Sept. 19, 1939. D. ARMSTRONG 2,173,091

ARMATURE AND COIL WINDING MACHINE

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Fig. 1.

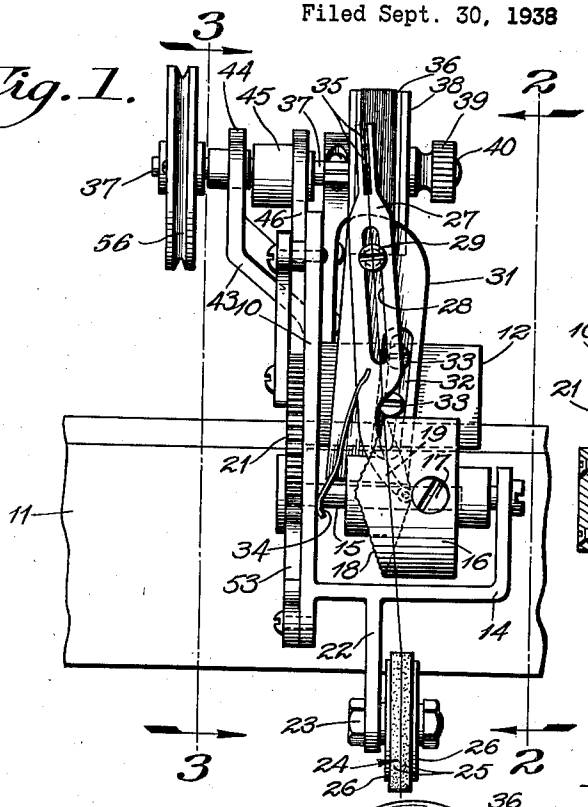


Fig. 6.

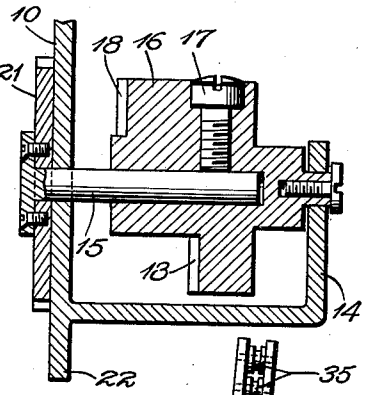


Fig. 7.

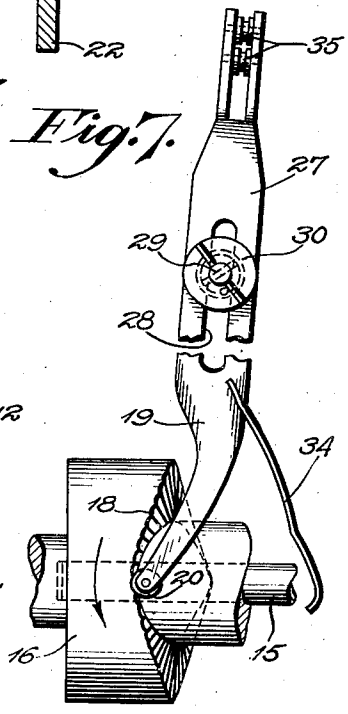
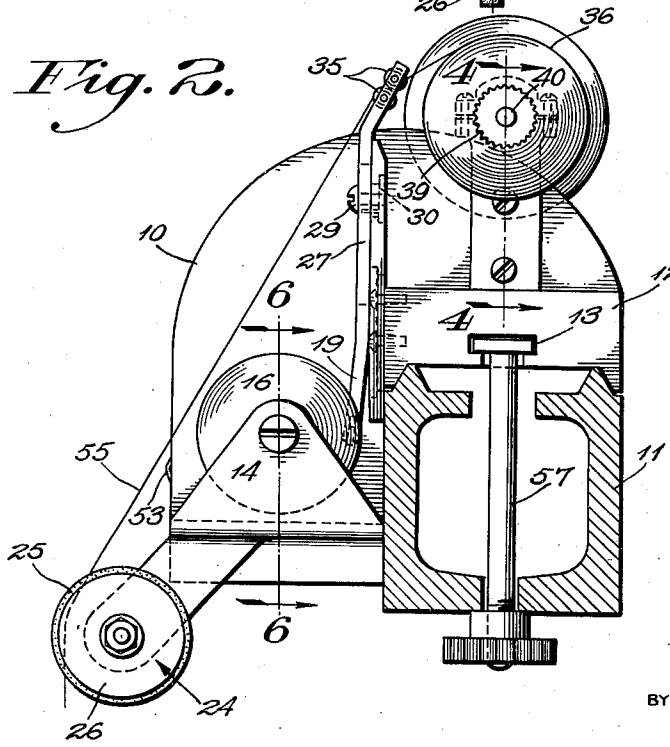


Fig. 2.



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Fig. 3.

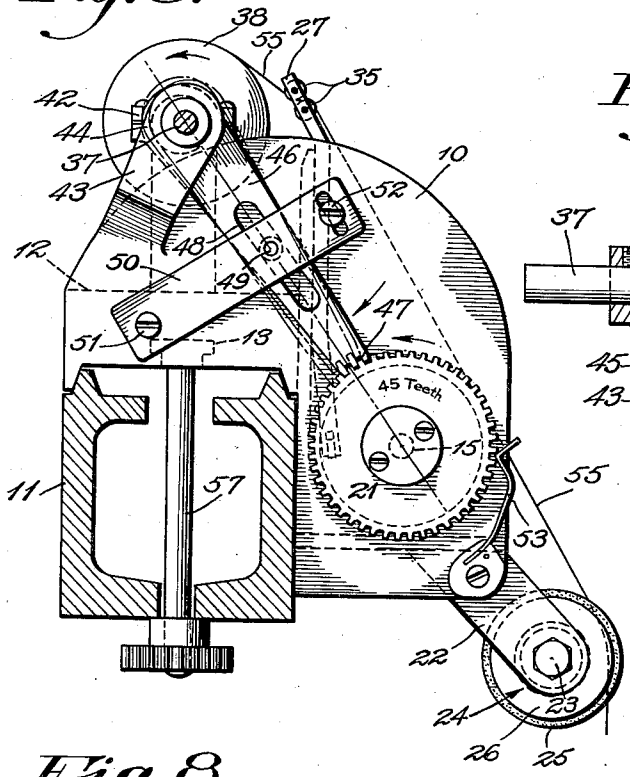


Fig. 4.

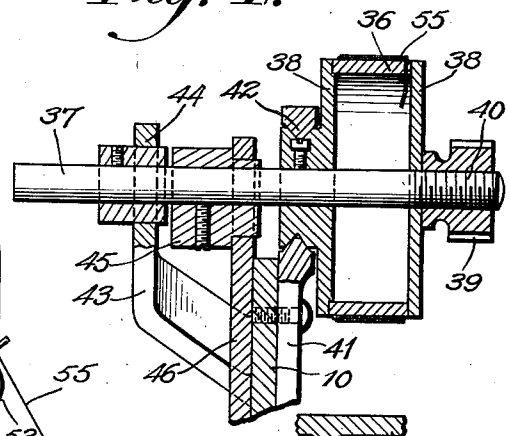


Fig. 5.

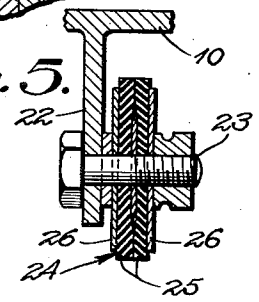
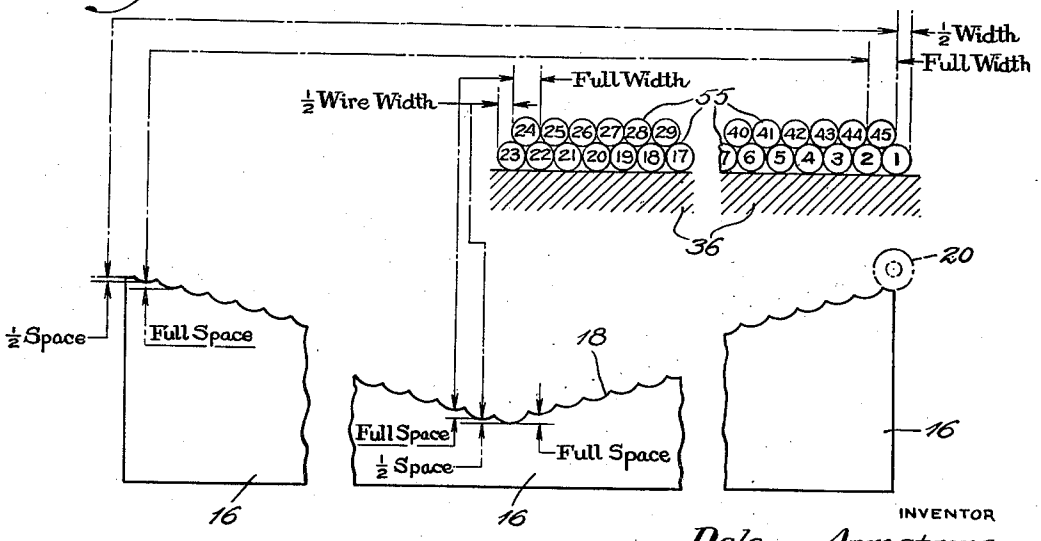


Fig. 8.



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UNITED STATES PATENT OFFICE

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ARMATURE AND COIL WINDING MACHINE

Dale Armstrong, Washington, D. C.

Application September 30, 1938, Serial No. 232,579

3 Claims. (Cl. 242—8)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

This invention relates to an armature and coil winding machine, and has for an object to provide an improved coil winding machine for winding a coil frame of any shape, whether round, rectangular, or hexagonal, and in which the coil will be wound so as to provide an even layer of wire at all times without any possibility of the wire piling up.

A further object of this invention is to provide a coil winding machine wherein the transverse movement of the wire as it is being wound occurs at just one particular portion of the coil throughout the winding operation, and wherein an upper layer of wire has its transverse movement of the wire occur at the same point of revolution, while the remaining wire lies smoothly in the groove and never on the ridges of the lower layer of wire, a feature difficult or impossible to attain with any other known machine, particularly on wire 1/100th of an inch in diameter, for which this invention is intended.

A further object of this invention is to provide a coil winding machine which may be adjusted, if desired, to make the adjacent convolutions lie in contact with each other or, if desired, be spaced apart one or more diameters of the wire. To insure such accuracy, a special V shaped bearing is provided, preventing any end play of the shaft on which the armature frame is mounted.

With the foregoing and other objects in view, the invention consists in the construction, combination and arrangements of parts hereinafter described and illustrated in the drawings, in which:

Fig. 1 is a front elevational view of the winding machine.

Fig. 2 is an elevational view on line 2—2 of Fig. 1.

Fig. 3 is an elevational view on line 3—3 of Fig. 1.

Fig. 4 is a sectional view on line 4—4 of Fig. 2.

Fig. 5 is an enlarged sectional view of the wire tensioning device.

Fig. 6 is a vertical sectional view on line 6—6 of Fig. 2.

Fig. 7 is an enlarged backside view of the cam and the winding lever; and,

Fig. 8 is a diagrammatic view of the wire spacing cam, showing its relation to the spaced windings on the coil.

There is shown at 10 the frame for the machine of this invention, which extends from a base 12 for securing the machine in suitable operative position as on a lath bed 11 by means of a T-slot 13 and holding down screw 57. A bracket 14 has journaled therethrough a shaft 15 on which is secured a cam 16 by means of a set screw 17, the cam 16 having its cam surface corrugated as at 18 for cooperation with a wire guide toe 19 having a friction-reducing wheel 20.

Keyed to the shaft 15 is a gear 21 provided with a suitable number of gear teeth such as forty-five teeth. Depending from the cam bracket 14 is an angle member 22 to which is journaled by means of bolt and nut 23 a wire tension wheel 24, consisting of a pair of flexible rubber washers 25, held between metallic washers 26. Obviously, adjusting the bolt and nut 23 will adjust the tension on the wire feeding therethrough to the wire guide 27. This wire guide 27 is provided with a slot 28 through which it is secured by means of a screw 29 in a turntable 30 on a guide holder 31, which, in turn, is adjustably secured through the slot 32 and screws 33 to the base 12. A leaf spring 34 secured in the wire guide 27 urges the wire guide toe 19 continuously in the direction of the cam surface 18 of the cam 16.

The upper end of the wire guide 27 is provided with a pair of grooved wheels 35 between which the wire 55 threaded and guided for positioning on the coil frame 36, which is mounted for rotation with the shaft 37, being secured thereon by means of a coil frame bracket 38, held in position by a thumb nut 39 secured to the threaded end 40 of the shaft 37. The shaft 37 which has a pulley wheel 56, which may be rotated by any suitable hand or mechanical power means, is supported on an arm 41 from the machine support 10, and is provided with a V shaped bearing 42, thereby preventing any possible end play of the shaft 37. Another arm 43, secured to the other end of machine frame 10, carries another bearing 44 which, if desired, may be similar in construction to the bearing 42.

Between the bearings 42 and 44 there is secured to the shaft 37 an eccentric cam 45 on which is journaled one end of a gear shift lever 46, whose other end is provided with a plurality of teeth 47 adapted to mesh with the teeth on the gear 21. This lever 46 is provided with a slot 48 through which extends a fulcrum pin 49 carried by a bridged adjusting arm 50, the bridged adjusting arm being secured to the support 10 by screws 51 and 52.

In operation, the wire 55 is fed from a supply spool over the tension wheel 24 and threaded through the slot formed by the grooved wheels 35 in wire guide 27, being secured thereto by a suitable clamp in cooperation with the coil frame

bracket 38. As the shaft 37 is rotated the wire guide 27 remains fixed during approximately three-fourths of the rotation of the shaft until the eccentric 45 moves the gear shift lever 46 into the mesh with the gear 21. During the next quarter of the rotation of the shaft 37 the gear 21 will be rotated one tooth, being held against accidental further rotation by means of the spring 53. This causes the cam 16 to be rotated just the desired amount and have its cam surface 18 acting against the wire guide toe 19 and in cooperation with the leaf spring 34, transversely moving the wire guide grooved wheels 35 a distance one diameter of the wire. The transverse lay of the wire is therefore confined to just one portion of the coil frame, while the remaining portions, of the lay of the wire, are in a plane exactly at right angles to the shaft 37.

After a complete layer of wire has been spread across the coil frame 36, the cam surface 18 on cam 16 is such that it causes the wire guide grooved wheels 35 to move step by step in the opposite direction with a similar result, but with each convolution of the wire between the transverse movements lying exactly in the grooves formed by the wire of the lower layer, as shown in Fig. 8, and not on the ridges thereof.

Other modifications and changes in the proportions and arrangements of the parts may be made by those skilled in the art without departing from the nature of the invention, within the scope of what is hereinafter claimed.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

I claim:

1. A coil winding machine comprising a machine frame, a shaft journalled in said frame, a coil bracket, said coil bracket being adapted to secure a coil frame on said shaft, an eccentric cam keyed on said shaft, a slidably mounted gear shift lever journalled at one end to said eccentric cam, a radially corrugated cam journalled on said machine frame, an adjustably pivoted wire guide, one end of said wire guide being yieldably urged against said radially corrugated cam, wire guiding means mounted on the other end of said wire guide through which the wire passes to the coil frame on said coil bracket, a toothed gear keyed to said corrugated cam having a number of gear teeth corresponding to the number of corrugations on said corrugated cam, and gear teeth on the other end of said gear shift lever adapted to engage said toothed gear and advance it one step for every rotation of said coil holding shaft to rotate said radially corrugated cam and shift said wire guide a predetermined distance at a predetermined portion of the revolution of the coil holding shaft to properly lay the wire convolutions on the coil frame.

2. A coil winding machine comprising a machine frame, a shaft journalled in said frame, a coil bracket, said coil bracket being adapted to secure a coil frame on said shaft, an eccentric cam keyed on said shaft, a slidably mounted gear shift lever journalled at one end to said eccentric cam, a radially corrugated cam journalled on said machine frame, an adjustably pivoted wire guide, one end of said wire guide being yieldably urged against said radially corrugated cam, wire guiding means mounted on the other end of said wire guide through which the wire passes to the coil frame on said coil bracket, a toothed gear keyed to said corrugated cam having a number of gear teeth corresponding to the number of corrugations on said corrugated cam, and gear teeth on the other end of said gear shift lever adapted to engage said toothed gear and advance it one step for every rotation of said coil holding shaft to rotate said radially corrugated cam and shift said wire guide a predetermined distance at a predetermined portion of the revolution of the coil holding shaft to properly lay the wire convolutions on the coil frame, said radially corrugated cam having approximately one-half its corrugations progressively displaced in one axial direction and the other half of its corrugations progressively displaced in the opposite axial direction, one-half group of the corrugations being one-half step out of phase with the other reverse half group to reverse the movement of said wire guide and place an upper lay of convolutions in the grooves formed by the first lay of convolutions of wire.

3. A coil winding machine comprising a machine frame, a shaft journalled in said frame, a coil bracket, said coil bracket being adapted to secure a coil frame on said shaft, an eccentric cam keyed on said shaft, a slidably mounted gear shift lever journalled at one end to said eccentric cam, a radially corrugated cam journalled on said machine frame, an adjustably pivoted wire guide, one end of said wire guide being yieldably urged against said radially corrugated cam, wire guiding means mounted on the other end of said wire guide through which the wire passes to the coil frame on said coil bracket, a toothed gear keyed to said corrugated cam having a number of gear teeth corresponding to the number of corrugations on said corrugated cam, gear teeth on the other end of said gear shift lever adapted to engage said toothed gear and advance it one step for every rotation of said coil holding shaft to rotate said radially corrugated cam and shift said wire guide a predetermined distance at a predetermined portion of the revolution of the coil holding shaft to properly lay the wire convolutions on the coil frame, and wire tensioning means mounted on said machine frame through which the wire passes on the way to said wire guide means.

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