

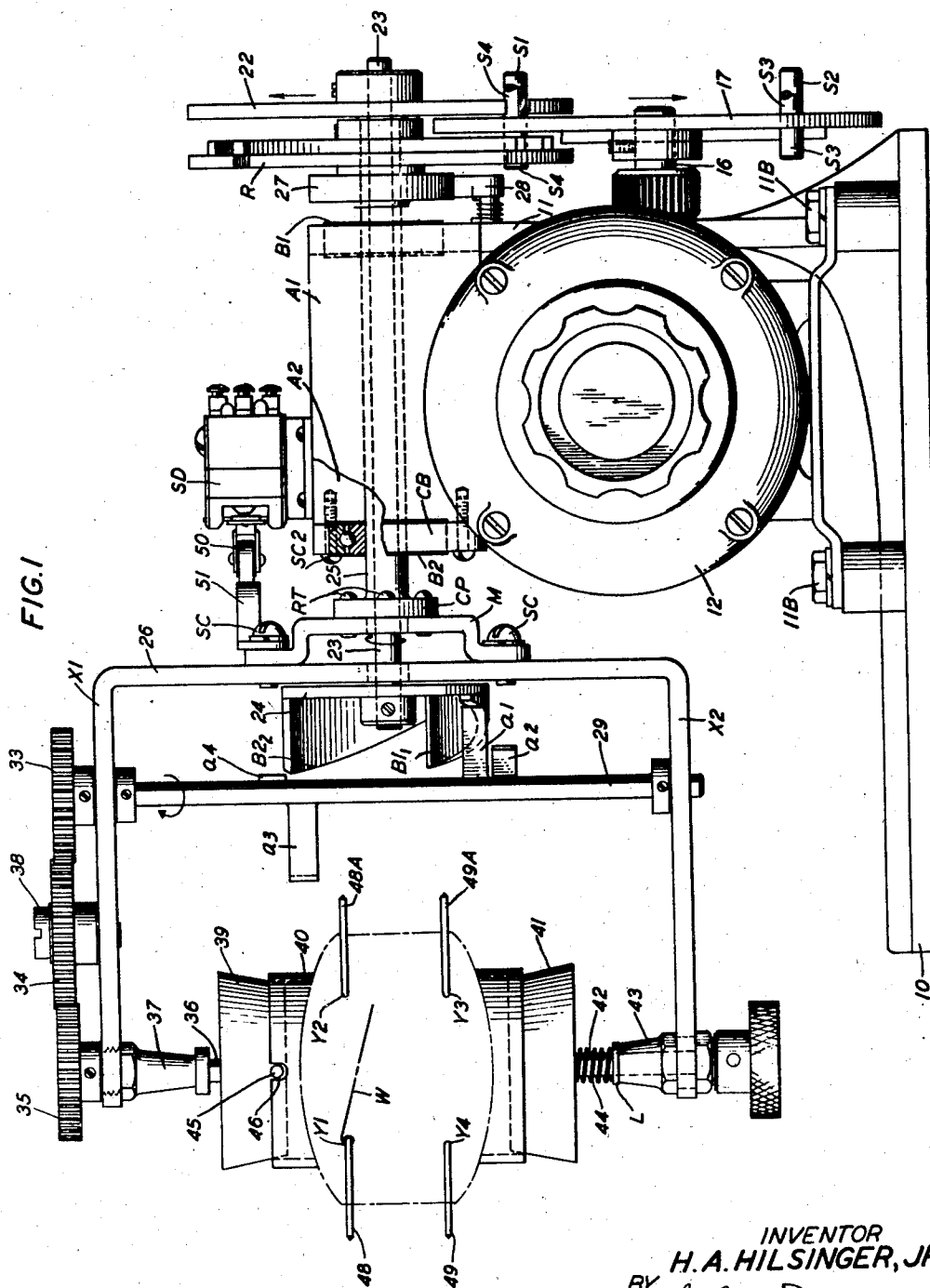
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H. A. HILSINGER, JR
COIL WINDING MACHINE

2,453,749

Filed June 7, 1946

4 Sheets-Sheet 1



INVENTOR
H. A. HILSINGER, JR.
BY *J. MacDonald*
ATTORNEY

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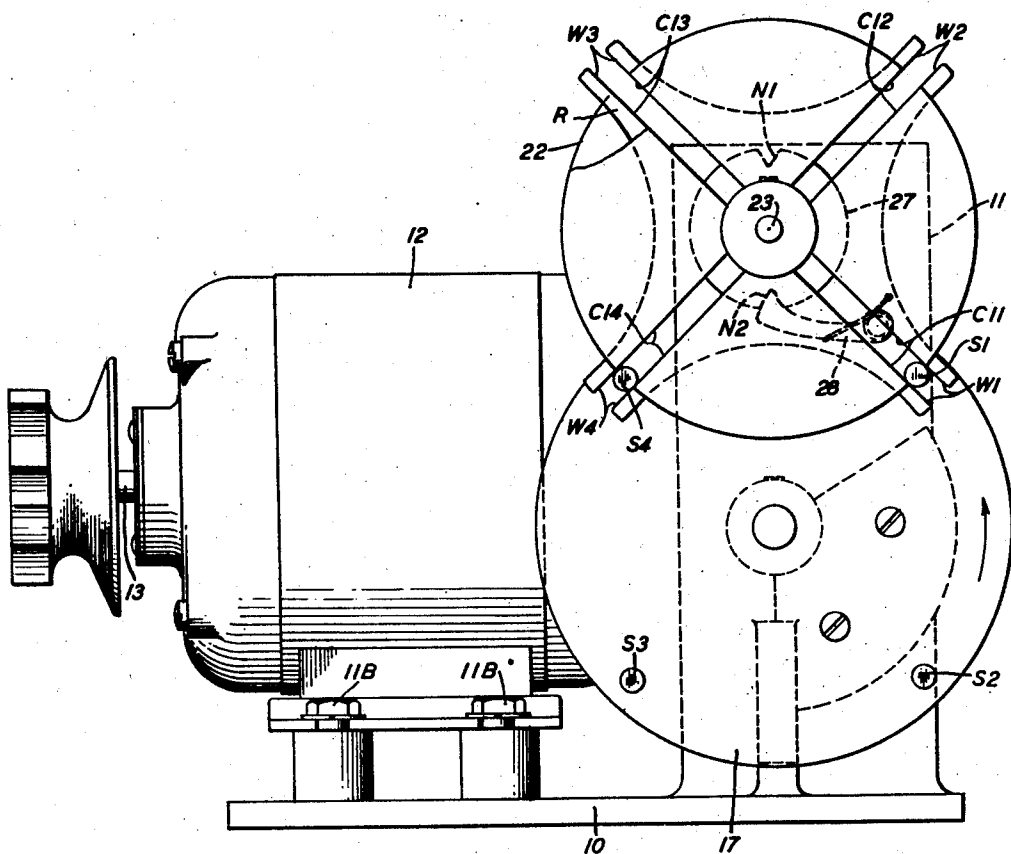
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FIG. 2



INVENTOR
H. A. HILSINGER, JR.
BY *J. Mac Donald*
ATTORNEY

Nov. 16, 1948.

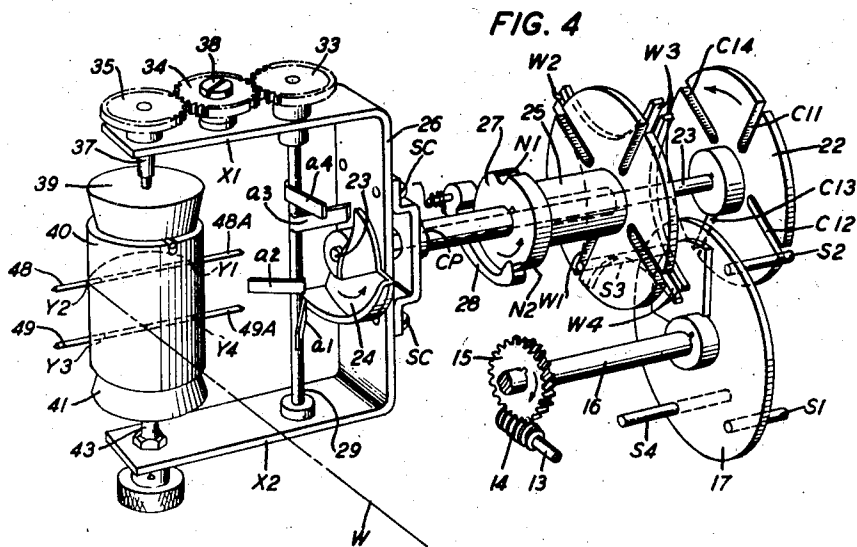
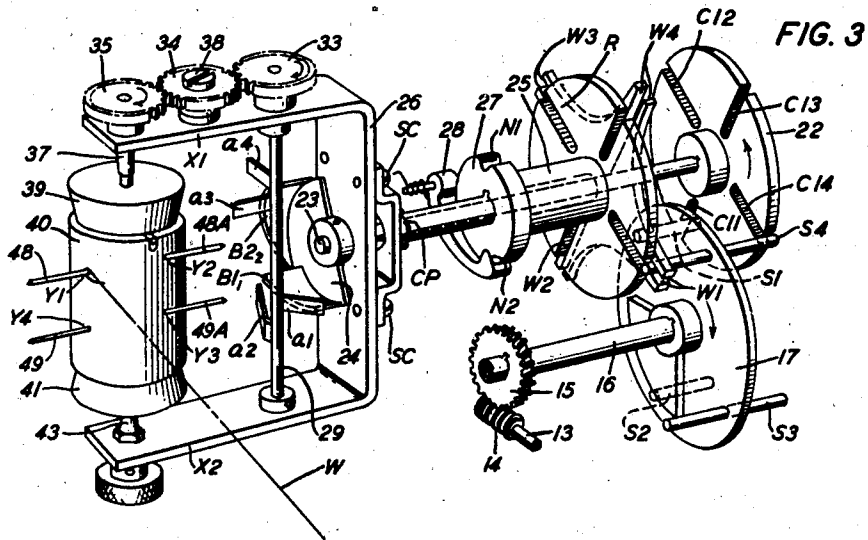
H. A. HILSINGER, JR

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INVENTOR
H. A. HILSINGER, JR.
BY *J. MacDonald*
ATTORNEY

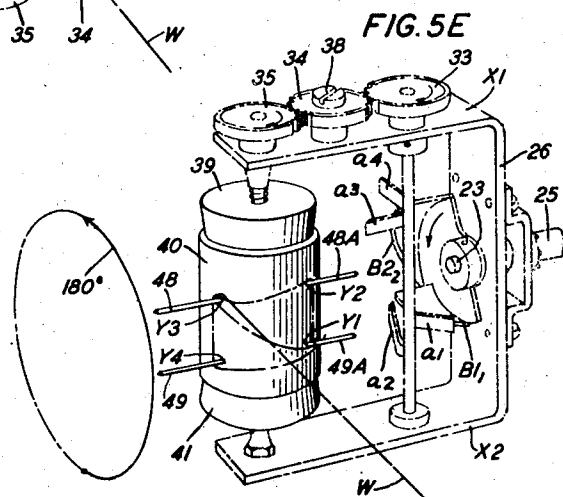
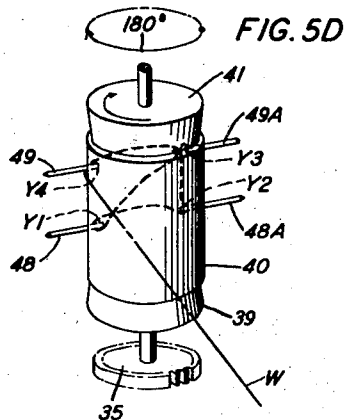
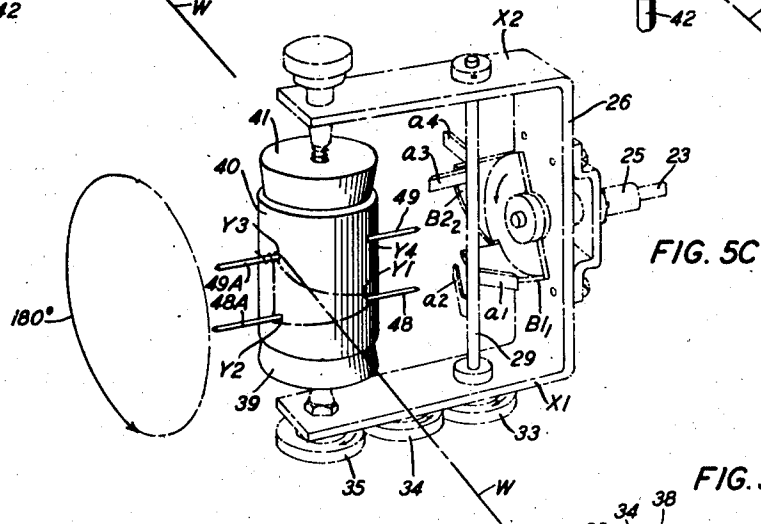
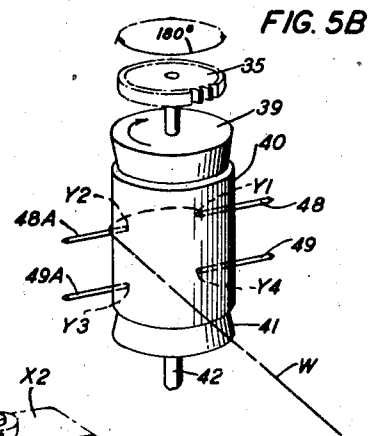
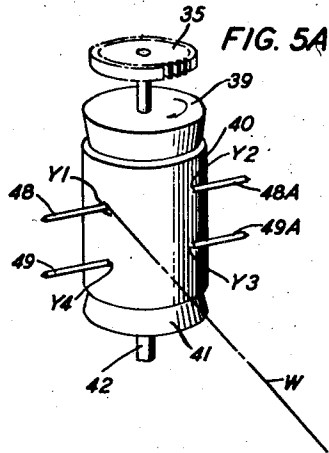
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4 Sheets-Sheet 4



INVENTOR
H. A. HILSINGER, JR.
BY *J. MacDonald*
ATTORNEY

UNITED STATES PATENT OFFICE

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COIL-WINDING MACHINE

Harry A. Hilsinger, Jr., East Orange, N. J., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

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5 Claims. (Cl. 140-92.2)

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This invention relates to coil winding machines and more particularly to a machine for winding coils of the type used in cathode ray tubes and the like.

In connection with cathode ray tubes, coils are used which are wound as in the ordinary manner with concentrically disposed layers around a mandrel of rectangular cross-section, the longer sides of the coil thus formed being afterwards bent to a curve corresponding to that of the diameter of the cylindrical portion of the tube with the consequent disarrangement of the wire turns and, therefore, the changing of the electromagnetic characteristics of the coil.

The object of this invention is the provision of a machine for winding cathode ray tube coils in which two parallel sides of the coil are formed on a mandrel with a curvature corresponding to that of the diameter of the cylindrical portion of the cathode ray tube with which the coils are used, thus avoiding the damaging of the coil in a subsequent bending operation of its required curved formation.

In the drawings:

Fig. 1 is a side elevation view showing the operating parts in position for winding one of the curved sides of the coil on the mandrel at the starting point of a coil winding operation;

Fig. 2 is a rear elevation view of Fig. 1 showing the drive for the intermittent rotary operation of the frame supporting the mandrel and for the intermittent rotation of the mandrel on the frame;

Fig. 3 is a view of the mechanism shown in perspective with the operating parts in position shown in Fig. 1, the mounting frame being shown yieldably held in its non-operated position by a detent mechanism;

Fig. 4 is a view of the mechanism in perspective shown with the operating parts in position at a point for beginning the winding of one of the straight side portions of the coil by the simultaneous rotation of the frame supporting the mandrel for the coil and that of the cam used for rotating such mandrel on the frame;

Fig. 5A is a partial view showing the mandrel and the wire secured thereon in position for starting the winding of a curved portion of the coil;

Fig. 5B is another partial view showing the mandrel turned 180 degrees from the position shown in Fig. 5A at the starting point for the winding of one of the straight side portions of the coil;

Fig. 5C is a diagrammatic view of the frame

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shown in position following the winding of one of the straight side portions of the coil;

Fig. 5D is a partial view showing the mandrel 180 degrees from the coil winding starting position shown in Fig. 5C; and

Fig. 5E is a diagrammatic view showing the frame 180 degrees from the position shown in Fig. 5C, i. e., following its movement in the direction indicated by the arrow in that figure completing a turn of the wire on the mandrel in a coil winding operation.

In the coil winding machine of this invention, a base 10, Figs. 1 and 2, is formed with an upright mounting plate 11 formed at its upper disposed end with arms A1 and A2 extending in parallel spaced relation to each other and perpendicularly to the upright mounting plate 11 for supporting a cross bar CB secured thereto by a number of screws SC2 best seen in Fig. 1.

On the base 10 is securely mounted, as by a number of bolts 11B, a motor 12 having an armature shaft 13 best seen in Figs. 3 and 4 provided with a worm 14 meshing with a worm gear 15 keyed on one end of a shaft 16 disposed at right angles to the motor armature shaft 13.

On the opposite end of shaft 16 is keyed a driving element of an intermittently operating mechanism in the form of a disc 17 provided with four studs S1, S2, S3 and S4 extending perpendicularly to one side thereof for engaging radially disposed slots C11, C12, C13 and C14 respectively, in a disc 22 keyed to one end of a shaft 23 for rotating a cam 24 keyed to the opposite end of shaft 23 while the studs S3 and S4 carried by disc 17 project through to the opposite side of the disc 17 for successively engaging with slots W1-W2 and W3-W4 respectively, in a Geneva gear R keyed on one end of a sleeve 25 journaled in ball bearings B1 and B2 fitted into openings in the mounting plate 11 and the cross bar CB.

The sleeve 25 serves for rotatably supporting the shaft 23 and is formed with a collar portion CP best seen in Figs. 1 and 4 to which is secured, as by a plurality of rivets RT, a yoke-shaped member M to which in turn is secured, as by a number of screws SC, a U-shaped frame 26, while a wheel 27 keyed on the sleeve 25 adjacent the Geneva gear R is provided with two diametrically opposite notches N1 and N2, Figs. 3 and 4, cooperating with a spring-pressed pawl-like member 28 to form a detent device serving for holding the frame 26 against rotation as would be imparted by friction during the operation of shaft 23 in the sleeve 25 as effected by the rotation of disc 17 for rotating the cam 24 in a cycle

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of operations which will be hereinafter described in detail.

On the parallel arms X1 and X2 of frame 28 is journaled a shaft 29 which is rotated by the engagement of the lobe portions B1₁ and B2₂ of cam 24 with the arms a1, a2, a3, and a4 laterally extending from a shaft 29 for imparting angular movement to a mandrel 40 through a gearing mechanism comprising the gear 33 keyed on shaft 29, the gear 34 mounted on a shoulder screw 38 and a gear 35 keyed to one end of a spindle 36 rotatably mounted in a sleeve 37 carried by the arm X1 of U-shaped frame 26. Spindle 36 is formed with a cone-shaped element 39 cooperating with a cone-shaped element 41 mounted for free rotation on a spindle 42 which is slidably mounted in a sleeve 43 carried by the arm X2 of the U-shaped frame 26 while a spring 44 is tensioned between the collar L formed on the spindle 42 and the cone-shaped element 41 to serve for readily centering the mandrel 40 on the frame, while a pin 45 carried by element 39, as shown in Fig. 1, engages a groove 46, Figs. 1 and 4, in the mandrel 40 for locating the mandrel and the parallelly disposed pins 48—48A and 49—49A carried thereby relative to the normal or starting position of frame 26.

An electric switch SD secured on the arms A1 and A2 of the mounting frame has its operable element 50 disposed in engageable relation with a cam 51 carried by the frame 26 for operating a revolution counter, not shown, provided for indicating the number of turns of frame 26 and thereby the number of turns in the coil thus wound, the removal of the pins 48—48A and 49—49A from the mandrel permitting the freeing of the coil therefrom.

In a typical example in the winding of a coil according to this invention, one end of the wire W is attached, for example, to the pin 48 at a point Y1 as shown in Figs. 1, 3 and 5, and the wire held with a light tension in an ordinary manner. The operation of motor 12 through the rotation of worm 14 on the armature shaft 13 and worm gear 15 on shaft 16 is effective to rotate the disc 17 in the direction indicated by the arrow in Figs. 1, 2 and 3 when the pin S1, which extends perpendicularly to the right side of disc 17, engages the slot C11 in the disc 22 for rotating the shaft 23 and thereby the cam 24 keyed thereon. Upon the rotation of cam 24 the lobe portions B1₁ and B2₂ of this cam successively engage the arms a1 and a2 of shaft 29 for rotating it an angular distance of substantially 180 degrees, i. e., from the position shown in Figs. 1, 3 and 5 to the position shown in Figs. 4 and 5B thus winding the wire W around the mandrel 40 from the point Y1 to point Y2.

Upon the continued operation of disc 17 the pin S3 which projects from both sides of disc 17 is now in position as shown in Fig. 4 for engaging the slot W1 in the Geneva gear R and the slot C13 in the disc 22 for rotating them and thereby the cam 24 and the frame 26 simultaneously an angular distance of 180 degrees from the position shown in Figs. 1, 3 and 4 to the position shown in Fig. 5C by the pins S3 and S4, the latter engaging the slot C14 of disc 22 and in the slot W4 of Geneva gear R for winding the wire from point Y2 to point Y3, one of the straight sides of the coil when the spring-pressed pawl 28 automatically engages the notch N2 at the periphery of wheel 27.

The continued rotation of disc 17 causes the pins S1 and S2 to successively engage the slots

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C11 and C12 in disc 22 for rotating the shaft 23 and cam 24 carried thereby, the shaft 29 and the mandrel 40, 180 degrees for winding the other curved side of the coil between the points Y3—Y2 which is followed by the successive engagement of pins S3 and S4 with the slots C13 and C14 of disc 22 and slots W3 and W4 of the Geneva gear R for winding the other straight side Y4—Y1 of the coil when the frame 26 has again reached the starting position and this cycle of operation is continued to the completion of the coil, each turn of wire on the mandrel being recorded by the operation of the switching device SD, above-mentioned, actuated once for each turn of the frame.

What is claimed is:

1. In a machine for winding rectangularly-shaped coils two opposite sides of which are curved and the other sides straight, said machine comprising a rotatable frame, a mandrel for the coils mounted on said frame having tangentially disposed pins at its periphery, a rotatable cam, a shaft rotatably mounted on said frame actuated by the operation of said cam, and a mechanism for successively intermittently actuating said cam and said frame, said cam imparting rotation to said mandrel for winding the curved sides of the coil as determined by the angular spaced relation of said pins on said mandrel and the rotation of said frame winding the straight sides of the coil.

2. A machine for winding a rectangularly-shaped coil having two opposite sides curved and two sides straight, said machine comprising a rotatable shaft, a sleeve rotatably mounted on said shaft, a U-shaped frame mounted on said sleeve for rotary movement therewith, a cam carried by said shaft, a mandrel mounted on said frame having means projecting at its periphery for determining the perimeter of the coil, a shaft mounted for rotary movement on said frame actuated by the movement of said cam, and a mechanism for intermittently actuating said frame and said cam in timed relation to each other for winding said coil on said mandrel as determined by said means.

3. A machine for winding a coil having its perimeter formed of two curved sides and two straight sides, said machine comprising a mounting having a pair of laterally extending arms, a cross bar secured at the end of said arms, a sleeve journaled in said frame and said cross bar, a shaft extending through said sleeve for rotation therein, a cam keyed on said shaft, a frame carried by said sleeve, a shaft mounted on said frame having means disposed in operative relation with said cam, a mandrel for the coil mounted on said frame and actuated by the operation of the last-mentioned shaft, and an intermittently actuating mechanism for actuating said frame and said mandrel in timed relation to each other, the operation of said cam winding the curved side of the coil on the mandrel and the rotation of said frame winding the straight sides of the coil, and means for holding said frame stationary during the rotation of said mandrel.

4. In a machine for winding a coil having two straight parallel sides and two curved sides, said machine comprising an intermittently operating mechanism, a pair of concentrically disposed shafts actuated in timed relation by said mechanism, a frame carried by one of said shafts, a mandrel mounted on said frame and movable therewith for winding the straight parallel sides of the coil, a cam carried by the other of said shafts, a shaft journaled on said frame having means disposed in operative relation with said

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cam for operation by the movement thereof during the stationary period of said frame by said mechanism for winding the curved sides of the coil, said mandrel comprising a tubular member, a pair of spindles journaled on said frame, cone elements carried by said spindles disposed in co-axial spaced relation to each other, spring means tensioned between said frame and one of said cone elements to cause the latter to engage said tubular member to force it into frictional engagement with the other of said cones, and means operatively connecting the last-mentioned cone to the shaft mounted on said frame for actuating said mandrel.

5. In a machine for winding rectangularly-shaped coils having two curved sides and two straight sides, said machine comprising a base, an electric motor, a shaft mounted on said base, a gear reduction mechanism operatively connecting said shaft to said motor, an intermittent operating mechanism having a driving element keyed on said shaft, a pair of concentrically disposed shafts each having a driven element of said inter-

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mittently operating mechanism keyed thereon, a frame carried by one of said concentric shafts, a cam carried by the other of said concentric shafts, a mandrel for the coil rotatably mounted on said frame, means actuated by the rotation of said cam for actuating said mandrel for winding the curved side of the coil upon the operation of one of said driven intermittently operable elements in timed relation with the operation of said frame by the other of said driven intermittently operating elements for winding the straight sides of the coils.

HARRY A. HILSINGER, JR.

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