March 7, 1939. G. M. PRENTICE 2,149,942

COIL FORMING MACHINE

Filed Aug. 31, 1938

Fig. 1.

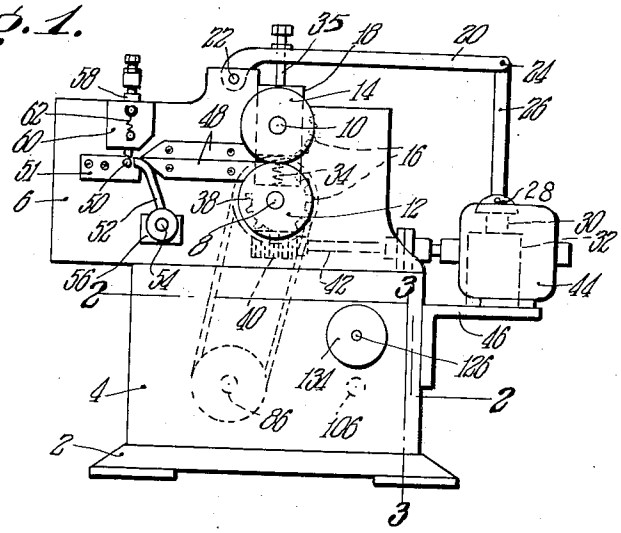


Fig. 2.

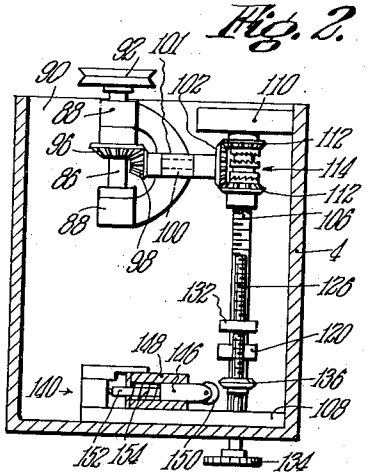


Fig. 4.

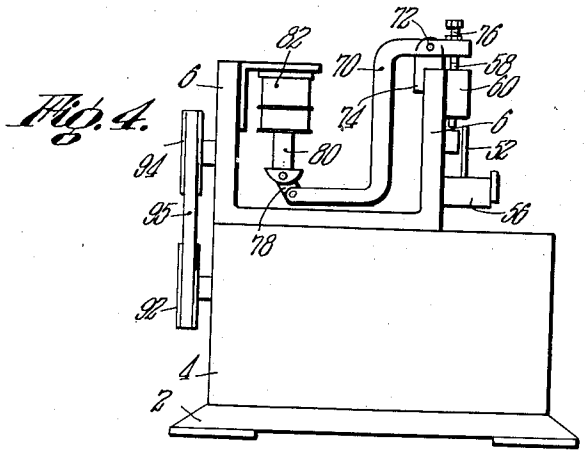


Fig. 3.

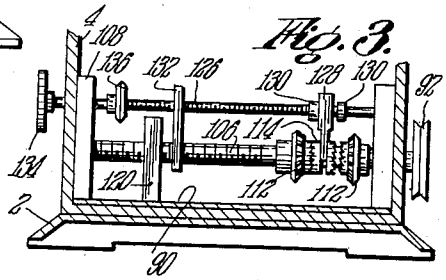
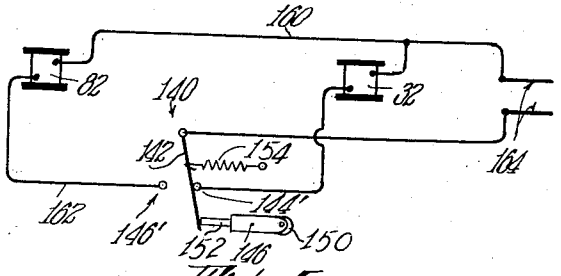


Fig. 5.



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COIL FORMING MACHINE

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Application August 31, 1938, Serial No. 227,799

8 Claims. (Cl. 153—67)

This invention relates to improvements in machines for forming a coil or helix from wire and this application is a continuation in part of an application filed by me on June 6, 1938, Ser. No. 212,147.

According to the principal objects of this invention, a machine is provided for forming coils from wire which is characterized by novel means for controlling the length of the coil being formed and as coils are formed successively they are cut off so that successive coils of a predetermined length are provided.

Various other novel features and advantages of the invention will be hereinafter more fully referred to in connection with the accompanying description of the preferred form of the invention.

In the drawing:

Fig. 1 is a front elevational view of a machine embodying the novel features of the invention;

Fig. 2 is a sectional plan view on the line 2—2 of Fig. 1;

Fig. 3 is a sectional elevational view on the line 3—3 of Fig. 1;

Fig. 4 is a side elevational view looking at the machine from the left in Fig. 1; and

Fig. 5 is a wiring diagram to explain certain features of the invention.

Referring now to the drawing more in detail the invention will be fully described.

A base plate is provided which is shown at 2 and on this there is a hollow base 4 which encloses certain parts of the mechanism. On the upper side of base 4 there are a pair of vertically extending spaced apart plates such as 6.

A lower shaft 8 is rotatable in the members 6 and an upper shaft 10 is journalled in bearing blocks 18 that are slidable, up and down, relative to the shaft 8 in slots provided in members 6, as shown. Rolls 12 and 14 having peripheral grooves are carried by the shafts 8 and 10 and when the said rolls are close together in feeding relation they feed wire for forming into a coil.

The shafts 8 and 10 carry intermeshing gears 16 whereby said shafts are operatively connected. A lever 20 is pivoted at 22 to one of the members 6 and has its outer end pivotally connected at 24 to a link 26.

The link in turn is connected at 28 to the movable member 30 of a solenoid 32. And an adjusting member 35 in threaded engagement with the lever 20 is arranged to engage the upper side of a box or boxes 18. A spring 34 below said box or boxes 18 tends to urge the same upwardly to separate the rolls 8 and 10.

When solenoid 32 is energized the member 30 thereof is moved downwardly to pull lever 20 downwardly and depress box 18 causing rolls 12 and 14 to feed wire forwardly. When current is cut off from the solenoid 32 the springs 34 move boxes 18 upwardly thereby separating the rolls 12 and 14 so that the wire is no longer fed thereby.

A worm gear 38 on shaft 8 is in engagement with a worm 40 of a shaft 42 which is connected to a motor 44. Motor 44 in the operation of the machine is in continuous rotation hence the feeding of the wire is interrupted by separation of rolls 12 and 14. A mandrel 50 in a block 51 receives the wire fed forwardly by the rolls 12 and 14 through guides 48 to form the wire into a coil.

A finger 52 extends upwardly from a shaft 54 in block 56. The finger threadedly engages said shaft 54 so as to be adjustable back and forth and control the pitch of the coil being formed.

A cutter 58 slidable up and down in a block 60 is provided for cutting off wire thereby to provide separate coils. A lever member 70 is pivoted at 72 to a bracket 74 and has an adjusting screw 76 on its outer end which engages the upper side of cutter 58. The lower end of lever 70 is connected by a link 78 to the movable member 80 of a solenoid 82.

As the solenoid 82 is energized, lever 70 is operated to depress cutter 58 and cut off the wire.

The mechanism described and the operation thereof is like or similar to that described in my pending application above referred to. In the operation thereof, wire is fed forwardly while solenoid 32 is energized. When current is cut off from said solenoid, the solenoid 82 is energized to cut the wire. Thus by energizing solenoid 32 for a predetermined length of time, a coil of predetermined length may be formed.

Mechanism for controlling the action of the solenoids and forming the important features of this invention will now be described.

A shaft 86 is rotatable in bearings 88 associated with a plate 90 and carries a pulley 92. Shaft 8 has a pulley 94 fixed thereto which is connected by a belt 95 to pulley 92 so that shaft 86 is driven from shaft 8.

A shaft 100 rotatable in a bearing 101 has a gear fixed thereto at one end which is in mesh with a gear 96 of shaft 86 while a gear 102 is fixed to the other end of said shaft.

A shaft 106 has its ends rotatable in blocks 108 and 110 and has fixed thereto spaced gears 112 which are provided on inner sides with clutch teeth for engaging with teeth of a clutch member 114, as shown in Fig. 3. The member 114 is slidable but nonrotatable on shaft 106.

The gears 112 are in mesh with gear 102 of shaft 100. With shaft 100 being continuously in rotation and in one direction the member 114 may be moved in one direction or the other to clutch either one or the other of the gears 112 to shaft 106 and in that way shaft 106 may be rotated in opposite directions.

The shaft 106 is provided with a screw thread as shown and a block 120 in threaded engagement therewith slides back and forth on plate 90 according to the direction of rotation of shaft 106.

An upper shaft or rod is journalled in blocks 108 and 110 and it carries a clutch shifter 128 between collars 130 fixed thereon. The shifter 128 is in operative engagement with clutch member 114. The shaft 126 is rotatable and reciprocable in the blocks 108 and 110 and as it reciprocates in one direction or the other the shifter is caused to move the clutch member.

A nut 132 in threaded engagement with shaft 126 has its lower end formed to loosely embrace shaft 106. As shaft 126 is rotated the nut 132 is moved therealong and longitudinally of shaft 106.

A cam member 136 for operating a switch mechanism, as will be described, is carried by shaft 126 and a manually engageable member 134 is provided on said shaft to facilitate rotation thereof. By rotating shaft 126 in opposite directions the nut 132 is moved towards and away from cam 136. A switch indicated generally by 140 is provided. This may take various forms but preferably will consist of a member 142 for contacting with contacts 144' and 146'. Normally contact 142 is held in contact with contact 144' by means of a spring indicated by 148.

A plunger 146 slidable in a block 148 carries a roll 150 in its forward end and a stem 152 on its rear end engages and acts on member 142 of the switch. A spring 154 acts on plunger 146 to move it to the right or return it to the position shown after the plunger has been depressed by cam 136.

In Fig. 5 solenoid 32 is shown as being connected with solenoid 82 by lines 160 and 162 to the switch mechanism described and current supply 164.

In the operation of the apparatus the shaft 8 is rotated continuously so that shaft 106 is rotated continuously. Normally, switch member 142 is in the position shown so that solenoid 32 is energized and thereby rolls 12 and 14 are in feeding relation so that a coil is formed. As shaft 106 rotates, member 120 is moved thereby in one direction or the other according to the direction of rotation of said shaft until said member 120 engages either cam 136 or the member 132. As member 120 engages one of the members on shaft 126, the said shaft is moved axially. As it moves axially the cam 136 acts on plunger 146 and the shifter 128 acts on clutch member 114.

As plunger 146 is depressed switch member 142 leaves contact 144' to break the circuit including solenoid 32, and contacts contact 146' to energize the circuit including solenoid 82. Thus the feed rolls assume a non-feeding relation to stop the feeding of wire while the cutter cuts off the wire forming a coil.

The parts are so arranged that the cam 136, as shaft 126 is rotated, passes from one side to the other of the axis of roll 150. Thus the cam moves up to and engages the roll, depresses member 146 and comes to rest on the other side of the roll.

As shifter 128 moves clutch member 114 the other one of the gears 112 is clutched to shaft 106 to reverse the direction thereof.

In a general way the member 120 travels the distance between cam 136 and member 132 and as it engages one or the other of said members the switch is operated to stop feeding of the wire while the cut-off is actuated. By changing the spacing of members 132 and 136 by rotating shaft 126 the length of the coils being formed may be varied.

While I have described the invention in great detail and with respect to the present preferred form thereof, it is not desired to be limited thereto since many changes and modifications may be made therein without departing from the spirit and scope of the invention. What it is desired to claim and secure by Letters Patent of the United States is:

1. The combination in a machine for winding successive coils from wire comprising, cooperating rolls for feeding wire relatively movable between feeding and non-feeding position, means for maintaining said rolls in feeding relation including a solenoid, a drive shaft for said feed rolls, means for receiving wire from said feed rolls and forming the same into a coil, means for cutting off successive coils therefrom including a solenoid, separate circuits for said solenoids, and means for alternately opening the said circuits so that the solenoids operate to permit the feed rolls to assume non-feeding positions while the cutting means is operated, including a shaft operatively connected to said drive shaft through a reversing mechanism, and a switch mechanism for said circuits operated by reversal of rotation of said shaft.

2. The combination in a machine for winding successive coils from wire comprising, cooperating rolls for feeding wire relatively movable between feeding and non-feeding positions, means for maintaining said rolls in feeding relation including a solenoid, a drive shaft for said feed rolls, means for receiving wire from said feed rolls and forming the same into a coil, means for cutting off successive coils therefrom including a solenoid, separate circuits for said solenoids, and means for alternately opening the said circuits so that the solenoids operate to permit the feed rolls to assume non-feeding positions while the cutting means is operated, including a threaded shaft, a nut movable back and forth thereby, a switch device for alternately opening and closing said circuits, reversible driving connections between said first-named shaft and threaded shaft having a movable shifter, and means operable by said nut to operate said switch device and shifter.

3. The combination in a machine for winding successive coils from wire comprising, cooperating rolls for feeding wire relatively movable between feeding and non-feeding positions, means for maintaining said rolls in feeding relation including a solenoid, a drive shaft for said feed rolls, means for receiving wire from said feed rolls and forming the same into a coil, means for cutting off successive coils therefrom including a solenoid, separate circuits for said solenoids, and means for alternately opening the said circuits so that the solenoids operate to permit the feed rolls to assume non-feeding positions while the cutting means is operated, including a threaded shaft, a nut movable back and forth thereby, a switch device for alternately opening and closing said circuits, reversible driv-

ing connections between said first-named shaft and threaded shaft having a movable shifter, a movable member engageable by said nut having means operatively engageable with said switch device and said shifter.

4. The combination in a machine for winding successive coils from wire comprising, cooperating rolls for feeding wire relatively movable between feeding and non-feeding position, means for maintaining said rolls in feeding relation including a solenoid, a drive shaft for said feed rolls, means for receiving wire from said feed rolls and forming the same into a coil, means for cutting off successive coils therefrom including a solenoid, separate circuits for said solenoids, means for alternately opening the said circuits so that the solenoids operate to cause the feed rolls to assume non-feeding positions while the cutting means is operated, including a threaded shaft, a switch device for alternately opening and closing said circuits, reversible driving connections between said first-named shaft and said threaded shaft having a movable shifter, a member movable in opposite directions having members operatively engageable with said switch device and shifter, a nut on said threaded shaft movable back and forth thereby, and engageable connections associated with said nut and movable member whereby the latter is moved by the former.

5. The combination in a machine for winding successive coils from wire comprising, cooperative rolls for feeding wire relatively movable between feeding and non-feeding positions, a means for maintaining said rolls in feeding relation, a drive shaft for said rolls, a means for receiving wire from said rolls and for formation into a coil, a means for cutting off successive coils therefrom, solenoids operable by separate circuits, and a means for alternately opening and closing said circuits so that said solenoids permit said rolls to assume non-feeding positions while said cutting means is operated including a shaft connected to said drive shaft and a switch mechanism for said circuits operated by said shaft.

6. The combination in a machine for winding successive coils from wire comprising, cooperating rolls for feeding wire relatively movable between feeding and non-feeding positions, a means for maintaining said rolls in feeding relation, a drive shaft for said rolls, a means for receiving wire from said rolls and forming same into a coil, a means for cutting off successive coils therefrom, solenoids operable by circuits, and a means for alternately opening and closing said circuits so said solenoids operate to permit said rolls to assume non-feeding positions while said cutting means is operated including a shaft and a switch device for alternately opening and closing said circuits and reversible driving connections between said drive shaft and the other said shaft, and a member operable by said shaft having a means to operate said switch device.

7. The combination in a machine for winding successive coils from wire comprising, cooperating rolls for feeding wire relatively movable between feeding and non-feeding positions, a means for maintaining said rolls in feeding relation, a drive shaft for said rolls, a means for receiving wire from said rolls and forming same into a coil, a means for cutting off successive coils therefrom, solenoids operable by circuits, a means for alternately opening and closing said circuits so said solenoids operate to permit said rolls to assume non-feeding positions while said cutting means is operated including a shaft and a switch device for opening and closing said circuits and a member movable on said shaft and a driving connection between said drive shaft and said shaft whereby said member is operatively engageable with said switch device.

8. The combination in a machine for winding successive coils from wire comprising, cooperating rolls for feeding wire relatively movable between feeding and non-feeding positions, a means for maintaining said rolls in feeding relation, a drive shaft for said rolls, a means for receiving wire from said rolls and forming same into a coil, a means for cutting off successive coils therefrom, solenoids operable by separate circuits, a means for opening and closing said circuits so that said solenoids operate to permit said rolls to assume non-feeding positions while said cutting means is operated including a shaft and a switch device and a driving connection between said drive shaft and said shaft having a movable shifter and a movable member operatively engageable with said switch device and said shifter all adapted and arranged whereby said movable member is actuated by said shaft.

GEORGE M. PRENTICE.