

Sept. 10, 1940.

K. K. ROBY ET AL
METHOD FOR WINDING COILS

2,214,384

Filed Aug. 25, 1937

3 Sheets-Sheet 1

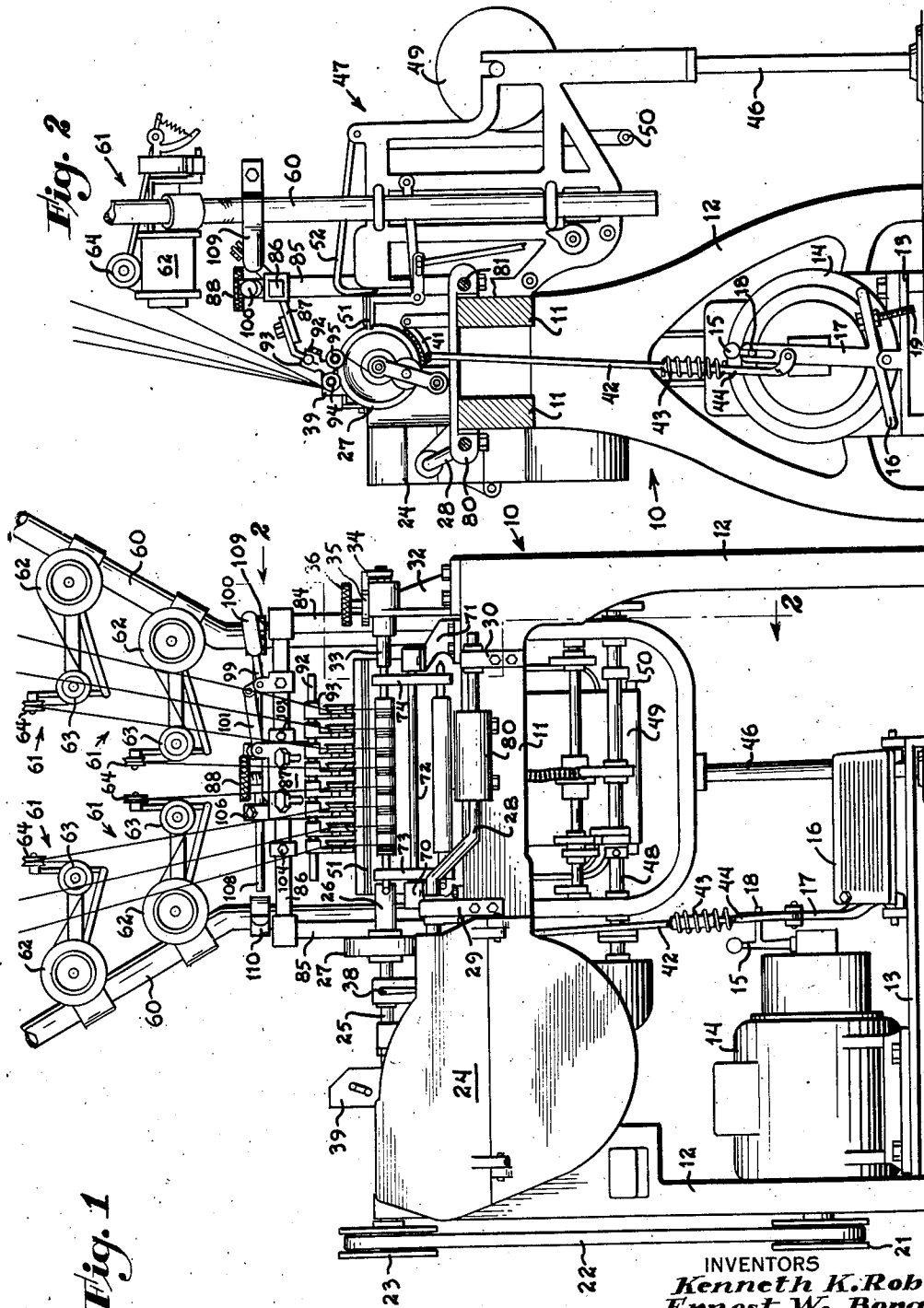


Fig. 1

Fig. 2

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Fig. 3

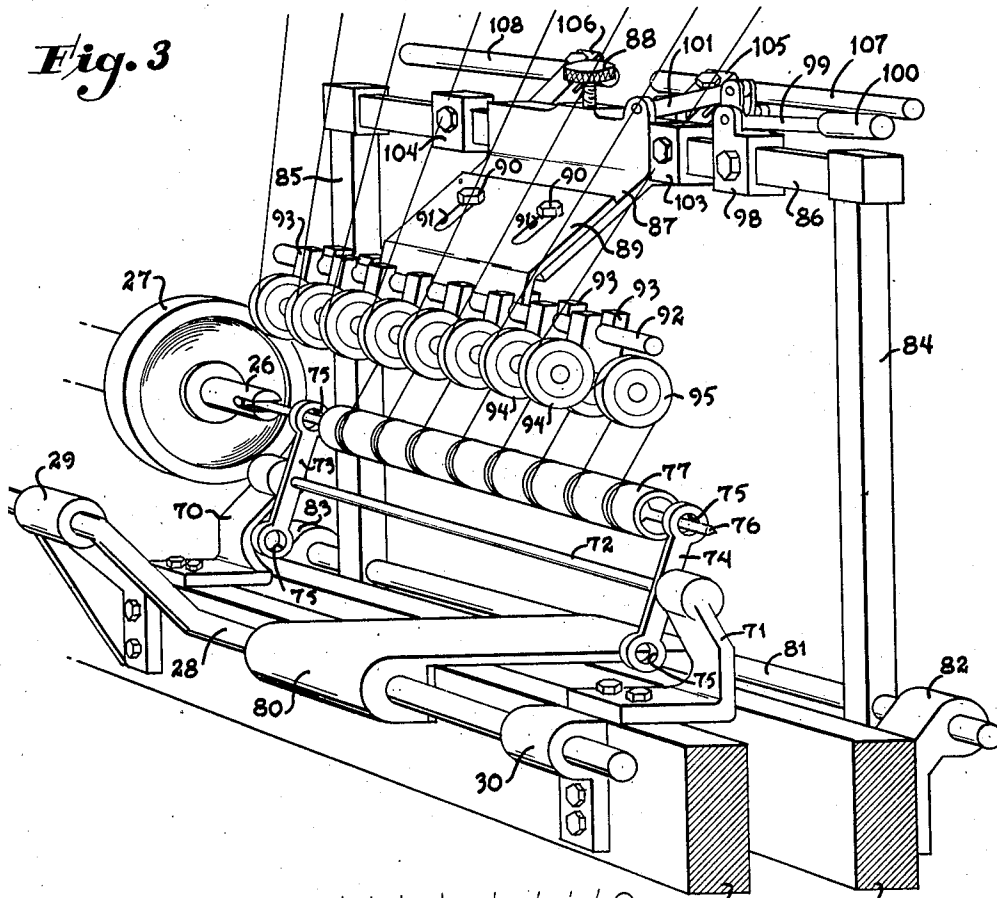
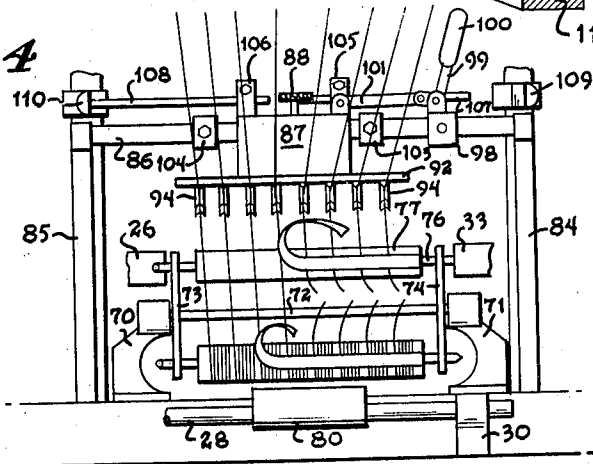


Fig. 4



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Fig. 6

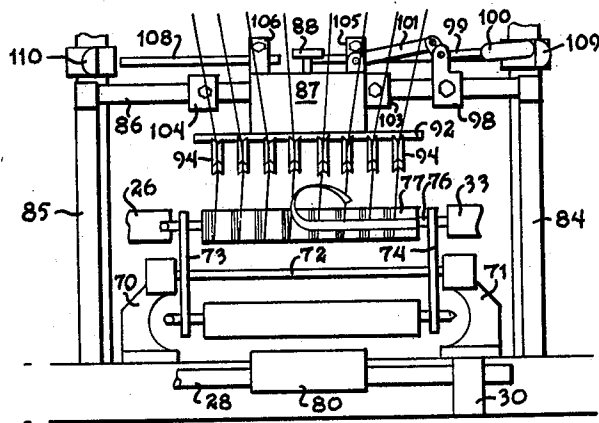


Fig. 5

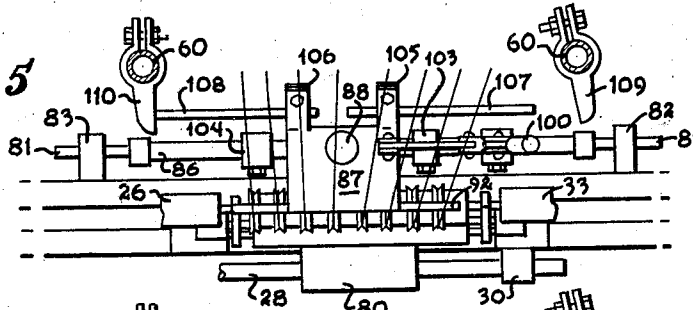


Fig. 7

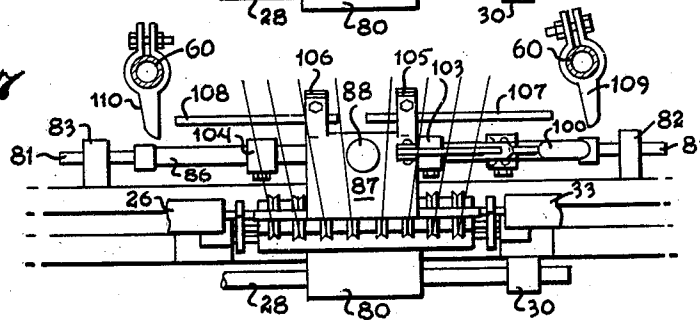
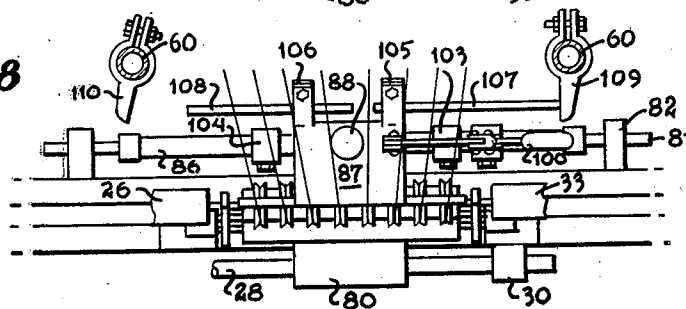


Fig. 8



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METHOD FOR WINDING COILS

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3 Claims. (Cl. 242—10)

This invention relates to improvements in coil winding machines and methods of winding coils.

In previous coil winding machines, it has been necessary to sever the strand of wire following the completion of a coil winding operation, secure the severed strand of wire to some stationary portion of the machine, remove the completed coil from the arbor, place a new core on the arbor, detach the severed strand of wire from the stationary securing means, crimp up a certain amount of the wire to form a lead for the next coil and fasten the crimped up wire on the new core before the next winding operation can be begun. Such a procedure is extremely laborious and very time taking, and this is especially true in the case of multiple coil winding machines wherein this procedure must be repeated for each coil.

It is therefore the prime object of this invention to reduce the time and effort required to start winding a coil following the completion of a coil by providing a new method and apparatus for winding coils. In carrying out this object of this invention, a plurality of winding arbors are utilized so that upon the completion of winding a coil on one arbor, the strand of wire may be secured directly to another arbor thereby obviating the necessity of severing the strand and securing it to some stationary portion of the machine. A continuous, uninterrupted process is therefore provided.

A further object is to provide a new method and apparatus for forming leads for the coils. In carrying out this object of the invention, the guide which guides the strand of wire with respect to the arbor is made adjustable, the guide being shifted to a given position with respect to the arbor and the arbor being given several turns to form the leads preparatory to the actual winding operation.

Other objects and advantages will become apparent to those skilled in the art upon reference to the accompanying specification, claims and drawings.

For a more thorough understanding of this invention, reference is made to the accompanying drawings, in which

Fig. 1 is a front elevational view of the improved coil winding machine of this invention;

Fig. 2 is a side sectional view taken substantially along the line 2—2 of Fig. 1;

Fig. 3 is an enlarged perspective view of a portion of the machine shown in Fig. 1;

Fig. 4 is a partial front elevational view showing the parts in one position;

Fig. 5 is a partial plan view showing the parts in the position illustrated in Fig. 4;

Fig. 6 is a partial front elevational view showing the parts in another position;

Fig. 7 is a partial plan view showing the parts in the position illustrated in Fig. 6, and

Fig. 8 is a partial plan view showing the parts in still another position.

The improvements of this invention are shown and described in connection with a No. 104 Universal Coil Winding Machine manufactured and sold by the Universal Winding Company of Boston, Massachusetts, and therefore this machine is shown only briefly in the drawings.

This machine is shown to comprise a table structure generally designated at 10 including cross members 11 supported by legs 12. Underneath the table structure 10 is a base 13 upon which is suitably mounted a variable speed motor 14. A lever 15 rotates the brushes of the motor 14 to vary the speed thereof. A treadle 16 is pivotally mounted on the base 13 and is provided with an arm 17. A pin 18 carried by the lever 15 engages in a slot in the arm 17 so that upon rotation of the treadle 16 in a clockwise direction, as viewed in Fig. 2, the lever 15 is likewise rotated in a clockwise direction to increase the speed of the motor 14. A stop 19 carried by the treadle 16 limits the amount of clockwise movement of the treadle 16 and therefore limits the speed of operation of the motor 14.

The motor 14 operates a pulley 21 which is connected by a belt 22 to a pulley 23. The pulley 23 operates a gear mechanism enclosed within the gear casing 24. This gear mechanism in the case 24 rotates a shaft 25 and reciprocates a rod 28 through an adjustable traverse mechanism located in the gear 24. By suitably adjusting the traverse mechanism, the length of the stroke of the rod 28 may be varied at will. The rotary shaft 25 carries a chuck 26 which receives one end of a winding arbor. The shaft 25 also carries a hand wheel 27. The reciprocating rod 28 is suitably journaled in bearings 29 and 30. A tail-stock 32 is suitably mounted on the cross members 11 and carries a retainer 33 which is adapted to engage the other end of the winding arbor. The retainer 33 is urged toward the left as viewed in Fig. 1 by means of a spring (not shown) and a bracket 34 operated by a cam 35 which, in turn, is operated by a knob 36 is adapted to overcome the spring to move the retainer 33 to the right so that the winding arbor may be removed from the chuck 26. A handle 38 operating a switch (not shown) places the motor 14

in operation which, as pointed out above, causes rotation of the shaft 25 and therefore the arbor and reciprocation of the rod 28. After the shaft 25 has rotated a predetermined number of times, a single turn counter 39 which indicates the number of revolutions trips the switch to an off position to stop operation of the motor 14. A brake 41 (Fig. 2) is adapted to engage the hand wheel 27 and this brake is operated by a rod 42, a spring 43 and a rod 44 connected to the arm 17 of the treadle 16. By rotating the treadle 16 to an extreme counter-clockwise position, the brake 41 is applied to the hand wheel 27 to completely stop rotation of the shaft 25. The treadle 16 therefore applies the brake when moved to an extreme counter-clockwise position, releases the brake when moved out of this position and increases the speed of the motor 14 when moved in a clockwise direction.

A standard 46 supports a paper feeding mechanism generally designated at 47. This paper feeding mechanism 47 is operated by a shaft 48 (Fig. 1) driven by the gear mechanism contained in the gear case 24. This paper feeding mechanism 47 feeds paper from a roll of paper 49 over a plurality of rollers, one of which is shown at 50, to a paper feeding device 51. A knife 52 cuts the paper as it is fed to the feeding device 51 so that a piece of paper of the desired size may be fed to the winding arbor by the feeding device 51 upon the completion of so many revolutions of the arbor. Preferably, the paper is fed to the arbor at the completion of every reciprocation of the rod 28.

Carried by the paper feeding mechanism 47 are two upright supports 60 which carry wire feeding assemblies generally designated at 61. Each wire feeding assembly comprises a spool of wire 62 and pulleys 63 and 64 over which the strands of wire are fed from the spool 62 to the arbor. Up to this point, the coil feeding machine generally indicated in the drawings is identical to the No. 104 Universal Coil Winding Machine and therefore a further description of this structure is not considered necessary.

Referring now to Figs. 1 and 2 and particularly to Fig. 3, a pair of trunnions 70 and 71 are carried by the cross members 11. Suitably journaled in these trunnions is a rod 72 carrying arms 73 and 74. The arms 73 and 74 are provided with openings 75 through which arbors 76 may extend. For coil winding purposes, the arbors 76 are usually provided with cores 77 upon which the coils are wound. By rotating the carriage formed by the arms 73 and 74 and the rod 72, one or the other of the arbors carried thereby may be selectively placed into engagement with the chuck 26 and the tail-stock retainer 33.

Slidably mounted on the cross members 11 and adjustably secured to the reciprocating rod 28 is a plate 80. The plate 80 is suitably secured to a rod 81 which is journaled in bearings 82 and 83. It is, therefore, seen that upon reciprocation of the rod 28, this reciprocating movement is transferred to the rod 81 by the plate 80. Rigidly secured to the rod 81 are upright members 84 and 85 which carry a carriage 86 in the form of a rectangular bar. Slidably mounted on the rectangular bar or carriage 86 is a guide member 87, and this guide member 87 may be rigidly secured to the bar 86 at any adjusted position with respect thereto by a hand screw 88. Adjustably mounted as by means of screws 90 and slots 91 on the guide member 87 is a plate 89 to which is secured a rod 92. Adjustably mounted on the rod

92 are a plurality of members 93 which carry guide rollers 94 and 95. The strands of wire leaving the wire feeding assemblies 61 are strung over the guide wheels 94 and 95 before they are suitably attached to the core 77. It will be apparent, therefore, that upon reciprocation of the rod 28 during rotation of the core 77, the guide wheels 94 and 95 are reciprocated with respect to the core 77 to guide the winding of the strands of wire on the core 77.

A block 98 is adjustably carried by the carriage or bar 86 and pivotally mounted on this block 98 is a bell-crank lever 99 having a handle 100. The bell-crank lever 99 is connected by a link 101 to the guide member 87. With the handle 100 in the position shown in Figs. 1 and 3, the guide member 87 is moved to the right with respect to the carriage or bar 86 and when the handle 100 is moved upwardly to the position shown in Fig. 4, the guide member 87 is moved to the left with respect to the carriage or bar 86. Also adjustably mounted on the carriage or bar 86 are adjustable stops 103 and 104. The guide member 87 carries brackets 105 and 106 in which are adjustably secured rods 107 and 108. These rods 107 and 108 are adapted to engage stops 109 and 110, respectively, carried by the supports 83. The stops 109 and 110 and the stops 103 and 104 carried by the carriage are adapted to limit movement of the guide member 87 with respect to the carriage or bar 86.

Assume now that it is desired to wind coils from left to right, that is, to begin the coils at the left end. Under these circumstances, the stop 104 carried by the carriage 86 and the rod 107 carried by the bracket 105 are not utilized. They may, therefore, be taken off of the machine or moved to some position where they will be ineffective. The rod 108 carried by the bracket 106 is adjusted to a given position with respect to the stationary stop 110, and the stop 103 carried by the carriage 86 is adjusted to a given position. Assume now the parts are in the position shown in Figs. 4 and 5, the handle 100 of the bell-crank lever 99 is moved upwardly to cause the guide member 87 to move to the left so that the rod 108 engages the stop 110. The various strands of wire which thread through the guide wheels 94 and 95 are then fastened on the core 77 carried by the arbor 76 which is in engagement with the chuck 26 and tail-stock retainer 33. Several turns are then given to the arbor 76 to form lead wires for the coil. After these several turns have been made, the handle 100 is moved downwardly until the guide member 87 engages the stop 103 carried by the carriage 86 and the hand screw 88 is turned to clamp the guide member 87 to the carriage 86. The parts are then in the position shown in Figs. 6 and 7. The wires are then fastened to the core at this position by means of a tape as illustrated in Fig. 6. The parts are now in a position for winding and the handle 32 is shifted to start the motor 14 in operation. The arbor 76 and hence the core 77 are rotated to wind the strands of wire thereon, the guide member 87 is reciprocated by the carriage 86 to guide the strands of wire as they are being wound on the core 77, and at the completion of every reciprocation of the guide member 87, the paper feeding mechanism 47 inserts a piece of paper in the coil to form what may be termed a layer coil. After the arbor 76 has been rotated a predetermined number of times and the guide member 87 has been reciprocated a predetermined number of times, the single turn counter 39 shuts off the

motor 14, thereby terminating the winding of the coils. A piece of tape is thereupon fastened to the completed coils to hold the windings intact, thereby completing the coil. The tail-stock retainer 33 is released by rotation of the knob 36 and the carriage formed by the arms 74 is rotated to place another arbor 76 carrying a new core 77 in alignment with the chuck 26 and tail-stock retainer 33. The knob 36 is again rotated to allow the retainer 33 to hold the new arbor 76 in engagement with the chuck 26.

The hand screw 88 is released and handle 100 of the bell-crank lever is then moved to the up position as shown in Fig. 4 to move the guide member 87 to the left until the rod 108 engages the stop 110 which positions the strands of wire to a given position with respect to the new core 77. The strands of wire are then secured to the new core 77 by a strip of tape as shown in Fig. 4, and when the wires are suitably secured to the new core 77 in this manner the strands of wire between the completed coil and the new core are severed as shown in Fig. 4. These severed strands form the outer leads for the completed coils. A few turns are thereupon given to the new core 77 to form inner leads for the new coils to be wound and then the handle 100 is moved to the down position to move the guide member 87 against the stop 103, as is shown in Figs. 6 and 7. The hand screw 88 is tightened and the strands are then taped in position as shown in Figs. 6 and 7, and the coil winding operation is repeated.

By reason of this process, a continuous operation is provided and the severing of the strands between the coils being wound and the wire feeding assemblies 61 is eliminated, thereby greatly increasing the speed of operation of the coil winding machine. Since it is desirable to have the leads start at a given position on the core 77, the stop 110 is made a stationary stop, that is, it is carried by a stationary portion of the machine. The stop 103, however, is carried by the carriage 86 since it is not necessary to have the coils start at any given position. All that is necessary in a coil is that it have so many turns and so many layers.

If now it be desired to start winding the coil from the right to the left instead of from the left to the right as previously described, the stops 103 and 110 are disregarded and the stops 109 and 104 are utilized. The rod 107 is suitably adjusted with respect to the stationary stop 109 and the stop 104 is suitably adjusted on the carriage 86. The handle 100 is thereupon moved downwardly to cause the rod 107 to engage the stop 109 and the strands of wire are fastened to the core in this position preparatory to forming the leads. The arbor is thereupon rotated several turns to form the leads and the handle 100 is then moved up to move the guide member 87 into engagement with the stop 104 preparatory to the winding operation. A further description of this reverse winding is not considered necessary since it is identical to that described above except in the reverse direction.

From the above, it is seen that a new method of winding coils and a new apparatus for winding coils have been provided wherein strands of wire between the wire feeding assemblies and the coils being wound are never severed, thereby forming a continuous cycle of operation, wherein the leads of the coils are readily and easily formed and wherein the time and effort required to change from one coil to another coil is reduced to a minimum.

Although for purposes of illustration, one form of this invention has been disclosed other forms thereof may become apparent to those skilled in the art upon reference to this specification, and therefore this invention is to be limited only by the scope of the appended claims.

We claim as our invention:

1. The method of winding wire on cores to form coils, comprising the steps of, positioning the wire and core to a given position with respect to each other, fastening the wire to the core at this position, rotating the core several times to form a lead for the coil, shifting the wire and core to a different position with respect to each other, fastening the wire to the core at this shifted position, rotating the core to cause the wire to wind thereon to form a coil, fastening the wire to the coil at completion of the winding operation to complete the coil, positioning the wire and a second core to a given position with respect to each other, fastening the wire to the second core at this position, severing the wire between the first coil and the point at which it is fastened to the second core and adjacent that point to form another lead for the first coil, and rotating the core several times to form a lead for a second coil preparatory to winding the second coil in a continuing process.

2. The method of winding a plurality of strands of wire on cores to form a plurality of coils, comprising the steps of, positioning the strands of wire and a core to a given position with respect to each other, fastening the strands to the core at this position, rotating the core several times to form leads for the coils, shifting the strands and the core to a different position with respect to each other, fastening the strands to the core at this shifted position, rotating the core to cause the strands to wind thereon to form a plurality of coils, fastening the strands to the coils at completion of the winding operation to complete the coils, positioning the strands and a second core to a given position with respect to each other, fastening the strands to the second core at this position, severing the strands between the first coils and the points at which the strands are fastened to the second core to form other leads for the first coils, and rotating the second core several times to form leads for the second coils preparatory to winding the second coils in a continuing process.

3. The method of winding wire on cores in layers to form coils comprising the steps of, positioning the wire and core to a given position with respect to each other, fastening the wire to the core at this position, rotating the core several times to form a lead for the coil, shifting the wire and the core to a given position with respect to each other, fastening the wire to the core at this shifted position, rotating the core and gradually shifting the wire and core in one direction with respect to each other to form a first layer of the coil, wrapping a sheet of insulating material around the first layer of the coil, rotating the core and gradually shifting the wire and core in the opposite direction with respect to each other to form a second layer of the core, wrapping a sheet of insulating material around the second layer of the coil, continuing the rotation of the core, the alternate shifting of the core and wire with respect to each other and the wrapping of the layers of the coil with insulating material until the coil is completed, fastening the wire to the coil at completion of the winding operation, positioning the wire and

a second core to a given position with respect to each other, fastening the wire to the second core at this position, severing the wire between the first coil and the point at which it is fastened to the second core to form another lead for the first coil, and rotating the second core several

times to form a lead for a second coil preparatory to winding the second coil in a continuing process.

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