85 in shaft or rod 69, and an intermediate part of the lever has a roller 86 co-acting with a cam 87 on sleeve 35, the roller being yieldingly pushed toward its operating cam by a bow-spring 88 having one end secured to the standard at 89, its other end being accommodated in a slot or hole 91 in sliding shaft 69.

Such cam 87 controls or governs the pitch of the wire convolutions of the first half or small end of the spring by regulating or varying the position of the cam or forming block 67, as will be readily understood.

As is indicated in the illustration in Figure 5, a roller 92 is adjustably mounted on the inner end of the sliding rod or shaft 69 and it cooperates with a cam 93 on the side of gear 36 (Fig. 7), such cam determining the pitch of the wire coils forming substantially the second half of the spring.

When the complete spring has been coiled, it is of course necessary to cut it off from the supply-wire, the feed of which is stopped for a short time, as indicated above, in order that such severance may be performed.

Accordingly, near the coil-forming rollers 39 and 46 the machine has an adjustably-clamped, stationary shear-bar 94 with which co-acts a shear-blade 95 fastened on a cut-away end portion 96 of a shaft 97 slidingly mounted in any convenient manner; the other end of the shaft being engaged at the proper moments by a cam projection 98 on the side of gear 36, a coiled spring 99 pressing at one end against a face of standard 12 and bearing at its other end against a pin 101 extended through the shaft, whereby the spring normally maintains the movable shear-blade retracted in inoperative position, the blade advancing and acting to cut off the spring from the supply-wire only when the cam slides the shaft and blade against the action of the spring.

A machine of this general style for the manufacture of the usual type of spiral-springs is not new, but the mechanism illustrated and described embodies certain novel features of improvement.

From a consideration of Figure 9, it will be perceived that the lower portion 102 of the spring produced by this machine gradually increases in diameter upwardly, that the central part 41 of the spring is of reduced diameter and has its coils in contact with one another, and that the upper section 103 of the spring increases in diameter upwardly and then decreases, so that the final wire convolution 104 just below the flat head 105 is of substantially less diameter than the largest part of the body of the spring, the head being formed, in the present instance, by about three convolutions of the wire in the same plane at a right-angle to the spring axis.

If this spring did not have the enlarged, plane head, and if the spring was not formed with the reduced-diameter neck just beneath the head, no substantial difficulty would be encountered in coiling it, but by reason of the stated physical characteristics special means are required for its production.

If a spring is coiled on a machine of this general type and the diameter of the spring is uniform, or, if such diameter progressively increases toward its top, no material trouble is met in making it.

When, however, after a larger portion, as 103, has been coiled and then a smaller diameter section, as 104, is coiled, there is a distinct tendency for the already-formed part of the spring to

wabble and for its axis to change position rather than to remain stationary, and, if such shift or movement is permitted to take place, the coiled head 105 will not be formed properly and it will very likely be at an oblique angle to, rather than at a right-angle to, the axis of the spring.

This is due to the fact that, as the diameter of the spring is decreased, as at 104, the resiliency of that portion of the spring is correspondingly reduced and such change in elasticity or pliancy tends to make the already-formed part of the spring of greater resiliency to become displaced as indicated.

To prevent such an occurrence and to assure the production of the required style of multiple-convolution top or head of the spring in its proper plane, the stationary holding or guiding rod 106 is correctly mounted on the pitch-forming member 67 to locate it inside of the spring where it may co-act with the inner sides of a sufficient number of the spring convolutions to keep the axis of the spring from materially changing its position.

From what precedes it will be clear that the incoming wire is straightened by the rollers 15, 15, that it is advanced interruptedly by the feed-rollers 17 and 18, that it passes between the rollers 38, 39, that it is coiled by engagement with the correlated roller 46 the position of which establishes the diameter of the spring, that it is fed in front of the pitch-forming member 67, that the coiled spring as it is undergoing production is prevented from undue or excessive movement out of place by the internal retaining or positioning rod 106, and that at the proper moment, during momentary cessation of wire feed, the finished spring is severed from the supply wire.

It will be understood also that the diameter-governing roller and the pitch-controlling bar are automatically regulated or adjusted to make the style or type of spring shown and that the bar 67 retracts sufficiently to allow the slightly-offset roller 46 in conjunction with its companion rollers to provide the small pitch of the wire convolutions of part 41 of the spring.

Those trained in this industry will understand that the principles of the invention as defined by the appended claims are susceptible of embodiment in various physical forms and that the machine set forth herein is subject to substantial modification without departure from the essence of the invention and without the loss or sacrifice of any of its substantial advantages.

I claim:

1. In a machine for coiling wire-springs, the combination of a plurality of rollers with which the wire co-acts positioned relatively to one another to effect the coiling of the wire, means to feed the supply wire through said rollers, means with which the wire cooperates after leaving said rollers to form the pitch of the wire convolutions, means to adjust the position of one of said rollers automatically to control the diameter of the wire convolutions, means to adjust said pitch-forming means automatically, said diameter-control means and said pitch-forming adjusting means cooperating to produce a spiral-spring with a head composed of more than one wire convolution in substantially the same place at practically a right-angle to the axis of the spring and with the spiral wire convolution just below said head of less diameter than a lower part of the spring, means to restrain movement of the spring as it is progressively formed to allow the production of a complete spring with the stated characteristics, and means to sever the coiled spring from the remainder of said supply wire.

2. The structure presented in claim 1 in which the head of the spring formed by the machine is composed of a plurality of convolutions of the wire in substantially the same plane.

3. The structure presented in claim 1 in which said restraining means is relatively stationary and is located inside of the formed part of the spring.

4. In a machine for coiling wire-springs, the combination of a plurality of rollers with which the wire co-acts positioned relatively to one another to effect the coiling of the wire, means to feed the supply wire through said rollers, means with which the wire cooperates after leaving said rollers to form the pitch of the wire convolutions, means to adjust the position of one of said rollers automatically to control the diameter of the wire convolutions, means to adjust said pitch-forming means automatically, said diameter-control means and said pitch-forming adjusting means cooperating to produce a spiral-spring with a head composed of a plurality of convolutions in substantially the same plane at practically a right-angle to the axis of the spring and with the spiral wire convolution just below said head of less diameter than the portion of the spring immediately below it, relatively stationary means located inside of the formed part of the spring to restrain movement of the spring as it is progressively formed to allow the production of a complete spring with the stated characteristics, and means to sever the coiled spring from the remainder of said supply wire.

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