Feb. 5, 1952 E. T. OLIVER 2,584,154

COILING DEVICE AND ATTACHMENT FOR DRILL PRESSES OR THE LIKE

Filed June 5, 1947 2 SHEETS—SHEET 1

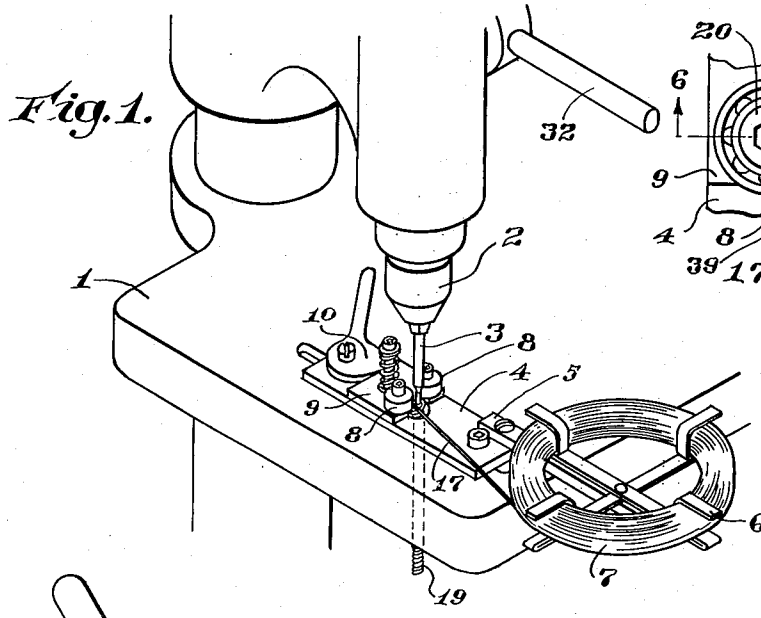


Fig. 1.

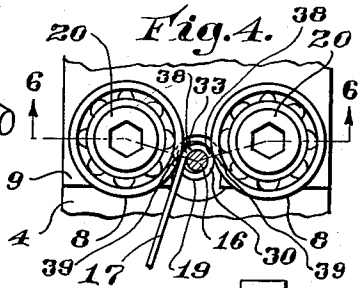


Fig. 4.

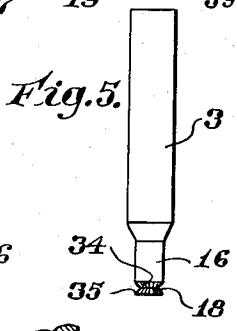


Fig. 5.

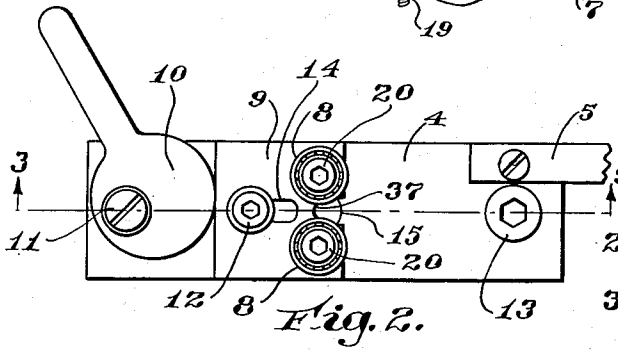


Fig. 2.

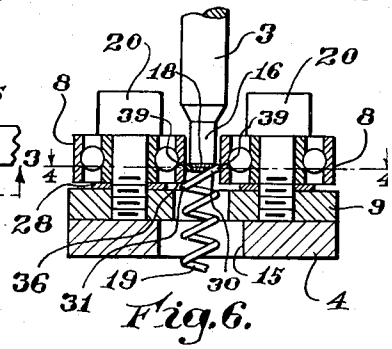


Fig. 6.

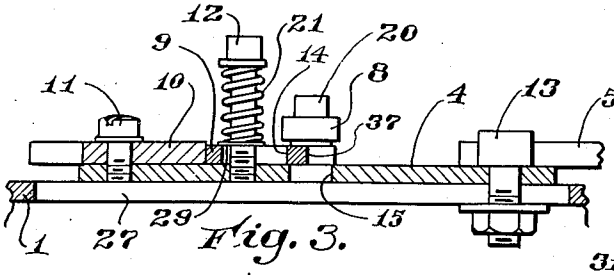


Fig. 3.

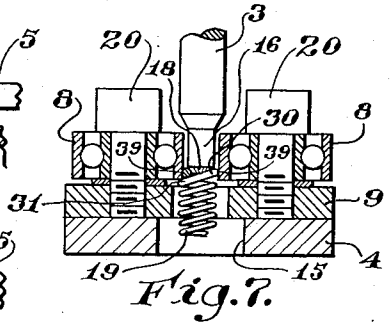


Fig. 7.

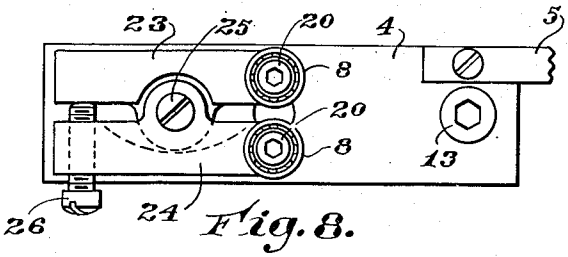


Fig. 8.

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COILING DEVICE AND ATTACHMENT FOR DRILL PRESSES OR THE LIKE

Filed June 5, 1947 2 SHEETS—SHEET 2

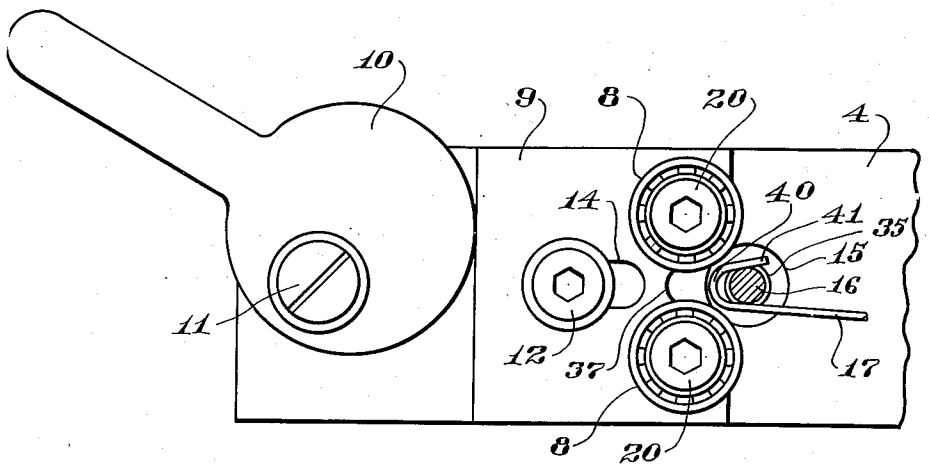


Fig. 9.

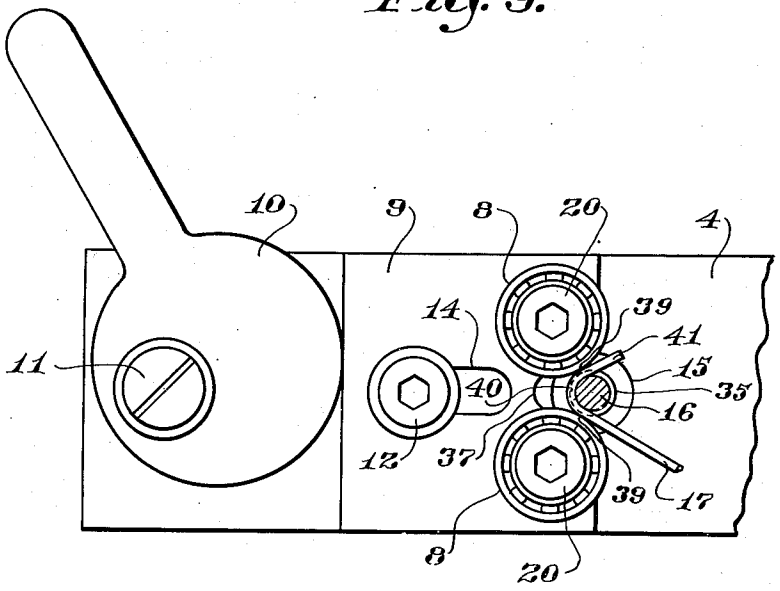


Fig. 10.

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COILING DEVICE AND ATTACHMENT FOR DRILL PRESSES OR THE LIKE

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4 Claims. (Cl. 153—64)

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The present invention relates to coiling machines, and more particularly to machines for coiling metal wire and other elastic materials into springs or other elastic coiled members.

An object of the invention is to provide a new and improved coiling machine that shall be simple in construction, efficient in operation and inexpensive.

A further object is to provide a new and improved coiling machine of the above-described character with the aid of which it shall be possible readily to change the spacing of the convolutions of the coil and, therefore, the pitch also.

A particular object of the invention is to provide a new and improved coiling attachment that may be readily adapted to existing machines, like drill presses, used previously for other purposes. Instead of necessitating the use of a separate expensive coiling machine, therefore, the present invention permits coiling with the aid of other machines at times when they are not otherwise in use.

Other and further objects will be explained hereinafter and will be particularly pointed out in the appended claims.

The invention will now be more fully explained in connection with the accompanying drawings, in which Fig. 1 is a fragmentary perspective of a drill press showing one form of the attachment of the present invention mounted thereon; Fig. 2 is a plan of the attachment shown in Fig. 1, upon a larger scale, but without the coiling mandrel; Fig. 3 is a longitudinal section, upon a still larger scale, taken upon the line 3—3 of Fig. 2, looking in the direction of the arrows; Fig. 4 is a fragmentary plan similar to Fig. 2, upon a still larger scale, partly in horizontal section upon the line 4—4 of Fig. 6, looking downward in the direction of the arrows; Fig. 5 is an elevation of the coiling mandrel shown in Fig. 1, upon a larger scale; Fig. 6 is a vertical section upon the broken line 6—6 of Fig. 4, looking in the direction of the arrows; Fig. 7 is a section similar to Fig. 6, showing the mandrel and the bending rolls differently adjusted relatively, in order to produce a differently pitched coil the convolutions of which are differently spaced; Fig. 8 is a view similar to Fig. 2 of a modification; Fig. 9 is a plan similar to Fig. 2, upon a larger scale, but showing also the mandrel in horizontal section, with an open loop of wire therearound prior to the commencement of the coiling operation; and Fig. 10 is a view similar to Fig. 9 showing the parts ready to commence coiling.

The novel attachment of the present invention comprises a coiling mandrel 3, shown clutched in

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the rotary chuck 2 of a drill press, and an attachment base supporting plate 4 secured to the bed frame 1 of the machine and on which is mounted a supporting-arm plate 9 or supporting plates 23, 24 for bending rolls 8. The bending rolls 8 cooperate with the mandrel 3 to convert a wire 17 into a coil 19. In order to facilitate their use with the attachment, the rolls 8 are shown as anti-friction rolls, instead of being positively driven.

Each anti-friction roll 8 is shown supported by ball bearings about a screw or axle 20 that is threaded into the roll-supporting plate 9, with a washer 26 interposed. As the screws or axles 20 are shown parallel to the mandrel 3, the anti-friction rolls 8 are freely rotatable on their ball bearings, in a plane at right angles to the mandrel 3, about axes parallel to the mandrel 3. The rolls 8 need not, however, necessarily be only two in number, as shown.

The effective or coiling part of the mandrel 3 is constituted of a portion 16 of reduced diameter that, as shown more particularly in Figs. 4, 9 and 10, is positioned preferably adjacent to, and somewhat in front of, the two rolls 8, along the perpendicular bisector of the line joining their centers. As is also shown in Figs. 4, 9 and 10, this reduced diameter of the coiling portion 16 of the mandrel 3 is preferably larger than the distance between the peripheral points of the two bending rolls 8 that are nearest to each other. When the wire 17 is caused to travel in the space between the mandrel 16 and the rolls 8, therefore, it becomes bent by reason of the bending pressure between the mandrel 3 and the rolls 8, as indicated at spaced points 38 in Fig. 4.

Before starting the coiling operation, the supporting plate 9 for the rolls 8 is first separated from the mandrel 3, as illustrated in Fig. 9, to carry the rolls 8 away from the mandrel 3. This enables slipping over the reduced coiling portion 16 of the mandrel, in a peripherally or circumferentially disposed groove 18 thereof, a loop 40 at the free end 41 of the wire 17. A cam 10 is then pivotally manipulated about a pivot 11, threaded in the attachment plate 4, to force the roll-supporting plate 9 toward the mandrel 3, thereby to cause the rolls 8 to engage the loop 40 of the wire 17, as illustrated in Fig. 10, in positions partially overlying the edge of the opening 15 in the base plate 4. The mandrel 3 is then started rotating. With the free end 41 of the wire 17 occupying the position shown, the mandrel 3 will be rotated clockwise. The roll-supporting plate 9 and the rolls 8 carried thereby are prevented from becoming displaced from

their adjusted position on the attachment plate 4 shown in Fig. 10, during the coiling operation, by the cam 10 engaging the plate 9.

During the rotation of the mandrel 3, the wire 17 becomes pulled progressively into the groove 18, first between the left-hand bending roll 8 and the coiling portion 16 of the mandrel 3, as shown by the left-hand numeral 39 of Figs. 6 and 7, and thereafter between the right-hand bending roll 8 and the coiling portion of the mandrel 3, as shown by the right-hand numeral 39, to produce the before-mentioned bends at 38. Nearly a half-convolution 33 becomes thus bent into the wire 17, between spaced points 38, in the plane 39—39, adjacent to the groove 18. The near-half-convolution 33 of the wire 17 becomes solidly clamped or gripped between the spaced points 38 and the walls of the groove 18. The walls of the groove 18, the peripheries of the rolls 8, or both, may be knurled or otherwise roughened, as shown at 34, Fig. 5, in order to increase frictionally the gripping or clamping action of the wire 17 by the rolls 8 against the walls of the groove 18 during their coiling of the wire 17. It is preferred to knurl the walls of the grove 18 only, as shown.

As the mandrel 3 is disposed somewhat in front of the peripheral portions of the rolls 8 that are nearest to each other, and as the diameter of the coiling portion 16 of the mandrel 3 is larger than the distance between these nearest-together peripheral portions, the nearly half-convolution portion 33 of the wire 17 is disposed around the periphery of the mandrel 3 over an angle of this periphery somewhat less than 180 degrees. It is for this reason that the portion 33 of the wire 17 between the spaced points 38 is not quite a half-convolution. The outside surface of the near-half-convolution 33 of the wire 17 is solidly gripped between the anti-friction rolls 8 and the inside surface by the walls of the groove 18.

With continued rotation of the mandrel 3, the now-bent portion of the wire 17 will become progressively forced out beyond the walls of the mandrel groove 18 and the right-hand anti-friction roll 8, as shown at 30, Figs 4, 6 and 7. With further continued rotation of the mandrel 3, the near-half-convolution 33 of the wire 17 will become converted into a complete convolution, the forward end 31 of which, as shown in Figs. 6 and 7, will become positioned directly under the still-unbent portion of the wire 17 that is about to enter the groove 18.

In due time, a portion of the coil 19, which may be represented as the free end 41 of the wire 17, shown in Figs. 9 and 10, or any other portion, such as the before-described portion 31, will descend below the level of the lower faces of the cylindrical wall portions of the rolls 8. As soon as this happens, becoming released from the confining action of the rolls 8, the portion of the coil 19 below the rolls 8, as it is constituted of spring metal, will, by reason of its inherent elasticity, expand suddenly outward, toward the left, as viewed in Figs. 6 and 7, under and into engagement with the lower face 36 of the cylindrical wall portion of the left-hand roll 8. The portion of the coil 19 so expanding outward is shown in Figs. 6 and 7 as the portion 31. By spring tension of the coil 19, this would tend to pull the whole wire 17 under the rolls 8. Such action is prevented, however, by reason of the fact that a portion of a convolution of the wire 17 is still confined

by the rolls 8 in the mandrel groove 18. The spring tension exerted on the portion 31 of the coil 19 by the face 36 of the left-hand roll 8, therefore, is transmitted only to the portion of the wire 17, shown at 30, that is just issuing from the mandrel groove 18, between the coiling portion 16 of the mandrel 3 and the right-hand roll 8. This portion 30 is maintained just below, but at nearly the level of, the mandrel groove 18 by the portion of the lower peripherally disposed shoulder 35 of this groove 18 that is disposed adjacent to the right-hand roll 8. The portion 30 cannot, therefore, move downward, in response to the spring tension exerted on the portion 31 by the lower face 36 of the left-hand anti-friction roll 8.

The part of the convolution of the coil 19 between the portions 30 and 31, therefore, becomes forced to assume the position illustrated in Figs. 6 and 7. The inclination to the axis of the mandrel 3 of this part of the convolution between the portions 30 and 31 is shown greater in Fig. 6 than Fig. 7, because the mandrel groove 18 is shown in Fig. 6 at a level above the face 36 of the left-hand roll 8 that is higher than the corresponding level shown in Fig. 7. The spacing of successive convolutions of the coil 19, and its consequent pitch, are thus determined by the distance between the shoulder 35 of the mandrel groove 18 and the lower face 36 of the left-hand bending roll 8. The lower face 36 of the left-hand roll 8, therefore, in combination with the position of the mandrel 3, thus constitutes a pitch-determining and convolution-spacing element.

By raising and lowering the mandrel 3 with respect to the position of the rolls 8, as through the medium of a handle 32 of the machine 1, it is possible, therefore, to control the spacing of successive convolutions of the coil 19 and the consequent pitch.

The coil 19, the pitch and the spacing of the convolutions of which have been thus determined, travels downward into a recess 37 of the bending-roll-supporting plate 9, and through the opening 15 in the attachment plate 4 and an elongated slotted opening 27 on the bed frame of the machine 1.

The wire 17 is fed between the mandrel 3 and the bending rolls 8 from a supply 7 of the wire on a reel 6 that is mounted on a pivoted arm 5. The wire 17 becomes automatically unwound from the reel 6 in response to the coiling of the wire about the rotating mandrel 3, as before described. During such automatic unwinding of the wire 17, it is kept more or less taut, at a desired angle, through the arm 5 becoming moved automatically about its pivot into engagement with the head of a bolt 13.

The bolt 13, as shown in Fig. 3, passes through an opening in the attachment plate 4 and through the elongated slotted opening 27 in the bed frame 1 of the machine, and cooperates with a nut to hold the attachment plate 4 fixed to the bed frame 1. The position of the attachment plate 4 on the bed frame 1 of the machine may be adjusted by adjusting the position of the bolt 13 in the elongated slotted opening 27.

The supporting plate 9, together with the bending rolls 8 carried thereby, is held firmly though yieldingly in engagement with the attachment base plate 4, in all positions of adjustment of the roll-supporting plate 9 on the attachment base plate 4, by a stiff coil spring 21. The spring 21 is shown mounted over a

screw 12 that, extending through a washer 29 that is disposed in engagement with the supporting plate 9 and an elongated slot 14 of the plate 9, is threaded into the attachment plate 4. The spring 21 is tensioned between the head of the screw 12 and the washer 29. It is because the slot 14 is elongated that it is possible, as before described, to adjust the supporting plate 9 upon the attachment plate 4 away from the mandrel 3, as shown in Fig. 9, and then toward the mandrel 3, as shown in Fig. 10. This adjustment, of course, is effected in opposition to the action of the spring 21. The adjustment of the bending rolls 8 away from the mandrel, illustrated in Fig. 9, as already stated, permits of separating the rolls 8 from the mandrel 3 in order to provide sufficient space in which to insert the open loop 40 at the free end 41 of the wire 17, prior to commencing the coiling operation. The adjustment illustrated in Fig. 10, according to which the loop 40 of the wire 17 becomes clamped by the rolls 8 against the walls of the groove 18 of the mandrel, permits of employing the attachment with wires 17 of different thickness and with mandrels 3 of different diameter. Within limits, moreover, it is possible to vary the diameter of the coil 19 even when employing mandrels 3 of the same diameter. The diameter of the coil 19 may be increased by adjusting the rolls 8 to a position not quite so far to the right, as shown in Fig. 10, so that the wire would not hug the walls of the groove 18 so tightly as has been described above. Though the effect of the gripping action of the knurled walls of the mandrel groove 18 becomes thereby lessened, a very effective coiling of a slightly larger-diameter coil may nevertheless be produced. Because of the yielding action of the spring 21, furthermore, the supporting plate 9 is rendered free to pivot about the screw 12 on the base 4, in order to enable the rolls 8 to adjust themselves automatically so as to maintain continuous engagement with the wire 17 during the coiling operation irrespective of variations in the uniformity of the diameter of different wires 17. The V-shape of the groove 18 adapts the device for operation with different-diameter wires 17 while continuing to maintain a firm grip between the groove 18 and the rolls 8 irrespective of the diameter of the wire 17.

In some cases, however, it is desirable to adjust not only the position of the rolls 8 relative to the mandrel 3, but also the distance between the rolls 8, particularly where mandrels 3 of substantially different diameter are to be employed. This result may be attained as illustrated, for example, in Fig. 8, according to which the rolls 8 are mounted upon the separate supporting plates 23 and 24, each pivoted to the attachment plate 4 at 25, and the pivotal adjustment of which is controlled by a set screw 26. Different-diameter rolls 8 could also be used. Wires 17 of different diameter may be coiled without varying the angle between the arms 23 and 24 by loosening the bolt 13, longitudinally adjusting the attachment support 4, and retightening the bolt 13 in its readjusted position in the elongated slotted opening 27. The supporting arms 23 and 24 are freely pivoted as a unit about the pivot 25 similarly to the pivotal arrangement of the supporting plate 9 about the pivot screw 12.

Further modifications will occur to persons skilled in the art, and all such are considered to

fall within the spirit and scope of the invention, as defined in the appended claims.

What is claimed is:

1. A coiling-device attachment for a machine provided with a frame and a rotary chuck for receiving a mandrel, said attachment comprising a base plate having an opening for receiving the completed coil, said base plate being adapted to be fixed to said frame, supporting means mounted on said base plate near said opening, parallel axles carried by said supporting means, coiling rolls for cooperating with the mandrel to form the coil therebetween and supported for rotation about said axles, each coiling roll being provided with a cylindrical wall portion, the lower faces of said wall portions being adapted partially to overlie the edge of said opening, whereby said coil may have its pitch determined by the lower face of one of said wall portions as said coil enters said opening, and means whereby said supporting means and rolls may be adjusted toward and away from said base plate opening.

2. A coiling-device attachment for a machine provided with a frame and a rotary chuck for receiving a mandrel, said attachment comprising a base plate having an opening for receiving the completed coil, said base plate being adapted to be fixed to said frame, a pair of arms, means for pivotally mounting said arms on said base plate, an axle spaced from said pivoted mounting means and carried by each of said arms in parallel relation, coiling rolls for cooperating with the mandrel to form the coil therebetween and supported for rotation about said axles, each coiling roll being provided with a cylindrical wall portion, the lower faces of said wall portions being adapted partially to overlie the edge of said opening, whereby said coil may have its pitch determined by the lower face of one of said wall portions as said coil enters said opening, and means whereby said arms and rolls may be adjusted about said pivotal mounting means to move said rolls toward and away from said base plate opening.

3. A coiling machine having, in combination, a frame, a rotary chuck, a cylindrical mandrel adapted to be clutched in the chuck and provided with a peripherally disposed groove, two rolls mounted upon the frame to rotate freely about axes substantially parallel to the axis of the mandrel adjacent to the groove when so clutched in the chuck and provided with wall substantially tangential to a substantially circular arc substantially concentric with the cylindrical surface of the mandrel at points spaced from each other less than 180 degrees along the said arc in order that inherently resilient material to be coiled may become gripped at said spaced points along said arc in the groove between the mandrel and the rolls, means supported by said frame whereby said rolls may be adjusted away from the mandrel in order to facilitate initially positioning the material in the groove between the mandrel and the rolls and toward the mandrel in order to grip the initially positioned material at said spaced points along said arc in the groove between the mandrel and the rolls, whereby rotation of the chuck will effect rotation of the mandrel about its axis to cause the mandrel to advance the material gripped at said spaced points in the groove between the mandrel and the rolls in order to coil the gripped material and to advance the coiled material beyond the groove into an unconfined space beyond a face of one roll in order to enable the coiled material to expand by its inherent resiliency in said unconfined space and in engage-

ment with said face to determine the pitch of the coiled material, the mandrel and the rolls being relatively adjustable longitudinally of the mandrel to adjust the pitch.

4. A coiling machine of the character described in claim 3 and in which the rolls are mounted upon a pair of arms pivotally adjustable upon the frame in order that the rolls may be adjusted toward and away from the mandrel.

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