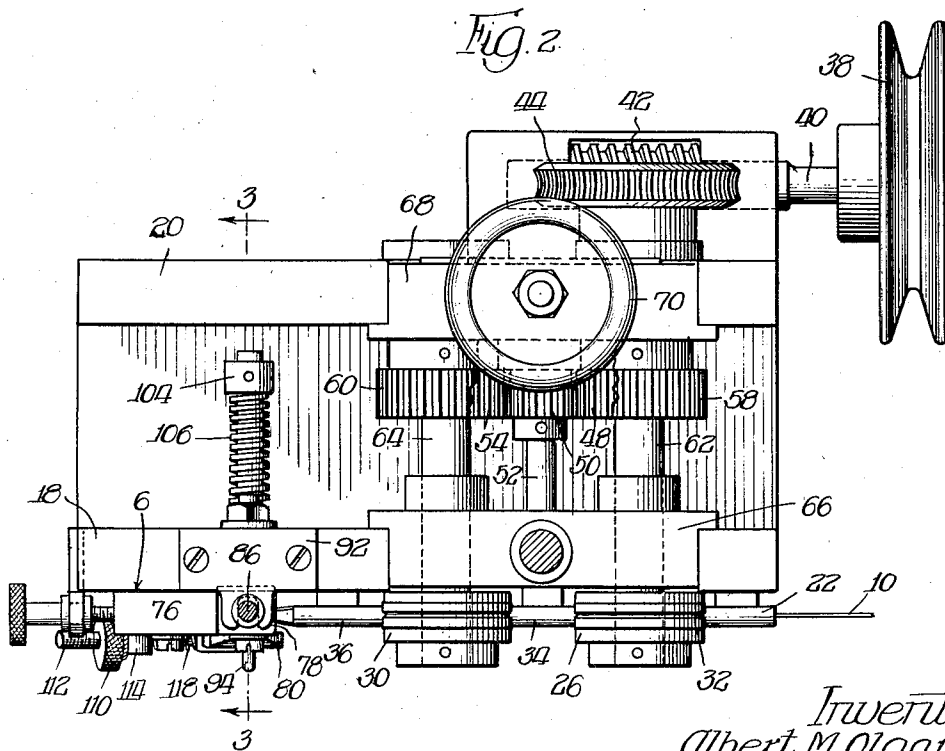


2,089,036

2 Sheets-Sheet 1



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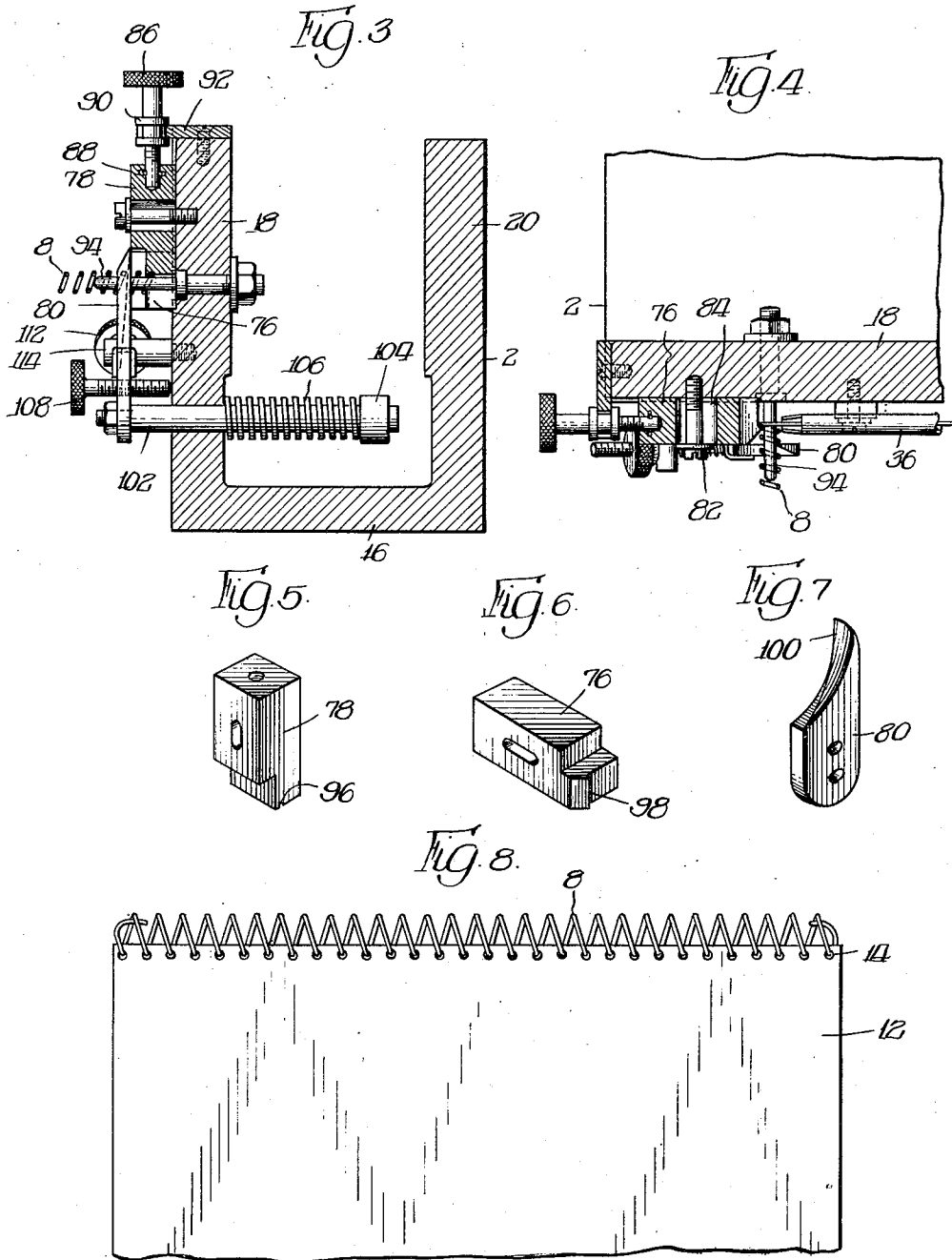
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WIRE COILING MACHINE

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WIRE COILING MACHINE

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17 Claims. (Cl. 153—65)

The present invention relates to coil forming machines and more in particular to machines for forming a continuous helical wire element.

Among the objects of the present invention is to provide a coil forming machine of simplified construction wherein the various working parts thereof may be readily adjusted and easily repaired or replaced.

The present invention comprehends the idea of providing a novel machine for continuously forming the helical wire element of any desired diameter and pitch.

Still another object of the present invention is to provide a novel coil forming machine wherein the parts are easily adjusted to vary the diameter of the coil, as well as to vary the pitch thereof as desired.

Other objects, features, capabilities and advantages are comprehended by the invention, as will later appear and as are inherently possessed thereby.

Referring to the drawings:

Figure 1 is a view in side elevation of a wire coiling machine made in accordance with the present invention;

Figure 2 is a top plan view of the machine shown in Figure 1 of the drawings taken in the plane represented by line 2—2 thereof;

Figure 3 is a view in cross-section taken in the plane represented by line 3—3 of Figure 2 of the drawings;

Figure 4 is a fragmentary view in cross-section taken in the plane represented by line 4—4 of Figure 1 of the drawings;

Figures 5, 6, and 7 are views in perspective of certain elements of the coil forming machine; and

Figure 8 is a fragmentary plan view of a notebook or the like disclosing the use of a coil made by the present machine.

Referring now more in detail to the drawings, a machine selected to illustrate the present invention is disclosed as comprising a frame or base 2 having a wire feeding mechanism 4 and a coil forming mechanism 6 for forming a coil 8 from a straight piece of wire 10. The coil 8, as disclosed in Figure 8 of the drawings, serves as a hinge element for connecting a plurality or stack of sheets of a notebook or the like 12 together, this notebook, if desired, being provided with front and back covers. As is well-known, a helix is formed by the uniform, longitudinal and angular progression of a point along the surface of a cylinder, and the present invention comprehends the idea of forming this wire coil

8 in the shape of a helix which may have any desired diameter depending upon the number of sheets which it is desired to secure together and which has a uniform pitch, the individual coils of the helical wire element being adapted to extend through the aligned and uniformly spaced openings 14 adjacent one edge of a plurality or stack of sheets of material. It is highly important that the spacing or pitch be uniform in order that the wire coil may be easily threaded through these openings during the assembly of the notebook. As disclosed in Figure 8 of the drawings, the length of the wire coil corresponds substantially to the width of the notebook or the like, and in order to lock the coil in position and to render the rough ends of the wire coil unobjectionable, these ends are bent inwardly to provide a smooth end construction. The advantages of connecting the sheets of a notebook or the like together by a coil of this construction are well-known, and it is accordingly within the purview of the present invention to provide a simple device which is adapted to form a continuous helical wire element which may be cut at intervals to provide these lengths of wire coil adapted for any width of notebook or the like.

The base or frame 2 preferably comprises a substantially U-shaped casting including a base 16 and upstanding walls 18 and 20. This base or frame may be secured in any desired manner to a proper foundation whereby the machine may be disposed in a position to be readily controlled by an operator. The wire 10, used in forming the wire coil 8, is supplied from a suitable source such as a roll or the like, the end thereof passing through a tubular guide member 22 to the wire feeding mechanism 4. This wire feeding mechanism includes a pair of cooperating rolls 24 and 26 and a second pair of cooperating rolls 28 and 30, each of which rolls is formed with an annular groove, such as 32, adapted to grip the wire to progressively feed the same at a uniform rate of speed to the coiling mechanism 6. After the wire 10 passes through rolls 24 and 26, the same is guided by a tubular guide member 34 to the rolls 28 and 30, after which the wire is received and guided by a similar tubular guide member 36 which terminates adjacent the coil forming mechanism 6.

The cooperating feed rolls are rotated by any suitable source of power, such as an electric motor or the like (not disclosed), which may, through a belt, rotate a pulley 38 fixed upon the end of a shaft 40 suitably mounted in the base

or frame 2. This shaft 40 is provided with a worm 42 meshing with a worm gear 44, which worm gear is mounted upon shaft 46. This shaft 46 is suitably journaled in the walls 18 and 20 of the frame and has the roll 24 mounted thereon at its forward end. Intermediate the ends of the shaft 46 and between walls 18 and 20 is a gear 48 which meshes with a pinion 50 mounted upon a shaft 52 suitably journaled in the walls 18 and 20 of the frame. Pinion 50 in turn meshes with a gear 54 mounted intermediate the walls 18 and 20 and in alignment with gear 48 upon a shaft 56 suitably journaled in these spaced walls. Shaft 56 at its forward end has the roll 28 mounted thereon. Meshing with gears 48 and 54 are gears 58 and 60, respectively. These gears are fixed to shafts 62 and 64, which have the rolls 26 and 30 mounted thereon at their forward ends in alignment with rolls 24 and 28, respectively. In order to provide for adjustment of the rolls 26 and 30 in respect to rolls 24 and 28 to accommodate various sizes of wire, the shafts 62 and 64 are journaled in the adjustable blocks 66 and 68, movably mounted within suitable openings in the walls 18 and 20, respectively, of the frame 2. These blocks 66 and 68 are each adjusted by means of a hand wheel 70 fixed to the upper end of a threaded shaft 72 mounted in the block, the lower end of this threaded shaft 72 being rotatably mounted but fixed against longitudinal movement as at 74 to a wall of the frame 2. It will therefore be clearly apparent that by suitable operation of the hand wheels 70, these blocks 66 and 68 may be moved in respect to walls 18 and 20 to adjust the cooperative relation of the wire feeding rolls to accommodate various sizes of wire.

The wire coiling mechanism 6 includes abutment blocks 76 and 78, as well as a pitch control member 80. Abutment blocks 76 and 78 are of somewhat similar construction, and each of them is secured to the front face of the wall 18 as by means of a set screw 82 extending through an elongated slot 84 in the block and engaging the wall 18. Each of these blocks may be adjusted, after the set screw has been loosened, by means of a thumb screw such as 86 mounted for rotation but fixed against longitudinal movement as at 88 in the block, a collar 90 threadedly mounted thereon being engaged by a yoke member, such as 92, which is secured in any desired manner to the wall 18.

Disposed adjacent the blocks 76 and 78 is a wire spindle 94 secured in any desired manner to the wall 18 and extending substantially normal thereto. The wire 10 passing through the tubular guide member 36 is received within and guided by wire groove 96 formed in the face of the block 78. The wire, as clearly shown in Figure 4 of the drawings, extends over the spindle 94 and engages the curved face 98 of the abutment block 76. This curved surface 98 in cooperation with the guiding groove 96 of block 78 causes the wire to be fed in the form of a coil onto the wire spindle 94. Inasmuch as the coil is in the form of a helical wire element, it is necessary to feed this wire to the blocks 76 and 78 at a uniform speed, and when the machine is initially started it is necessary to wind the end of the wire about the wire spindle 94. Further manipulation is unnecessary, and upon operation of the machine the wire is formed by the cooperative relation of abutments 76 and 78 to form the wire element upon the spindle 94 and to discharge the same normal to the direction

of feed of the wire 10. This may be a continuous operation, the operator cutting lengths of the coil as desired from time to time in accordance with the requirements for the particular job at hand.

The uniformity of pitch is maintained by the pitch control member 80 which is provided at one end with the substantially V-shaped edge 100 normally disposed adjacent the spindle 94 and in a position to progressively engage the coils of the wire element as the same is formed between the abutments 76 and 78 and on the spindle 94. This member is mounted upon the outer end of rod 102 which extends through an opening in the wall 18 and has a collar or the like 104 secured at its other end, a coil spring 106 being disposed between this collar and the inner face of wall 18, in order to urge the member 80 axially in respect to the axis of spindle 94. The position of member 80 with respect to the spindle 94 is determined by the adjustment of the thumb screw 108 which threadedly engages this member adjacent the mounting therefor upon the rod 102, the inner end of this thumb screw 108 engaging wall 18. Spring 106 therefore tends to move thumb screw 108 in any of its adjusted positions into engagement with the wall 18 to hold the pitch control member 80 in any of its adjusted positions. Movement of member 80 axially with respect to the spindle 94 effects a variation in the pitch of the helical wire element whereby this pitch or spacing between adjacent coils may be adjusted as desired.

The member 80 is adjusted radially with respect to the spindle 94 by means of a nut 110 threaded upon the end of a rod 112, which rod extends through an opening in a pin 114 connected to the face of wall 18 and is pivotally connected as at 116 to the member 80 in spaced relation to its mounting upon rod 102. Nut 110 is maintained in abutting relation with pin 114 by means of coil spring 118 disposed between pin 114 and the inner end of rod 112. This adjustment is desired to adapt member 80 for use with spindles of varying diameters.

The diameter of the helical wire element is controlled by the position of abutments 76 and 78. Under normal conditions for helical wire elements having a diameter of $\frac{5}{8}$ " or under, abutment 78 may remain in a fixed position, and abutment 76 adjusted to provide helical wire elements of varying diameters. Where it is desired to form such a wire element having a diameter greater than approximately $\frac{5}{8}$ ", both of the abutment blocks 76 and 78 are adjusted to form the same. Where it is desired to form helical wire elements of various diameters, it is recommended that a number of spindles be provided of different diameters to accommodate the various sizes of helical wire elements formed by the cooperation of abutment blocks 76 and 78. Where a change has been made in the size of the spindle, it is necessary of course to make the necessary adjustment to blocks 76 and 78 and member 80 whereby these members are suitably positioned in respect to the spindle 94.

While I have herein described and upon the drawings shown illustrative embodiments of the invention, it is to be understood that the invention is not limited thereto but may comprehend other constructions, arrangements of parts, details and features without departing from the spirit of the invention.

I claim:

1. A wire coiling machine comprising means 75

for progressively and uniformly feeding wire, means for forming a helical wire element therefrom, said means including abutment means and a spindle, said abutment means including an abutment adapted to guide said wire and an abutment disposed at substantially 90° to said first-named abutment for cooperating with said spindle to form said wire element, said spindle being disposed normal to the direction of feed of said wire, and a pitch control member cooperating with said wire mounted for pivotal and axial movement with respect to said spindle.

2. A wire coiling machine comprising means for progressively and uniformly feeding wire, means for forming a helical wire element therefrom, said means including abutment means and a spindle, said abutment means including an abutment adapted to guide said wire and an abutment disposed at substantially 90° to said first-named abutment for cooperating with said spindle to form said wire element, means for adjusting said abutments for varying the diameter of said wire element, said spindle being disposed normal to the direction of feed of said wire, and a pitch control member cooperating with said wire mounted for pivotal and axial movement with respect to said spindle.

3. A wire coiling machine comprising means for progressively and uniformly feeding wire, means for forming a helical wire element therefrom, said means including abutment means and a spindle, said abutment means including an abutment adapted to guide said wire and an abutment disposed at substantially 90° to said first-named abutment for cooperating with said spindle to form said wire element, means for adjusting said abutments for varying the diameter of said wire element, and means cooperating with said wire element on said spindle for maintaining a substantially uniform spacing of the coils of said wire element.

4. A wire coiling machine comprising means for progressively and uniformly feeding wire, means for forming a helical wire element therefrom, said means including abutment means and a spindle, said abutment means including an abutment adapted to guide said wire and an abutment disposed at substantially 90° to said first-named abutment for cooperating with said spindle to form said wire element, means for adjusting said abutments for varying the diameter of said wire element, and means cooperating therewith for regulating the pitch of said helical wire element.

5. A wire coiling machine comprising cooperating wire gripping rolls for progressively feeding wire from a source of supply, means for forming a continuous coil from said wire, means for guiding said wire to said rolls and from said rolls to said coil forming means, said coil forming means including cooperating coil forming abutments disposed at substantially 90° to one another and a spindle, and a pitch regulating member cooperating with the wire on said spindle to provide substantially uniform spacing of the coils.

6. In a wire coiling machine, the combination of a coil receiving spindle, means for forming a coil on said spindle from wire fed thereto, said means comprising adjustable abutments disposed at substantially 90° to one another, and pitch control means for said coil, said means comprising a pivotally mounted member slidably adjustable axially with respect to said coil and cooperating therewith.

7. In a wire coiling machine, the combination of a coil receiving spindle, means for forming a

coil on said spindle from wire fed thereto, said means comprising adjustable abutments disposed at substantially 90° to one another, and pitch control means for said coil, said means comprising a pivotally mounted member slidably adjustable axially with respect to said coil and cooperating with said spindle and oppositely disposed portions of said coil.

8. In a wire coiling machine, the combination of a coil receiving spindle, means for forming a coil on said spindle from wire fed thereto, pitch control means for said coil, said means comprising a pivotally mounted member slidably adjustable axially with respect to said coil and cooperating therewith, and resilient means for maintaining said member in said adjusted positions.

9. In a wire coiling machine, the combination of a coil receiving spindle, means for forming a coil on said spindle from wire fed thereto, said means comprising adjustable abutments disposed at substantially 90° to one another, pitch control means for said coil, said means comprising a member cooperating with said coil and movably mounted in a plane substantially normal to the axis of said coil, and means for adjustably positioning said member in said plane.

10. In a wire coiling machine, the combination of a coil receiving spindle, means for forming a coil on said spindle from wire fed thereto, pitch control means for said coil, said means comprising a member cooperating with said coil and movably mounted in a plane substantially normal to the axis of said coil, and means for adjustably positioning said member in said plane, said means including resilient means for holding said member in any of said adjusted positions.

11. In a wire coiling machine, the combination of a coil receiving spindle, means for forming a coil on said spindle from wire fed thereto, said means comprising adjustable abutments disposed at substantially 90° to one another, pitch control means for said coil, said means including a member cooperating with said coil, said member being movably mounted in a plane substantially normal to the axis of said coil and being slidably adjustable axially with respect to said coil, and means for adjustably positioning said member in said plane.

12. In a wire coiling machine, the combination of a coil receiving spindle, means for forming a coil on said spindle from wire fed thereto, pitch control means for said coil, said means including a member cooperating with said coil, said member being movably mounted in a plane substantially normal to the axis of said coil and being slidably adjustable axially with respect to said coil, means for adjustably positioning said member in said plane, and resilient means for holding said member in any of its adjusted positions.

13. In a wire coiling machine, the combination of a support having a base and an upstanding wall, a coil receiving spindle mounted in said wall and extending outwardly therefrom, means for feeding wire to said spindle being disposed in part adjacent the outside face of said wall adjacent said spindle, abutment means secured to the face of said wall adjacent said spindle cooperating with said spindle to form said coil, and a pitch control member mounted in said wall and cooperating with said coil for regulating the pitch of said coil.

14. In a wire coiling machine, the combination of a support having a base and spaced upstanding walls, a coil receiving spindle mounted in one of said walls and extending outwardly

therefrom, means mounted in said spaced walls for feeding wire to said spindle and being disposed in part adjacent the outside face of said wall adjacent said spindle, abutment means secured to the face of said wall adjacent said spindle cooperating with said spindle to form said coil, and a pitch control member mounted in said wall and cooperating with said coil for regulating the pitch of said coil.

10 15. In a wire coiling machine, the combination of a support having a base and spaced upstanding walls, a coil receiving spindle mounted in one of said walls and extending outwardly therefrom, means mounted in said spaced walls for feeding
15 wire to said spindle and being disposed in part adjacent the outside face of said wall adjacent said spindle, abutment means adjustably secured to the face of said wall adjacent said spindle cooperating therewith to form said coil, and a pitch
20 control member mounted in said wall for pivotal and axial adjustment with respect to said spindle.

16. In a wire coiling machine, the combination of a support having a base and an upstanding wall, a coil receiving spindle mounted in said wall and extending outwardly therefrom, means for
25 feeding wire to said spindle being disposed in part adjacent the outside face of said wall adjacent said spindle, abutment means secured to the face of said wall adjacent said spindle cooperating
30 with said spindle to form said coil, a pitch control member cooperating with said coil for regulating the pitch of said coil, and a mounting for

said pitch control member comprising a member fixed to said pitch control member and pivotally mounted in said wall, resilient means between said wall and second-named member, stop means operable against the compression of said resilient
5 means for adjusting said members axially with respect to said spindle, and adjustable stop means for regulating the angular position of said pitch control member with respect to said spindle.

17. In a wire coiling machine, the combination
10 of a support having a base and spaced upstanding walls, a coil receiving spindle mounted in one of said walls and extending outwardly therefrom, means mounted in said spaced walls for feeding wire to said spindle and being disposed
15 in part adjacent the outside face of said wall adjacent said spindle, abutment means adjustably secured to the face of said wall adjacent said spindle cooperating therewith to form said coil, a pitch control member cooperating with said coil
20 for regulating the pitch of said coil, and a mounting for said pitch control member comprising a member fixed to said pitch control member and pivotally mounted in said wall, resilient means
25 between said wall and second-named member, stop means operable against the compression of said resilient means for adjusting said members axially with respect to said spindle, and adjustable stop means for regulating the angular position of said pitch control member with respect
30 to said spindle.

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