Sept. 11, 1951 E. R. WORKMAN 2,567,537

WIRE WINDING MACHINE AND METHOD OF FORMING COILS OF WIRE

Filed July 5, 1945 2 Sheets-Sheet 1

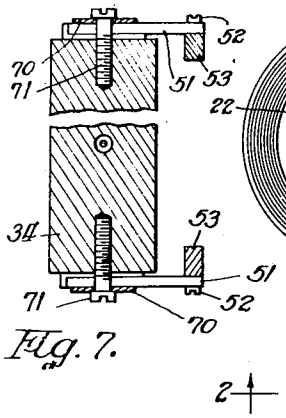


Fig. 7.

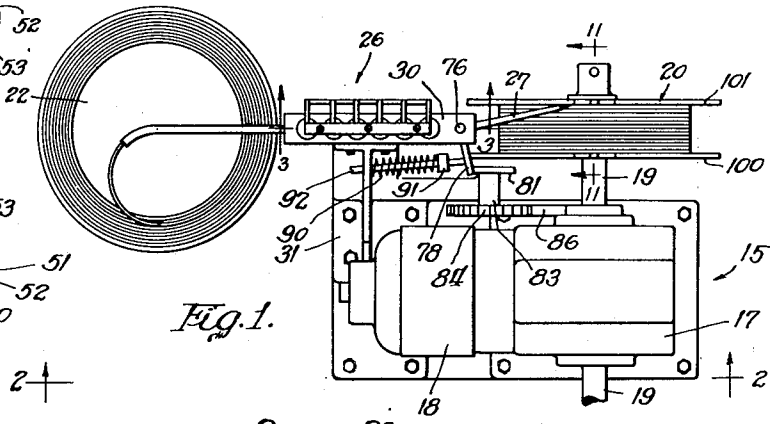


Fig. 1.

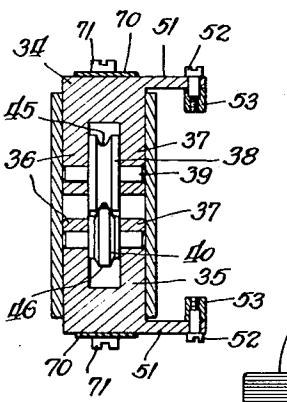


Fig. 8.

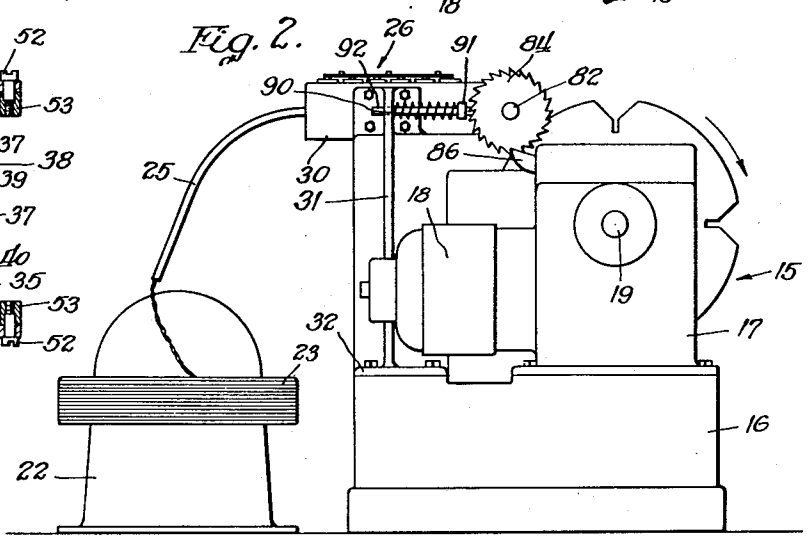


Fig. 2.

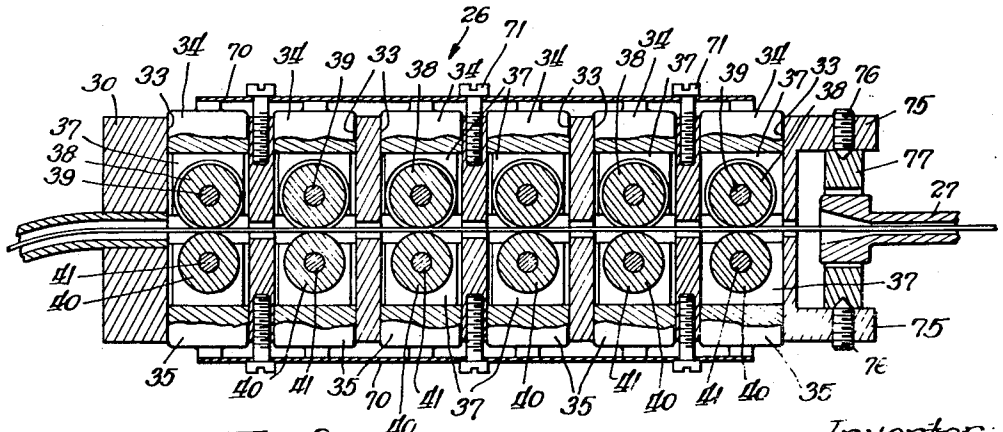


Fig. 3.

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WIRE WINDING MACHINE AND METHOD OF FORMING COILS OF WIRE

Filed July 5, 1945 2 Sheets-Sheet 2

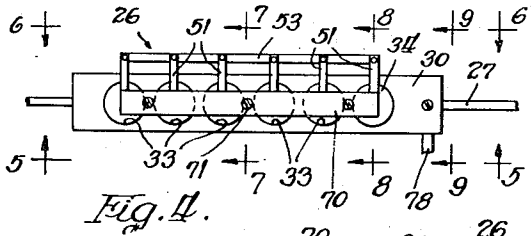


Fig. 4.

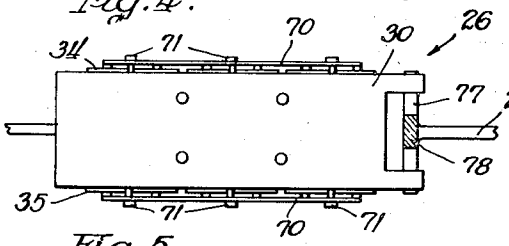


Fig. 5.

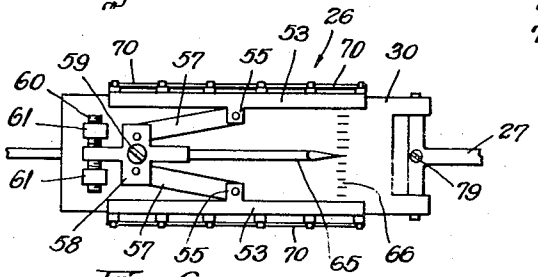


Fig. 6.

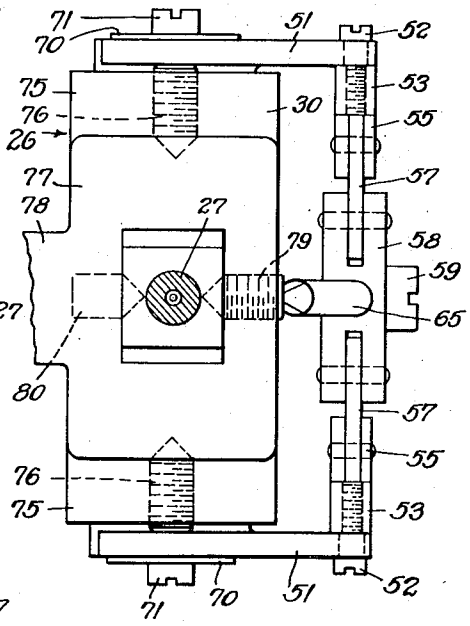


Fig. 9.

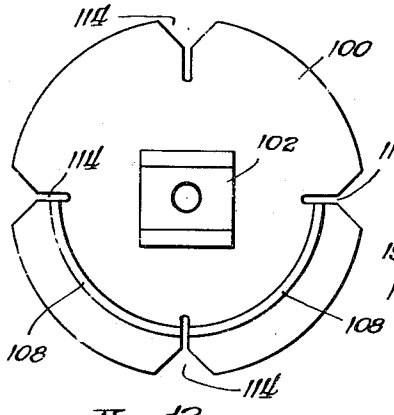


Fig. 12.

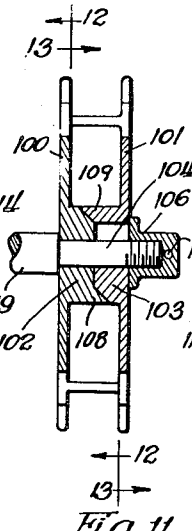


Fig. 11.

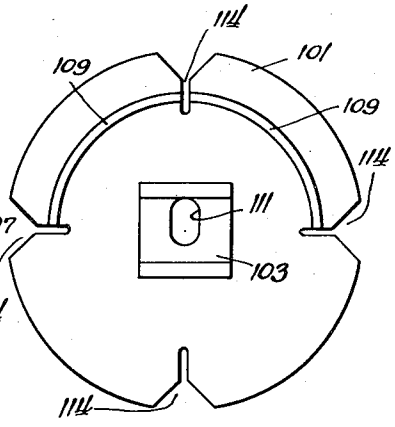


Fig. 13.

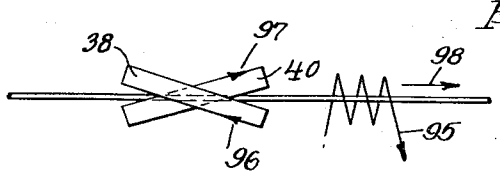


Fig. 10.

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2,567,537

UNITED STATES PATENT OFFICE

2,567,537

WIRE WINDING MACHINE AND METHOD OF FORMING COILS OF WIRE

Ernest Robert Workman, Chicago, Ill.

Application July 5, 1945, Serial No. 603,375

14 Claims. (Cl. 242—78)

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My present invention relates to an improvement in a wire winding machine, and a method of forming coils of wire, and more particularly is concerned with a machine and method for forming a coil of wire in which the wire has a torsion strain therein.

It is an object of my invention to provide a coil of wire from which the wire may be withdrawn with a coil stationary without having objectionable torsion strain present in the withdrawn wire.

A further object of my invention is to provide a method and means for forming a coil of wire with the wire having a torsion strain therein, which when the wire is withdrawn from the coil with the latter in a stationary position, the torsion strain tended to be created by withdrawal of the wire from the coil is neutralized by the torsion strain present in the wire.

In order to accomplish the aforesaid objects, I propose to withdraw wire from a stationary coil by which withdrawal the wire has a torsion strain imparted thereto, and rotatably rewinding the withdrawn wire so that the wire in the rewound coil has a torsion strain therein. The method of my invention in its essential aspects may thus be practiced by simply withdrawing wire from a stationary supply coil and rotatably rewinding the withdrawn wire in a second or rewound coil. Thus, if the wire in the rewound coil has a torsion strain therein tending to rotate the wire in, for example, a right hand direction, this torsion strain may be neutralized by withdrawing the wire from the rewound coil in a left hand direction. Machines suitable for carrying out the method herein involved in its simpler form need only to comprise a means adapted to support stationarily a supply coil of wire and a means to withdraw the wire from the stationary coil and wind it upon a rotatable drum. In the method and means above described it is desirable to control the wire so that when it is passing from the stationary supply coil to be rewound that the torsion strain in the withdrawn wire does not tend to kink or knot or otherwise become fouled by the torsion strain therein.

A preferred feature of my invention resides in the provision of means between the supply reel and the rewinding means for purposes of straightening the wire as it is drawn from the supply coil, and to prevent the tension strain therein from fouling the wire.

A further preferred feature resides in the provision of a straightening means for the wire withdrawn from the supply coil which comprises at least a pair of rollers arranged adjacent each

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other so that the wire passes therebetween, and in which the axis of the rollers extends transversely and diagonally of the lengthwise path of the withdrawn wire in opposite directions so that the moving wire is tended to be rotated in a direction to neutrally effect the torsion strain created in withdrawing the wire from the supply coil. The wire after passing through the straightening rollers is rewound upon a suitable rotatable drum or reel, and it will be observed that since the wire is tended to be rotated by the torsion strain therein and by the offset rollers of the straightening means, that a torsion strain is imparted to the wire as it is rewound upon the rotatable drum. In this manner the torsion strain is accumulated in the coil of wire on the rewinding drum.

A further preferred feature of my invention is in the provision of means comprising a rotatable drum for rewinding the wire with a torsion strain which means also serves to withdraw the wire from the supply coil and through the rollers of the wire straightening means in which the straightening rollers are caused to be driven by the wire passing therethrough.

A still further preferred feature of my invention resides in the provision of a rewinding reel or drum of a character that may be quickly collapsed for removing the rewound coil from the drum.

Further objects and advantages of my invention will appear from the detail description.

Now, in order to acquaint those skilled in the art with the manner of constructing and utilizing a machine in accordance with my invention, I shall describe in connection with the accompanying drawings a preferred embodiment of my invention and the method involved therein.

In the drawings:

Figure 1 is a plan view of a wire winding machine embodying the principles of my present invention;

Figure 2 is a side elevational view of the machine of Figure 1 taken on line 2—2 of the latter figure and looking in the direction indicated by the arrows;

Figure 3 is an enlarged vertical sectional view taken substantially on line 3—3 of Figure 1 looking in the direction indicated by the arrows showing the straightening means through which the wire passes from the supply coil to the wire rewinding means with certain of the parts being shown in elevation;

Figure 4 is an enlarged plan view of the wire straightening means of Figure 1;

Figure 5 is a side elevational view of one side

of the wire straightening means of Figure 4 taken on the line 5—5 of the latter figure and looking in the direction indicated by the arrows;

Figure 6 is a side elevational view of the other side of the wire straightening means of Figure 4 on the line 6—6 of the latter figure and looking in the direction indicated by the arrows;

Figure 7 is an enlarged vertical sectional view taken on line 7—7 of Figure 4 looking in the direction indicated by the arrows;

Figure 8 is an enlarged vertical sectional view taken on line 8—8 of Figure 4 looking in the direction indicated by the arrows;

Figure 9 is an enlarged end elevational view of the wire straightening means of Figure 4 taken on the line 9—9 of the latter figure and looking in the direction indicated by the arrows;

Figure 10 is a diagrammatic plan view illustrating the manner in which the wire passes through the wire straightening means of my invention;

Figure 11 is a central vertical sectional view of one form of reel or drum suitable for use with the machine illustrated in Figures 1 and 2;

Figure 12 is a view taken substantially on the line 12—12 of Figure 11 looking in the direction indicated by the arrows, and showing in elevation the inside of one of the two side frame members making up the reel or drum of the latter figure; and

Figure 13 is a view taken substantially on line 13—13 of Figure 11 looking in the direction indicated by the arrows and showing in elevation the inside of the other of the two side frame members making up the reel or drum of the latter figure.

Referring now to Figures 1 and 2, the wire winding machine 15 of my invention preferably comprises a base member 16 upon which a driving gear unit 17 of any suitable and known type is mounted, which gear unit comprises an electric motor 18 as a source of motive power which electric motor 18 through the provision of known worm reduction gearing is adapted to drive the worm gear shaft 19. A rewinding reel or drum 20 is mounted on the shaft 19 for rotation therewith and this reel 20 may be of certain present known forms or may be of a construction to be hereinafter described of one preferred form of reel of my invention for use with the machine of Figures 1 and 2. The driving unit 17, in the embodiment of my invention herein disclosed, is constructed so that, as viewed in Figure 2, the reel 20 is adapted to be driven in a clockwise direction.

A supply coil supporting means 22 comprising an inverted substantially cylindrical pot member having a semi-spherical upper end is mounted adjacent the base member 16 and supports a coil of wire 23. The wire coil 23 in the usual practice of my invention will in most instances be a regular mill coil and in which, the wire while in the form of the coil, is free of torsion strain. The inverted pot member or supporting means 22 is of a character for supporting the supply coil of wire against rotation, and as shown the wire is withdrawn from the coil 23 through a flexible guide tube 25 through wire straightening means indicated generally at 26 and a guide tube 27 to the reel 20. The driving unit 17 serves to rotate the reel 20 to which the free end of the wire from the supply coil 23 is suitably secured causing the wire to be withdrawn from the supply coil 23 in a counterclockwise direction as viewed in Figure 1 so that the wire as it is being withdrawn has

a torsion strain imparted thereto tending to rotate the wire in a right hand direction as viewed in Figure 1.

The method of my invention in its broader aspects simply comprises the steps of withdrawing wire from a stationary supply coil, and rotatably rewinding the withdrawn wire so that the wire in the rewound coil has a torsion strain therein. Assuming the direction of withdrawal of the wire is as described in Figure 1 so that it has a torsion strain tending to turn the wire in a right hand direction, then rotatably rewinding this wire in a coil upon the reel 20 is effective so that upon withdrawal of the wire from the rewound coil while stationary and in a left hand direction neutralizes the torque or torsion strain present in the wire. In other words the torsion strain created by the left hand withdrawal of the wire from the stationary rewound coil is neutralized by the right hand torsion strain present in the wire in the rewound coil.

Referring again to Figures 1 and 2 it will be seen that the wire straightening means 26 comprises a frame or block member 30 which is secured by a plurality of bolts to a flange at the upper end of a bracket 31, which bracket has a flange 32 at its lower end for securing it to the base member 16. The bracket 31 supports the wire straightening means at the upper end of the machine and through which the wire from the supply coil passes in a lengthwise path to the rewinding reel or drum 20. The frame or block member 30 as more clearly shown in Figures 3 and 4 has a plurality of cylindrical bores 33 extending vertically therethrough, and into which bores from the upper and lower surfaces of the block or frame member 30 a pair of cylindrical upper and lower roller supporting members 34 and 35, respectively, extend. The roller supporting members 34 and 35 at their inner ends are slotted to provide a pair of arms 36 and 37 and between which arms of the upper cylindrical roller supporting members 34, rollers 38 are rotatably mounted upon pivot pins 39 the opposite ends of which are supported in the arms 36 and 37. Between the arms 36 and 37 of each of the lower cylindrical roller supporting members 35 a roller 40 is rotatably mounted upon a pivot pin 41 the ends of which are mounted in the arms 36 and 37.

As shown more clearly in Figure 8, it will be seen that the upper rollers 38 are each provided with a centrally inwardly extending peripheral groove 45, and that the lower rollers 40 each have a central peripheral tongue 46 of a diameter so that the cylindrical surfaces thereof are adapted to extend slightly within the grooves 45 of the upper rollers 38 to confine the wire in the groove 45 in passage thereof through the several pairs of opposed upper and lower rollers 38 and 40.

The roller supporting members 34 and 35 are each provided with an arm 51 extending laterally of one side of the block 30 the outer ends of which are each connected by a pivot pin 52 to a pair of upper and lower links 53. The several upper cylindrical roller supporting members 34, at the upper end of the block 30, are all connected to the upper link 53, and all of the lower cylindrical roller supporting members 35 are all connected to the lower link 53 so that the several upper cylindrical roller supporting members 34 may be rotated simultaneously to the same degree in the bores 33 of the block member 30, with the same also being true of the several cylindrical roller supporting members 35 extending inwardly

of the bores 33 from the lower end of the frame member or block 30.

As shown in Figure 6, it will be seen that the links 53 substantially intermediate the ends thereof are each formed with a forked lug 55 between which one each of a pair of links 57 are pivotally connected at one end, with the links 57 at their other end having pivotal connection between forked lugs of an indicator supporting member 58 which is pivotally mounted by a screw 59 having threading engagement with the frame or block member 30. The supporting member 58 is provided with a screw 60 extending through one end thereof and which screw 60 has threading engagement with a pair of projections 61 formed as part of the frame member 30 so that the supporting member 58 may be rotated about its pivot by adjustment of the screw 60. It will be seen that with this construction pivotal movement of the indicating lever supporting member 58 through the links 57 will cause rectilinear movement of the pair of links 53 lengthwise of the frame 30 in opposite directions, which by reason of the connection of the links 55 with the laterally extending arms 51 of each of the cylindrical roller supporting members 34 and 35 causes rotary movement of the latter in opposite directions relative to the other to provide for positioning the axes of rotation of the several rollers supported in the cylindrical roller supporting members diagonally and transversely of the lengthwise path of the wire in passing through the wire straightening means 26. The indicating frame member 58 at its other end carries a pointer 65, which together with a scale 66 on the adjacent side of the frame or block member 30 provides for setting of the axes of the several rollers any desired amount.

The connections above described between the cylindrical roller supporting members 34 and 35, and the links 53, together with the link 57, and the indicating supporting frame member 58 is preferably such that when the pointer 65 is in the central position shown in Figure 6, all of the rollers will be positioned with their axes at right angles to the path of movement of the wire being drawn through the several rollers.

It will also be observed that a pair of flat leaf spring members 70 one each extend along the upper and lower surfaces of the frame member 30 in engagement with the outer ends of each of the cylindrical roller supporting members 34 and 35. The springs 70 are secured by a plurality of screws 71 which have threaded engagement with portions of the block or frame member 30 between certain of the cylindrical bores 33 thereof. The springs 70 thus provide for retaining the several cylindrical roller supporting members 34 and 35 in position within the cylindrical bores 33 of the block 30, and the force of the springs 70 tend to urge opposed pair of upper and lower cylindrical roller supporting members 34 and 35 toward each other. The tension of the springs 70 may be adjusted by means of the plurality of screws 71 which secure the spring members 70 to the block or frame member 30.

Referring again to Figure 3 and Figure 9, it will be observed that the end of the block or frame member 30 from which the wire leaves the wire straightening means 26, is provided with a pair of arms 75 having a pair of screws 76 threaded therein which pivotally support a trunnion 77 having an arm 78 projecting substantially at right angles therefrom. The tube 27 is pivoted at one end to the trunnion 77 by means of a screw 79 and pivot pin 80 carried by the trunnion, as shown in Figures 6 and 9. The outer end of the arm 78 of the trunnion 77 engages a cam 81 (see Figure 1) fixed to one end of a horizontally extending shaft 82 rotatably mounted in a bearing 83 and which shaft at its other end carries a ratchet wheel 84. A pawl 86 is suitably keyed to the worm gear shaft 19 in a known manner for driving the ratchet 84 to cause rotation of the cam 81 which cam causes movement of the trunnion 77 about its pivotal mounting on the opposite pointed ends of the screws 76 to cause the tube 27 to traverse the axis of the rewinding reel 20 axially to and fro thereof to feed the wire coming from the wire straightening means 26 in successive layers upon the rewinding reel or drum 20. The arm 78 is adapted to be held in engagement with the surface of the cam 81 by means of a spring 90 which is confined between an abutment 91 on a push rod 92, and the bracket 31 which supports the wire straightening means so that the spring 90 exerts a force to maintain the arm 78 in engagement with the surface of the cam 81.

It will be understood that the size of the ratchet and its number of teeth, together with the travel of the pawl 86 and the shape of the cam 20, are suitably arranged and designed with respect to the size of the wire and the width of the rewinding reel so as to rotate the outer end of the guide tube 27 about its pivot to effect winding of the wire on the rewinding coil or drum 20 in even layers.

It will be seen in Figure 1 that the worm gear shaft 19 extends laterally from each side of the drive unit 17, and it will be understood that the bracket 31 may also be duplicated on the other side of the machine so that the single motorized unit 17 may be utilized to effect the winding of a pair of coils of wire with the equipment previously described being duplicated at the other side of the machine.

Reference may now be had particularly to Figures 3 and 10 from which it will be observed that the wire as it is drawn from the supply reel 23 by rotation of the drum or reel 20 passes through the tube 25 and enters the wire straightening means 26. The upper and lower rollers 38 and 40 are positioned as shown in Figure 10 with their axes extending transversely and diagonally of the lengthwise path of the wire passing through the wire straightening means in opposite directions with respect to each other, the arrangement of the axes of the rollers being such that as when the wire is being withdrawn from the supply reel in a counterclockwise direction, as shown in Figures 1 and 2, a torsion strain is imparted thereto tending to rotate the wire in a right hand direction. Each pair of upper and lower rollers 38 and 40 are thus positioned with their axes extending diagonally of the lengthwise path of the wire and in opposite directions with respect to each other to effect rotation of the wire in the right hand direction, as indicated by the arrow 95 in Figure 10. The directions of rotation of the upper and lower rollers are indicated by the arrows 96 and 97, respectively. The arrow 98 indicates the general direction of travel of the wire through the wire straightening means 26.

It will thus be observed that the wire is tended to be rotated by the several pairs of rollers in the same direction that the torsion strain in the wire tends to rotate it. Now, with the wire being wound upon the winding reel 20 it, in effect, is

being restrained against this right hand turning which upon being wound upon the reel imparts a torsion strain to the wire as it is wound upon the rewinding reel 20. After all the wire from the supply coil 23 has been fed through the machine as described, the wire upon the rewound reel 20 will have a torsion strain therein tending to rotate the wire in a right hand direction. Now after the rewound coil has been completed, the coil may be removed from the reel. Then by holding the rewound coil stationary the wire may be withdrawn in a left hand direction, which withdrawal of the wire has the torsion strain tended to be accumulated in the wire by such removal neutralized by the torsion strain present in the wire.

It is to be observed that by adjustment of the linkage mechanism comprising the indicator supporting member 58, the position of the axes of the several pairs of rollers in the straightening means 26 may be positioned to provide for rewinding of wire in either the left hand or right hand direction or the amount of torsion strain to be accumulated in the wire wound in the rewind reel may be adjusted by positioning of the axes of the several rollers to that end. The machine thus described in connection with Figures 1 and 2 may be readily adjusted to reverse the diagonal position of the axes of the rollers from the position shown in Figure 10 in which case the wire from the supply reel may be withdrawn in the left hand direction to provide the wire in the rewound reel with a torsion strain therein tending to rotate it in the left hand direction, which may be neutralized in withdrawing wire from the rewound reel while in stationary position in a right hand direction. The machine therefore is adaptable for carrying out my invention with either right or left hand withdrawal of the wire from a supply reel or of the neutralized wire from a rewound coil as desired.

It is to be observed therefore that in the machine and method, as above described, of forming a coil of wire having a torsion strain therein as accocmplished by withdrawing wire from a stationary reel so that a torsion strain is imparted thereto, and permitting the wire to rotate in the direction the torsion strain tends to rotate it, and to rewind the wire into a coil while a torsion strain is being imparted thereto. Thus the method of my invention in its simplest form only requires the withdrawal of wire from a stationary coil and rotatably rewinding the wire into a second coil so that the effect of the torsion strain in withdrawing it from the stationary supply coil in effect causes a torsion strain to be accumulated in the wire in the rewound coil.

The wire straightening means 26 is not essential in the practice of my invention but is preferred in that it affords a means of control of the wire to prevent it from kinking and knotting in passing from a supply coil to the rewind reel, and also to effect straightening of the wire which frequently in the coils as supplied by wire manufacturers is bent and of irregular shape. By virtue of the positioning of the axes of the upper and lower rollers of the wire straightening means, the wire is rotated in passing through each of the several pairs of upper and lower rollers, which rollers will impart a bending effect for straightening the wire, and since the wire is continuously rotating this bending effect will be applied from all angles to the wire as it is passing through the wire straightening means 26 so as to effect straightening of the wire with the least amount of bending of the same.

Although many forms of rewinding reels or drums may be utilized in my invention, I have shown in Figures 11, 12 and 13 one preferred form of reel or drum 20 for use with the machine and method of my invention.

As shown in the figures last referred to the reel or drum 20 comprises a pair of side frame members 100 and 101, which are provided with hub portions 102 and 103, respectively, which hub portions are suitably formed with openings extending therethrough for mounting the same on the reduced end 104 of the worm gear shaft 19. The reduced outer end 104 of the worm gear shaft 19 is preferably threaded to receive a nut 106 for drawing the reel tightly upon the end of the shaft 19, which nut 106 may be provided with an opening 107 extending therethrough for insertion of a bar or other instrument to draw the nut tightly upon the threaded end of the reduced portion 104 of the worm gear shaft 19. The side frame member 100 comprises a pair of laterally inwardly extending arcuate projections 108 which together in effect form a substantially semi-cylindrical sleeve defining a portion of a spool for the reel. The side frame member 101 is formed with a pair of laterally inwardly extending arcuate projections 109 which projections 109 in effect also form a semi-cylindrical portion of a spool for the reel. The side frame members 100 and 101 are adapted to be assembled with the lateral projections 108 and 109, respectively, disposed toward each other so that the two semi-cylindrical portions defined by the inwardly arcuate projections 108 and 109, in effect, form a spool between the side frame members 100 and 101. The hub portions 102 and 103 of the side frame members 100 and 101 are suitably formed so that they are only adapted to be assembled with the lateral projections 108 and 109 assembled, as shown in Figure 11, so that the projections form the spool for the reel. This may be accomplished by providing suitable complemental tapered surfaces on each of the inner ends of the hub members 102 and 103, as shown in Figure 11 of the drawing. The side frame member 101 is provided with elongated opening 111 therethrough so that the reel may be collapsed upon loosening of the nut 106 which permits shifting of the lateral projections 109 of frame member 101 radially inwardly of the coil of wire on the drum so as to release the wound coil for removal from the reel. Also, it will be observed that each of the side frame members 100 and 101 are provided with a plurality of radially inwardly extending slots 114 preferably having a V-shaped portion at the rims of the side frame members which slots project inwardly beyond the arcuate portions 108 and 109 to provide for the passage of tie wires to secure the coil in its wound position prior to removal of the side frame member 101. In this manner the wire wound in the coil in the reel 20 will not become displaced or the even layers disturbed during its removal from the reel 20.

While I have shown what I consider to be the preferred embodiments of my invention, it will be understood that various modifications and rearrangements may be made therein without departing from the spirit and scope of my invention.

I claim:

1. In a machine of the character described comprising means for withdrawing wire from a supply coil, a rewind reel for winding the with-

drawn wire in a rewound coil, and means for rotating the withdrawn wire a predetermined amount about its longitudinal axis in its travel from said supply coil to said rewound coil whereby the wire in said rewound coil has a predetermined torsion strain therein.

2. In the machine of the class described, the combination of means for supporting a supply coil of wire, means for withdrawing wire from said coil, a rewind reel for rewinding the wire thus withdrawn in a second coil, and means for rotating the withdrawn wire a predetermined amount about its longitudinal axis in its travel from the first coil to the second coil whereby the wire in said second coil has a predetermined torsion strain therein.

3. In a machine of the class described the combination of means adapted to support a supply coil of wire, means including a rotatable drum adapted to withdraw the wire in a lengthwise path from said supply coil, and winding the withdrawn wire into a second coil, means comprising a plurality of rollers between said first two means through which the wire is adapted to pass in its lengthwise path upon being withdrawn from said supply coil, said rollers being arranged with their axes adapted to extend transversely of the axis of said path of lengthwise movement of the wire and diagonally in opposite directions thereof so that said rollers tend to rotate the wire passing therethrough, whereby the wire wound into said second coil has a torsion strain therein.

4. In a machine of the class described the combination of means adapted to support a supply coil of wire, means including a rotatable drum adapted to withdraw the wire in a lengthwise path from said supply coil, and wind the wire withdrawn into a second coil, means comprising a plurality of rollers between said first two means through which the wire is adapted to be drawn in its lengthwise path upon being withdrawn from said supply coil, said rollers being arranged with their axes adapted to extend transversely of the axis of said path of lengthwise movement of the wire and diagonally in opposite directions thereof so that said rollers tend to rotate the wire passing therethrough, whereby the wire wound into said second coil has a torsion strain therein, and oscillating guide means between said rollers and said rotatable drum for guiding the wire thereon to and fro axially of said drum.

5. In a machine of the class described the combination of means for withdrawing wire from a supply source, a rotatable reel for receiving said wire to wind the same in a coil, and means between said supply source and said reel for rotating the wire a predetermined amount about its longitudinal axis to provide the same with a predetermined amount of torsion strain therein.

6. In a machine of the class described the combination of means for withdrawing wire from a supply source, a rotatable reel for receiving said wire to wind the same in a coil, means between said supply source and said reel for rotating the wire about its longitudinal axis to provide the same with a torsion strain, and means for said last named means for adjusting the latter to provide for rotating the wire a predetermined amount to provide the wire in the coil with a predetermined amount of torsion strain therein.

7. In a machine of the class described the combination of means for withdrawing wire in

a lengthwise path from a supply source, a rotatable reel for receiving said wire to wind the same in a coil, means including a plurality of rollers in the path for said wire between which said wire is adapted to pass and said rollers being arranged with their axes extending diagonally of the longitudinal axis of said wire whereby the latter is caused to be rotated about its longitudinal axis by said rollers.

8. In a machine of the class described the combination of means for withdrawing wire in a lengthwise path from a supply source, a rotatable reel for receiving said wire to wind the same in a coil, means including a plurality of rollers in the path for said wire between which said wire is adapted to pass, and said last named means including means for adjusting said rollers to vary the diagonal relation of the axes thereof with respect to the longitudinal axis of said wire.

9. In a machine of the class described the combination of means for withdrawing wire in a lengthwise path from a supply source, a rotatable reel for receiving said wire to wind the same in a coil, means in said path including a plurality of rollers between which the wire is adapted to pass, and said rollers having their axes extending diagonally of the longitudinal axis of the wire in said path for rotating the wire about its longitudinal axis and for straightening the wire as it passes therethrough.

10. In a machine of the class described, the combination of means for withdrawing wire in a lengthwise path from a supply source, a rotatable reel for receiving said wire to wind the same in a coil, and means disposed in said path through which said wire is adapted to pass for rotating said wire about its longitudinal axis and engaging the wire about its periphery to straighten the same.

11. The method of drawing wire substantially free of torsion strain from a stationary coil comprising the steps of drawing wire from a stationary supply coil to impart a predetermined torsion strain thereto, rotatably winding the withdrawn wire into a rewound coil to retain the predetermined torsion strain therein, and then retaining the rewound coil stationary and drawing the wire therefrom in a direction so that the torsion strain normally tended to be created thereby is neutralized by the torsion strain present in the wire.

12. In a machine of the class described, the combination of means for withdrawing wire in a lengthwise path from a supply source, a rotatable reel for receiving said wire to wind the same in a coil, means including a plurality of roller means in the path of said wire between which said wire is adapted to pass, each of said roller means having co-engaging rollers in which one of the rollers is provided with a peripheral groove through which the wire is adapted to pass and in which the other of the rollers is provided with a peripheral tongue projecting into said groove for retaining the wire therein, and said roller means being arranged with their axes extending diagonally of the axis of said path of lengthwise movement of the wire.

13. In a machine of the class described, the combination of means for withdrawing wire in a lengthwise path from a supply source, a rotatable reel for receiving said wire to wind the same in a coil, means including a plurality of roller means in the path of said wire between

which said wire is adapted to pass, each of said roller means having co-engaging rollers in which one of the rollers is provided with a peripheral groove through which the wire is adapted to pass and in which the other of the rollers is provided with a peripheral tonguge projecting into said groove for retaining the wire therein, and each pair of said rollers being arranged with their axes extending transversely of the axis of said path of lengthwise movement of the wire and diagonally in opposite directions thereof so that said rollers tend to rotate the wire about its longitudinal axis while passing therethrough.

14. In a machine of the class described, the combination of means for withdrawing wire in a lengthwise path from a supply source, a rotatable reel for receiving said wire to wind the same in a coil, means including a plurality of roller means in the path of said wire between which said wire is adapted to pass, each of said roller means having co-engaging rollers in which one of the rollers is provided with a peripheral groove through which the wire is adapted to pass and in which the other of the rollers is provided with a peripheral tongue projecting into said groove for retaining the wire therein,

and said roller means being arranged with their axes extending diagonally of the axis of said path of lengthwise movement of the wire, and said means including means for adjusting said rollers to vary the diagonal relation of the axes thereof with respect to the longitudinal axis of said wire.

ERNEST ROBERT WORKMAN.

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