Nov. 25, 1958 A. A. BONDE ET AL 2,861,622

ANGULARLY ADJUSTABLE DEVICE FOR TRIMMING LEADING EDGE OF COIL SPRING

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Fig. 1.

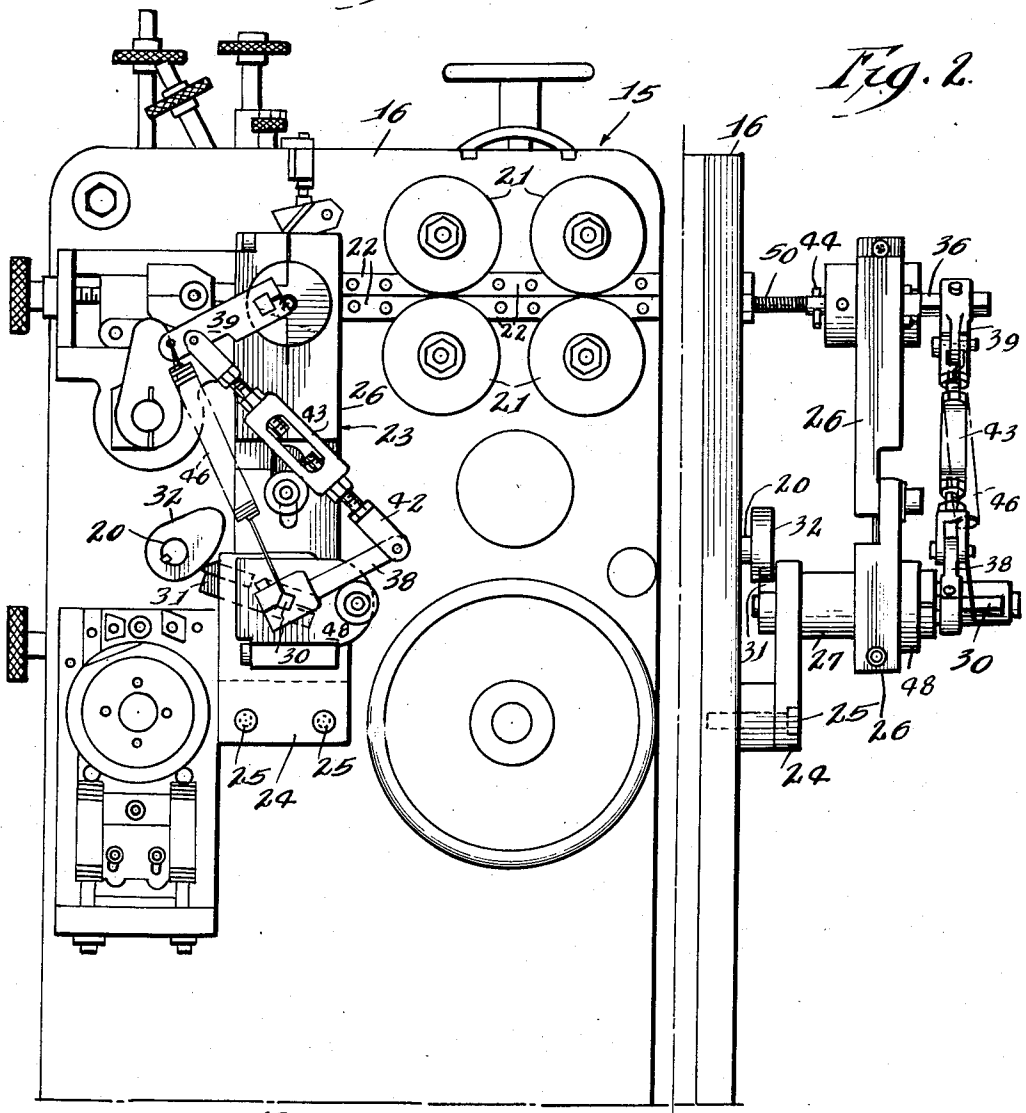



Fig. 2.



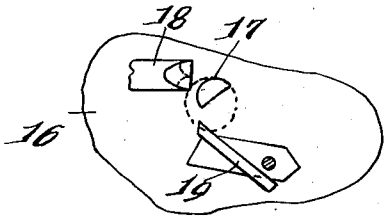




Fig. 1a.

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Fig. 3.

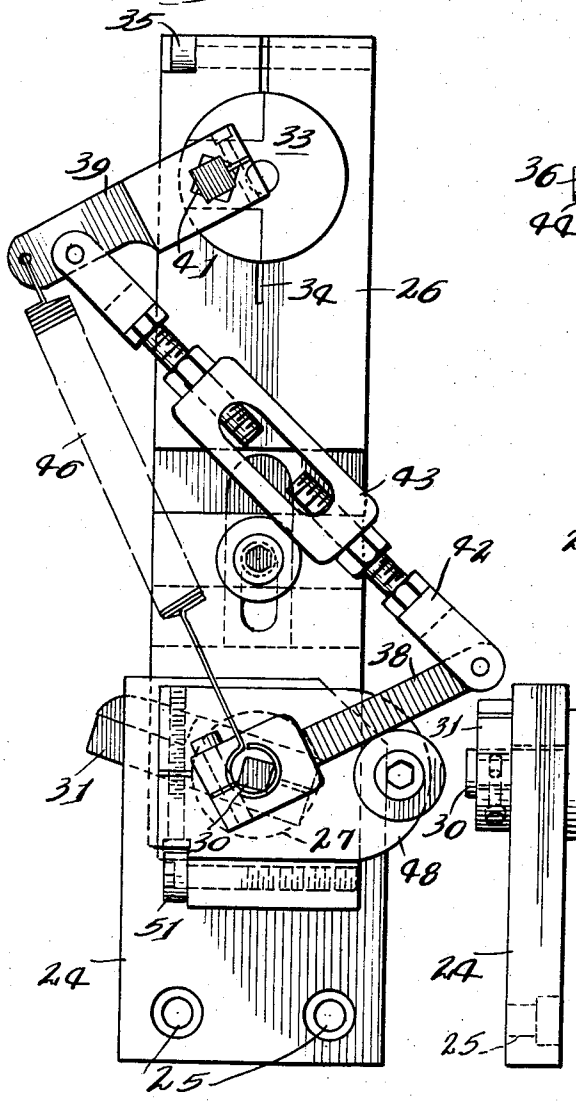
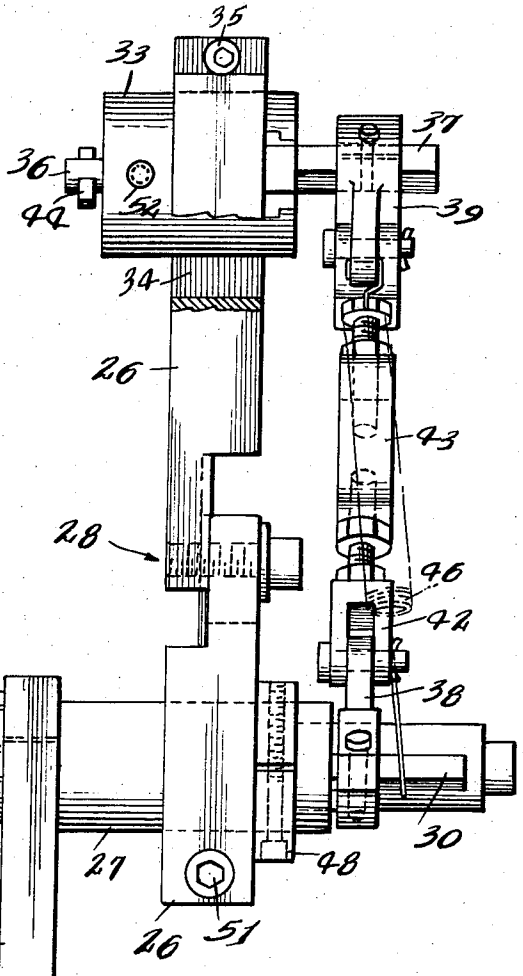



Fig. 4.




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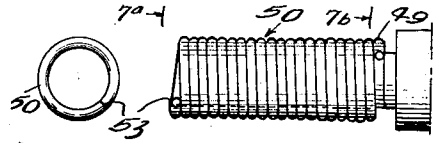



Fig. 7a. Fig. 7.

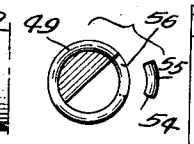



Fig. 7b.

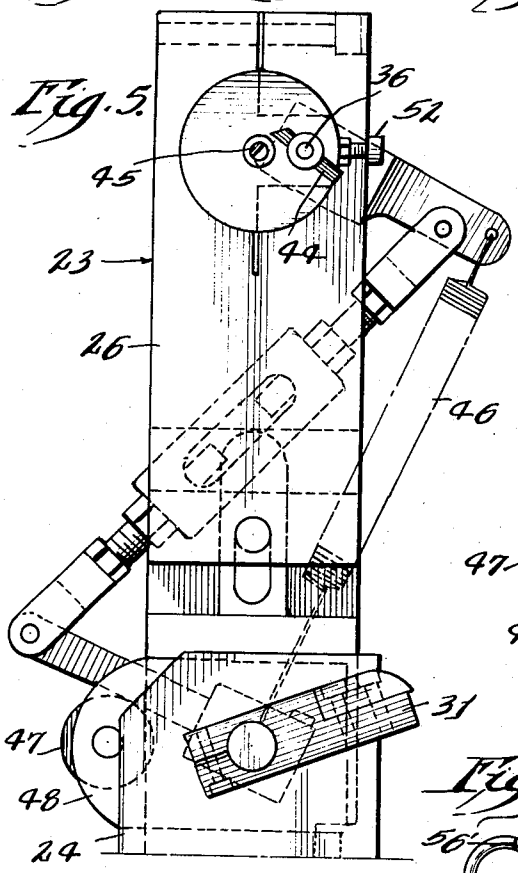



Fig. 5.




Fig. 6.

Fig. 8.

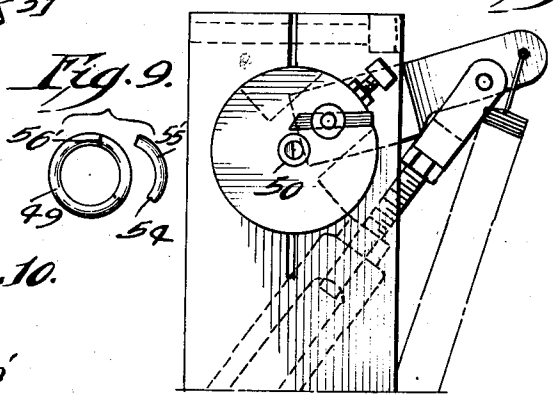



Fig. 9.

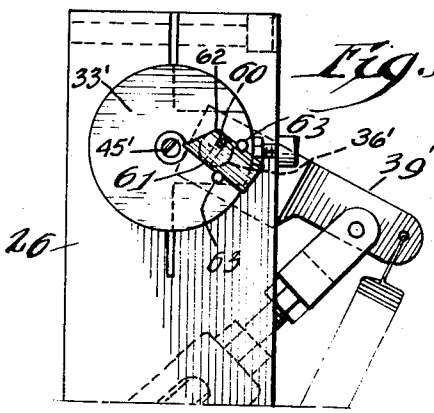



Fig. 10.

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# ANGULARLY ADJUSTABLE DEVICE FOR TRIMMING LEADING EDGE OF COIL SPRING

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Application September 26, 1955, Serial No. 536,476

7 Claims. (Cl. 153—65)

This invention relates to a trimming device for spring coiling machines and in particular to an improved method and apparatus for determining the length of a raw spring.

A particular embodiment of the invention shown is designed for operation with a universal coiler of the type shown in Bergevin et al. Patent No. 2,119,002, dated May 31, 1938, but the invention is equally applicable to other types of spring coiling machines.

Spring coiling machines of the type indicated embody wire feeding means which feed a predetermined length of wire between an arbor and a coiling point. The length of the spring is determined by the amount of feed imparted by the feed rolls, after which a cutoff device is actuated.

Although the cutoff device always determines the angular position of the trailing edge of the raw spring with certainty, it does not necessarily follow that the length of the spring can be measured by an integral number of convolutions, due to spring back. The variation in angular length will vary from job to job according to the resilience of the stock and the length of spring, but on any particular job, for a given amount of feed, the variation will be of the order of 10 to 15 degrees on either side of a median position. Furthermore, since the raw spring is subjected to subsequent operations, such as the forming of hooks of varying size, it is not always desired that the raw spring contain an integral number of convolutions.

It is an object of the present invention to provide a trimming device by means of which a raw spring can be produced of any desired length, the term "length" as used herein referring to angular length, and in particular to a fractional part of the convolution as measured in degrees, the number of complete convolutions being disregarded for purposes of this description.

According to this invention, the trimming device operates on the leading edge of the spring substantially simultaneously with the operation of the cutoff device, which determines the trailing edge.

It is another object of this invention to provide an improved method and apparatus for determining the length of a raw spring by operating on both the leading and trailing edges of the spring substantially simultaneously.

A further object of this invention is to provide a trimming device which is angularly adjustable.

Still another object is to provide a trimming device in the form of an attachment which can be readily mounted on a standard type of spring coiling machine.

A still further object is to provide, in a spring trimming device of the type indicated, an improved cutting action.

Further objects, features and advantages will become apparent as the description proceeds.

With reference now to the drawings, in which like reference numerals designate like parts:

Fig. 1 is a front elevation of a spring coiling machine embodying this invention;



Fig. 1*a* is an elevational view of certain parts obscured in Fig. 1;

Fig. 2 is a side view of certain parts shown in Fig. 1;

Fig. 3 is an enlarged front elevation of the trimming device;

Fig. 4 is a left end view of Fig. 3;

Fig. 5 is a rear elevation of Fig. 3;

Fig. 6 is a view similar to Fig. 5 showing the parts in a changed position;

Fig. 7 is a detailed elevation of a raw spring after trimming;

Figs. 7*a* and 7*b* are views taken along lines 7*a* and 7*b* respectively of Fig. 7 illustrating the trimming operation.

Fig. 8 is a fragmentary view similar to Fig. 5, but showing an adjusted position of the parts;

Fig. 9 is a view illustrating the trimming operation with respect to the adjusted position shown in Fig. 8, and

Fig. 10 is a view similar to Fig. 5, but showing a modification.

With reference now to Figs. 1 and 1*a*, the reference numeral **15** indicates generally a spring coiling machine of the type shown in the aforementioned patent, on which machine is mounted the trimming device **23**. The machine **15** includes a front plate **16** through which extends an arbor **17** and on which is mounted a coiling point **18**, the latter elements being overlain by the trimming device **23** and hence being shown separately in Fig. 1*a*. A trailing edge cutoff blade **19** is also provided, the setup being shown for a righthand spring.

The spring coiling machine also includes a rotating cam shaft **20** which projects through the front plate **16**, and feed rollers **21** and guide blocks **22** mounted on the front plate.

In operation the feed rollers **21** feed wire stock to the left through the guide blocks **22** and above the arbor **17** and into engagement with the coiling point **18**. The latter deflects or bends the wire stock and the convolutions are displaced by a suitable pitch tool, not shown, all as described in the aforementioned Patent No. 2,119,002. At the conclusion of each cycle of operation, the trailing edge cutoff **19** is actuated to sever the raw spring from the stock.

The trimming device **23** is mounted forwardly of said front plate **16** and arbor **17** and includes a bracket **24** which is secured to the front plate **16** by means of suitable screws **25**. A bearing plate **26** is supported from the bracket **24** by means of a hollow post **27** at its lower end, and additional supporting means may be provided at its upper end if desired. The bearing plate **26** is provided with a length adjustment designated generally by the reference numeral **28** in Fig. 4.

A shaft **30** is suitably journaled within the post **27** and carries at its rear end a follower arm **31** which is engaged by a cam **32** mounted on the cam shaft **20**. The latter is rotated once during each cycle of operation of the machine **15**, and hence the shaft **30** will be rocked once during each cycle of operation. The timing is such that the rocking occurs at the end of each cycle.

Adjustably mounted in the upper end of the bearing plate **26** is a cylindrical plug **33**. The bearing plate is split as indicated at **34** and a takeup screw **35** is provided to maintain the plug in any desired angular position. A cutter shaft **36** is journaled in the plug **33** and is provided with a square end **37**.

Means are provided to transmit the rocking motion of the shaft **30** to the cutter shaft **36**. In this connection, a lever arm **38** is suitably secured to the square end of the shaft **30**, and a second lever arm **39** is mounted on the square end **37** of the cutter shaft **36**. The lever arm

39 is provided with a star-shaped opening 41 which provides angular adjustment of the lever arm 39 with respect to the cutter shaft 36 in increments of 45°. A link 42 connects the outer ends of lever arms 38 and 39, the link including a turnbuckle 43 for purposes of adjustment.

The rear end of the cutter shaft 36 is slotted to accommodate a blade 44 which is suitably secured therein. Also projecting backwardly from the rear surface of the plug 33 is an anvil 45 which cooperates with the blade 44. The anvil is centrally located in the plug 33 and the cutter shaft is eccentrically located so that rotation of the plug, as between the Fig. 5 and the Fig. 8 positions, for example, will cause angular displacement of the shearing plane.

A spring 46 extends between the outer end of the lever arm 39 and the end of shaft 30 to urge the linkage mechanism 38—42—39 into its unoperated position, as determined by a stop 47 projecting from adjustably mounted stop plate 48.

At the conclusion of each cycle the follower arm 31 will be rocked by the cam 32 to cause movement of the cutter blade 44 from its normal Fig. 5 position into its operative position shown in Fig. 6. The cutter blade 44 is aligned with the first convolution 49 of the spring 50 so that the first convolution will be trimmed in the desired manner.

The whole bearing plate 26 is adjustably mounted on the hollow post 27 by means of the takeup screw 51 in order to secure proper alignment. Additionally, a suitable lock screw 52, having an eccentric dog point, not shown, which engages in a groove in the cutter shaft 36, may be provided for a fine adjustment of the cutter blade 44 with respect to the first convolution 49.

Figs. 7, 7*a* and 7*b* illustrate the operation of the trimming device. The trailing edge is shown at 53 in Fig. 7*a*, and the leading edge is shown at 54 in Fig. 7*b*. A comparison of Figs. 7*a* and 7*b* will indicate that the length of the spring 50 is approximately 335° (disregarding complete convolutions). It is desired to provide a spring having a length of 285°, for example. Therefore, 50° must be trimmed from the first convolution 49, and the plug 33 is, therefore, adjusted accordingly.

Referring now to Figs. 8 and 9, if it is desired to provide a spring having a length of 240°, then the plug 33 will be rotated 45° in the counterclockwise direction from the Fig. 6 position. In Figs. 7*b* and 9, the trimmed portion of the spring is designated by the reference numerals 55 and 55′ respectively, and the trimmed edge by the reference numerals 56 and 56′ respectively.

Since the coiling machine 15 is a universal machine, meaning that it is adapted to fabricate springs of varying numbers of convolutions, pitch, and diameter, according to setup, the trimming device 23 is provided with the various adjustments previously mentioned to the end that the anvil 45 and cutting blade 44 may be properly located, and so that the throw of the cutter shaft 36 may be regulated accordingly.

A modified type of cutter blade mounting is shown in Fig. 10 in which the cutter shaft 36′ terminates in an eccentric pin 60 which engages in a slot 61 formed in the cutter blade 44. The cutter blade 44, in turn, is slidably mounted on the surface of the plug 33′ by means of under cut guide pins 63. Thus, rotation of the lever arm 39′ in counterclockwise direction will project the cutter blade 62 to the left in a direction toward the anvil 45′, thus providing an essentially translational motion of the cutter blade 62 as contrasted with the rotational motion provided by the cutter blade 44. The translational motion has the advantage of facilitating setup since, in the rotational type, the angular disposition of the actual plane of shearing tends to vary with respect to the displacement of the plug 33 when operating on springs of different diameter. In the translational type, however, such variation is not present.

It is understood that the anvil 45 is replaceable since, for springs of varying diameters, anvils of different diameters may also be required.

To summarize the operation, which has been described in detail in connection with the description of the various parts and sub-assemblies, the spring coiling machine of Fig. 1 operates in discrete cycles of operation, automatically severing the spring at the conclusion of each cycle. The trimming device 23 serves to trim the leading edge of a spring substantially simultaneously with the operation of the trailing edge cutoff 19, in order to provide a spring of desired length. The length adjustment is obtained by regulating the angular position of the plug 33 within the bearing plate 26, as illustrated by a comparison of Figs. 5 and 8, thus shifting the plane of shearing as illustrated by a comparison of Figs. 7*b* and 9.

It is, of course, understood that in setting up the spring coiling machine for a particular job, the rough length of the spring, determined by the amount of feed imparted by the feed rollers 21, is set so that the maximum variation from the median angular length prior to trimming is greater than the angular distance between the plane of shearing and the angular position of the median rough length. In order words, with respect to Figs. 7*b* and 9, assuming that the leading edge 54 represents the median rough length, then the amount of feed must be set so that the angular length of the trimmed portions 55 and 55′ exceeds the maximum variation expected.

The timing of cam 32 is such that the trimming device is operated just prior to the operation of the cut off device, and after the feeding and coiling operation has been completed. At this time, the spring is maintained in its position shown in Fig. 2 by reason of the fact that it has not yet been severed from the wire stock.

The trimming device may be built into the coiling machine 15 as an integral part thereof, or it may be constructed in the form of an attachment, as shown, the cam shaft 20 which is provided on the machine of the type shown for other purposes being thus readily available as a convenient source of power for actuating the trimming device.

Although only the preferred embodiment of this invention has been shown and described herein, it will be understood that various modifications and changes may be made in the construction shown without departing from the spirit of this invention as pointed out by the appended claims.

We claim:

1. A trimming device for a spring coiling machine which includes wire feeding means, an arbor, and a cut off device located adjacent said arbor and operating along a fixed shear plane, comprising, in combination, a bearing plate mounted forwardly of said arbor, a plug mounted in said bearing plate, an anvil centrally mounted on and projecting rearwardly from the rear surface of said plug, a cutter shaft journaled in said plug, and a cutter blade actuated by said cutter shaft and cooperating with said anvil to sever the leading edge of a spring which is located on said arbor, said plug being adjustably mounted in said bearing plate for angular adjustment so that the shear plane of said cutter blade may be adjusted with respect to said fixed shear plane in order to regulate the length of said spring, and means for operating said cutter shaft at the conclusion of a spring coiling operation and immediately prior to the operation of said cutoff device.

2. A trimming device for a spring coiling machine which includes wire feeding means, an arbor, and a cut off device located adjacent said arbor and operating along a fixed shear plane, comprising, in combination, a bearing plate mounted forwardly of said arbor, a plug mounted in said bearing plate, an anvil centrally mounted on and projecting rearwardly from the rear surface of said plug, a cutter shaft journaled in said plug, a cutter blade slidably mounted on the rear surface of said plug, the end of said cutter shaft and said cutter blade presenting

opposed surfaces, a slot formed in one of said surfaces, and an eccentric pin projecting from the other of said surfaces into said slot whereby oscillation of said cutter shaft will cause translational movement of said cutter blade toward said anvil to sever the leading edge of a spring which is located on said arbor, said plug being adjustably mounted in said bearing plate for angular adjustment so that the direction of movement of said cutter blade may be adjusted with respect to said fixed shear plane in order to regulate the length of said spring, and means for oscillating said cutter shaft at the conclusion of a spring coiling operation and immediately prior to the operation of said cutoff device.

3. A trimming device for a spring coiling machine which includes a front plate, wire feeding means mounted on said front plate, an arbor, and a cut off device located adjacent said arbor and operating along a fixed shear plane, comprising, in combination, a bracket secured to said front plate, a post projecting forwardly on said bracket, a bearing plate mounted on said post, a rock shaft journaled in said bracket and extending through said bearing plate, cam means projecting from said front plate for rocking said rock shaft at the conclusion of a spring coiling operation and immediately prior to the operation of said cut off device, a plug adjustably mounted in said bearing plate for angular adjustment, an anvil centrally mounted on and projecting rearwardly from the rear surface of said plug, a cutter shaft journaled in said plug, a first lever arm mounted on said cutter shaft, a second lever arm mounted on said rock shaft, link means connecting said lever arms whereby the rocking motion of said rock shaft will be transmitted to said cutter shaft, and a cutter blade located at the rear surface of said plug and eccentrically thereof and actuated by said cutter shaft.

4. A trimming device as claimed in claim 3 in which said link means includes a turnbuckle so that the effective length of said link means may be adjusted to correspond with the variation in distance between said eccentrically located cutter blade and said rock shaft as said plug is angularly adjusted in said bearing plate.



5. A trimming device as claimed in claim 3 in which the effective length of said bearing plate is adjustable, and in which the effective length of said link means is adjustable.

6. A trimming device as claimed in claim 3 in which said bearing plate is adjustably mounted on said post for forward and back adjustment to accommodate different lengths of spring which are coiled on said coiling machine.

7. A trimming attachment for a spring coiling machine, which includes wire feeding means, an arbor, and a cutoff device located adjacent said arbor and operating along a fixed shear plane comprising, in combination, a mounting bracket, a post projecting forwardly from said bracket, a bearing plate mounted on said post, a rock shaft journaled in said bracket and extending through said bearing plate, a plug adjustably mounted in said bearing plate for angular adjustment, an anvil centrally mounted on and projecting rearwardly from the rear surface of said plug, a cutter shaft eccentrically journaled in said plug, a first lever arm mounted on said cutter shaft, a second lever arm mounted on said rock shaft, link means connecting said lever arms whereby the rocking motion of said rock shaft will be transmitted to said cutter shaft, and a cutter blade located at the rear surface of said plug and actuated by said cutter shaft.

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