M. E. GYSEL.

COIL WINDING APPARATUS.

APPLICATION FILED DEC 13, 1917.

1,431,947. Patented Oct. 17, 1922.

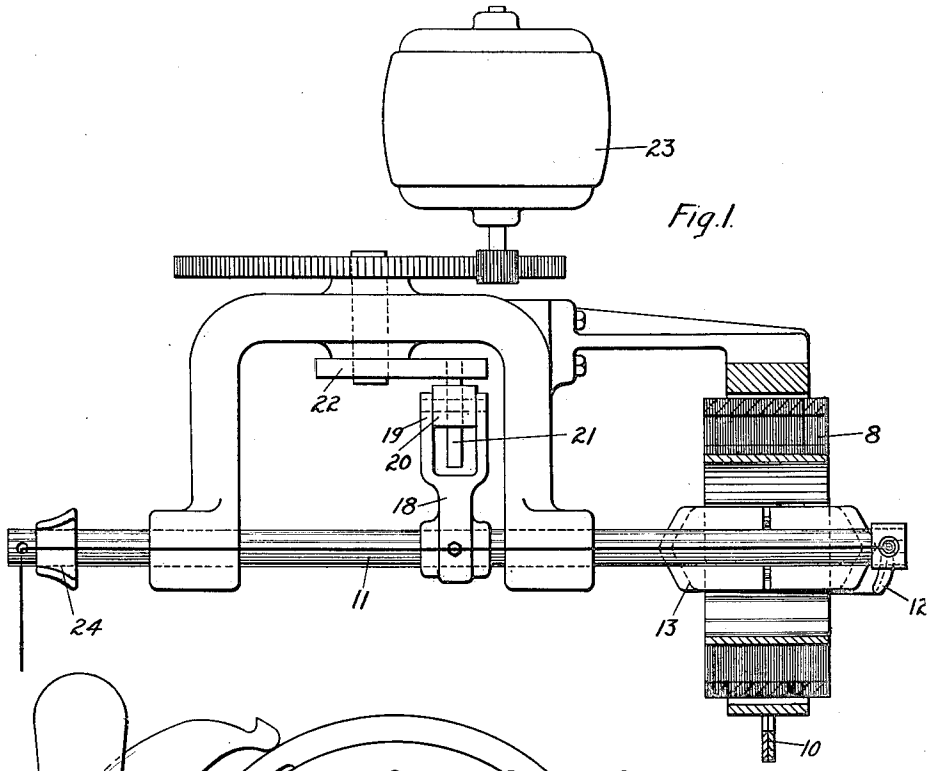


Fig. 1.

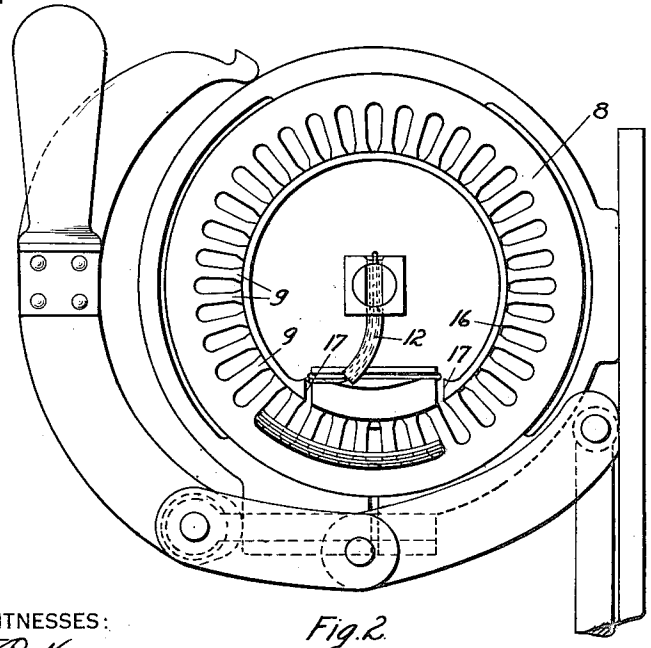


Fig. 2.

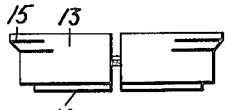


Fig. 3.

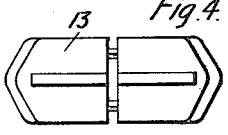


Fig. 4.

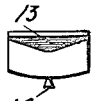


Fig 5

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UNITED STATES PATENT OFFICE.

MAX E. GYSEL, OF WILKINSBURG, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

COIL-WINDING APPARATUS.

Application filed December 13, 1917. Serial No. 207,008.

To all whom it may concern:

Be it known that I, MAX E. GYSEL, a citizen of the Republic of Switzerland, and a resident of Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Coil-Winding Apparatus, of which the following is a specification.

My invention relates to coil-winding mechanisms employed for forming and applying the windings to dynamo-electric machines and it has particular relation to mechanisms of the character designated which are particularly adapted for applying windings to the interior of a hollow cylindrical core member.

My invention has for its object to provide apparatus of the character designated which shall be simple and inexpensive in construction and highly effective in operation, said mechanism not being fully automatic but performing, automatically, many of the operations which are usually performed by hand in an expeditious manner, leaving the operator free to perform the remaining operations, thus permitting an operator to form many more coils in a given time than would be possible by purely manual operation.

In the accompanying drawing, Fig. 1 is a plan view of a coil-winding machine constructed in accordance with my invention and Fig. 2 is an end elevational view of the machine shown in Fig. 1. Fig. 3 is a side elevational view of the block upon which the coil is wound, prior to being inserted in the slots of the machine. Figs. 4 and 5 are a bottom plan view and an end elevational view, respectively, of the block shown in Fig. 3.

In the application of windings to small dynamo-electric machines, many attempts have been made to automatically apply a winding to slots lying in the interior face of a hollow cylindrical core member. Purely automatic apparatus for performing this function is extremely expensive and complicated, so much so, in fact, as to seriously militate against the use thereof.

In accordance with my invention, I apply a block member to the inner surface of a core member of the type described, together with suitable winding guides, and I then apply a winding to the sides of said block by suitable rapidly moving automatic apparatus. An operator then forces said winding into the slots of the core member and moves said block to another pair of said slots, whereupon the action is repeated. In this manner, the coils themselves are very rapidly formed in close proximity to the slots where they are to lie and the operator's attention may be largely fastened upon forcing the coils into the appropriate slots and fastening them therein.

Referring to the drawing for a more detailed understanding of my invention, I show the stator member of a dynamo-electric machine at 8 in Fig. 1. Said stator member is of usual form having inwardly projecting teeth, as indicated at 9. The stator member 8 may be suitably positioned for operation, as by a circumferential clamp 10. A shaft 11 is mounted coaxially with respect to the stator 8 and is arranged for combined longitudinally reciprocating and rocking movement by a mechanism to be hereinafter described.

The shaft 11 carries a hollow needle 12 at its end, said hollow needle projecting radially into proximity to the inner surface of the teeth 9.

A block 13, of any suitable material, is adapted to lie upon the inner face of the core member 8 and is preferably positioned therein, as by the engagement of a fin or lug 14 on the under surface thereof with a slot on the core structure 8. If it be desired to form a coil having a pitch of, for example, six slots, the width of the block 13 is such that its sides are immediately adjacent to the slots having the appropriate displacement, the fin 14 engaging the sides of an intervening slot.

For convenience of insertion, the block 14 is preferably formed in two portions, as shown in Fig. 3, said two portions engaging each other in any desired manner, as by a pin-and-socket connection. The block 13 is further provided with overhanging lips at the ends thereof, as shown at 15.

To still further aid in positioning the wire with respect to the slots in which it is to be placed, a guiding member 16 is placed within the core member 8 and comprises an arcuate spring provided with cheek plates 17 at its ends, said cheek plates being adapted to lie adjacent the remaining sides of the two slots in which a coil is to be placed. The

member 16 retains its position within the core member by reason of its inherent spring construction.

The end of the needle 12 is caused to travel around the block 13 and to wind wire thereabout and under the lips 15 by reason of the combined longitudinal reciprocating and rocking motion imparted to the shaft 11, hereinbefore referred to. Said combined motion is preferably formed by the following mechanism, although I desire it to be distinctly understood that many equivalent mechanisms may be used for obtaining the same result.

An arm 18 projects from the shaft 11, is rigidly attached thereto and is suitably forked at its outer end, as shown at 19. A block 20 is pivotally mounted between the members of the fork 19, and a crank pin 21 traverses said block, being arranged to slide freely therethrough and being carried by a suitable member 22 driven by any suitable means, such as a motor 23.

Having thus described the arrangement of apparatus embodying my invention, the operation thereof is as follows: Having placed the block 13 and the guide members 16 in position so that temporary slots are provided between the cheek plates 17 and the sides of the block 13, the motor 23 is started into operation and wire is drawn over a suitable apron 24 and through the needle 12 against the block 13, the end of the wire being held initially by the operator. Motion of the crank pin 21 toward or away from the core member 8 imparts a longitudinally reciprocating motion to the shaft 11 and to the needle 12, thus enabling said needle to travel along the sides of the block 13, as desired. Motion of the crank pin 21 transversely to the shaft 11 causes the partial rotation of said shaft, the crank pin 21 sliding freely in the block 20 and the block 20 pivoting upon the fork 19 to secure this result, and the rotation of the shaft carrying the end of the needle 12 across the ends of the block 13 at the desired time.

Thus, the end of the needle 12 is caused to travel around the block 13 and to form a coil therearound, the shaping of said coil being further aided by the cheek plates 17.

When the desired number of turns has been formed, the operator stops the feeding mechanism and, by applying suitable pressure to the formed coil, forces it into the core slots immediately beneath the temporary slots in which it has been formed and then fastens said coil in place, as by suitable wedges.

The block 13 is now removed, as by withdrawing the two halves therefrom from opposite sides of the core member, and is reinserted in position for the formation of another coil, the frame structure 8 being suitably rotated in the clamp 10 to bring about the desired positioning of the block 13 with respect to the path of movement of the end of the needle 12.

While I have described my invention in connection with the formation of coils on the inner surface of a cylindrical core member, for which purpose it is peculiarly adapted, it will be obvious to those skilled in the art that it is readily susceptible of application to the formation of coils on the outer surface of a cylindrical core member without departing from the spirit thereof.

It will further be apparent to those skilled in the art that my invention is susceptible of still further alterations and modifications without departing from the spirit thereof and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or are specifically set forth in the appended claims.

I claim as my invention:

1. In a coil-winding mechanism, the combination with a block member adapted for coaction with a slotted core member, of means for wrapping wire about said block, said block being secured in position for transfer of said wire to certain slots of said core member.

2. In a coil-winding mechanism, the combination with a block member adapted to fit upon the face of a slotted core member to which a winding is to be applied, said block member being provided with a lug shaped to fit within a slot of said core member, of means for wrapping wire about said block in position for transfer to certain slots of said core member.

3. In a coil-winding mechanism, the combination with a block member adapted for coaction with and secured relative to a slotted core member, of a hollow needle, means for causing the end of said hollow needle to travel around said block, and means for feeding wire through said hollow needle, whereby a winding is formed about said block suitable for transfer to two slots of said core member.

4. In a coil-winding mechanism, the combination with a block member adapted to fit upon the face of a slotted core member to which a winding is to be applied, said block member being provided with a lug shaped to fit within a slot of said core member, of a hollow needle, means for causing the end of said hollow needle to travel around said block, and means for feeding wire through said hollow needle, whereby a winding is formed about said block suitable for transfer to two slots of said core member.

5. In a coil-winding mechanism for cylindrical slotted core structures, the combination with a block member adapted to rest upon said core member and having its sides adjacent two slots thereof, respectively, of a guiding member adapted to engage said

core member and terminating adjacent the sides of said two slots, respectively, and means for forming a coil about said block, the sides of said coil being restrained by said guiding member, whereby said coil is adapted for transfer to said slots.

6. In a coil-winding mechanism for applying a winding to internal slots on a cylindrical core member, the combination with a block member adapted to rest upon the slotted face of said core member and having its sides adjacent to two slots thereof, respectively, of an arc-shaped, spring, guiding member adapted to fit within said core member and terminating adjacent the sides of said slots respectively, and means for forming a coil about said block, the sides of said coil being restrained by said guiding member, whereby said coil is adapted for transfer to said slots.

7. In a coil-winding mechanism for cylindrical slotted core structures, the combination with a block member adapted to rest upon said core member and having its sides adjacent to two slots thereof, respectively, of a guiding member adapted to engage said core member and terminating adjacent the sides of said two slots respectively, a hollow needle, means for causing the end of said hollow needle to travel around said block, and means for feeding wire to said needle, whereby a coil is formed around said block in position for transfer to said slots.

8. Means for forming a coil suitable for insertion in two slots of a slotted core-member comprising a block adapted to overlie said core-member and having its two sides adjacent to said slots, respectively, said block being provided with a positioning fin on its under surface shaped to fit within a slot of said core member.

9. Means for forming a coil suitable for insertion in two slots of a slotted core-member comprising a block adapted to overlie said core member and having its two sides adjacent to said slots, respectively, said block being provided with a positioning fin on its under surface shaped to fit within a slot of said core member, said block being split transversely to said fin, and the two portions thereof being provided with mutually engaging portions, whereby the two portions of said block may be inserted from opposite sides of said core structure to unite and form substantially a unitary structure.

10. Means for imparting a combined longitudinal and rocking motion to the end of a winding needle comprising a longitudinally and rotatably mounted shaft, said needle radiating therefrom, a rotatably mounted crank-pin, a radial arm attached to said shaft and extending into proximity to said crank-pin, means for causing pivotal and sliding engagement of said arm and crank pin, and means for rotating said crank pin, whereby a combined longitudinally reciprocating and rocking movement is imparted to said shaft.

11. Means for forming a coil within a hollow cylindrical core member comprising a block resting upon the inner face of said core member, a shaft axially mounted with respect to said core member, a hollow needle projecting radially from said shaft into proximity to a side of said block, means for applying a combined longitudinally reciprocating and rocking motion to said shaft, whereby the end of said needle is caused to travel around said block, and means for feeding wire through said needle.

12. Means for forming a coil within a hollow cylindrical core member comprising a block resting upon the inner face of said core member, a shaft axially mounted with respect to said core member, a hollow needle projecting radially from said shaft into proximity to a side of said block, a rotatably mounted crank-pin, means for applying a combined longitudinally reciprocating and rocking motion to said shaft comprising an arm projecting radially therefrom and into proximity to said pin, means providing a pivotal and sliding engagement between said arm and said pin and means for rotating said pin, whereby the end of said needle is caused to travel around said block, and means for feeding wire through said needle.

In testimony whereof, I have hereunto subscribed my name this 30th day of Nov., 1917.

MAX E. GYSEL.