

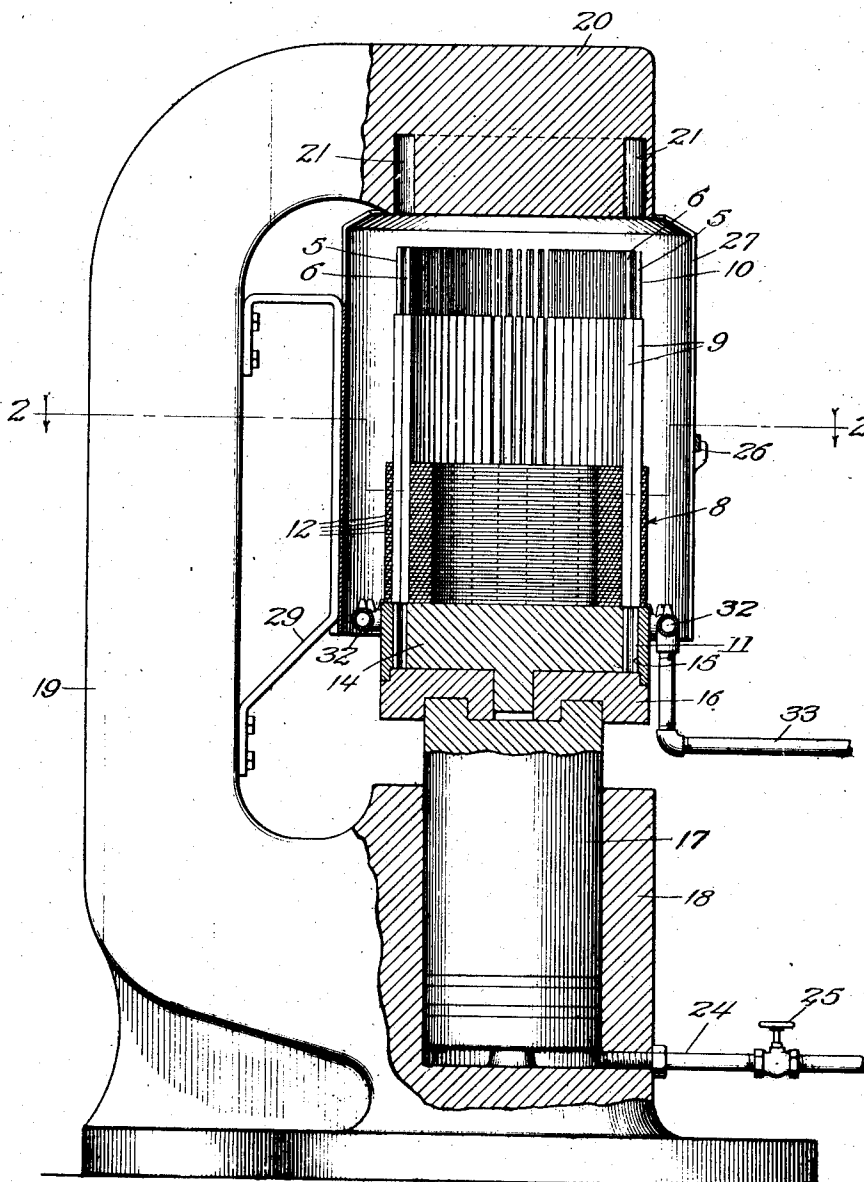
V. G. APPLE.
METHOD OF CONSTRUCTING ARMATURES AND THE LIKE FOR DYNAMO ELECTRIC MACHINES.
APPLICATION FILED DEC. 30, 1916.

1,315,936.

Patented Sept. 16, 1919.

2 SHEETS—SHEET 1.

Fig. 1.



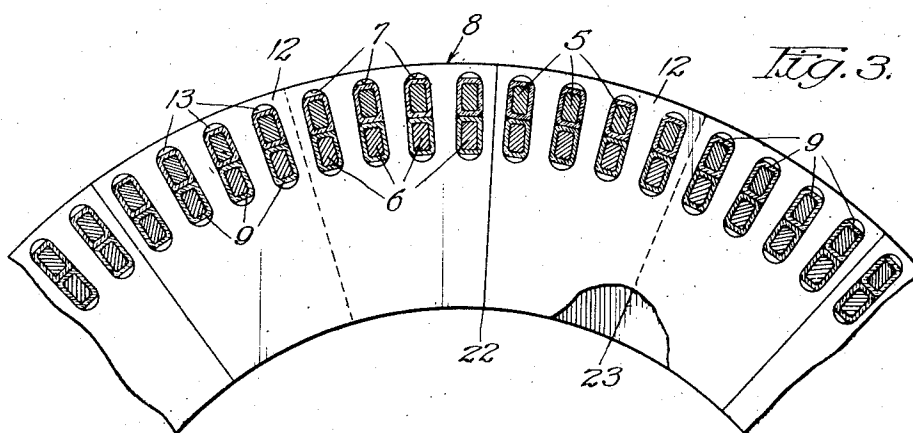
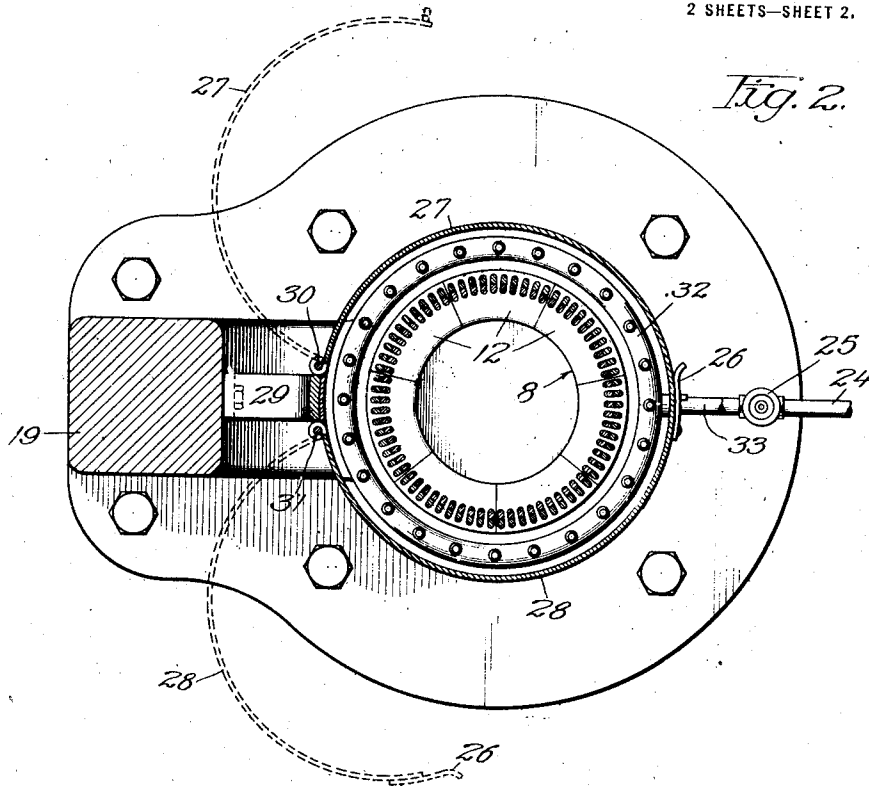
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

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METHOD OF CONSTRUCTING ARMATURES AND THE LIKE FOR DYNAMO-ELECTRIC MACHINES.

1,315,936.

Specification of Letters Patent.

Patented Sept. 16, 1919.

Application filed December 30, 1916. Serial No. 139,753.

To all whom it may concern:

Be it known that I, VINCENT G. APPLE, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Methods of Constructing Armatures and the like for Dynamo-Electric Machines, of which the following is a specification.

One of the objects of my invention is to provide a new, useful and economical method of constructing armatures, and stators of dynamo-electric machines, whereby to so thoroughly insulate the inductive conductors thereof as to substantially eliminate the danger of destruction by short circuiting of the conductors with themselves, or with the core.

Another object of my invention is to build up the core of relatively short segments of suitable laminae, or complete circumferentially-extending rings around the conductors, and varnish or cover the laminae, preferably, as they are applied, with a suitable liquid, cementitious, insulating material, such as bakelite, which becomes hardened and adhesive, after being heated to suitable temperatures, so as to thereby hold the composite, laminae in intimate, substantial contact with each other, to constitute a rugged, stable self supporting core structure, without requiring additional supports, and whereby the conductors are so firmly held within the core structure as to prevent any relative movement or displacement thereof. Furthermore, to similarly cement the previously insulated conductors to the surfaces of the core, through which they extend, by use of the same or similar cementing material, which may be applied to the previously insulated conductors in liquid form at the same time as to the segments, during the building up process, or by the excessive cementing material which may flow into the crevices or openings around the conductors at the time when the core laminae are being pressed together.

Another object of my invention is the provision of a machine for carrying my method into effect.

Other and further objects of my invention will become readily apparent, to persons skilled in the art, from a consideration of

the following description when taken in conjunction with the drawings, wherein:—

Figure 1 is an elevation of a machine showing an armature being built up and showing parts of the structure in cross section.

Fig. 2 is a transverse section taken on line 2—2 of Fig. 1.

Fig. 3 is an enlarged plan view of a part of the armature core showing the conductors and the insulating material surrounding them, in section.

In all the views the same reference characters are employed to indicate similar parts.

In carrying my invention into effect I first provide inductive conductors 5 and 6, which may be straight copper bars, or hairpin form of conductors that are to be inserted in the openings 7, which may be slots or perforations, of the core 8. I prefer to then cover the conductors with a fibrous absorbent separator or coating of insulating material which may be impregnated with a liquid insulation, such as bakelite or other similar heat hardening insulation 9, preferably compacted and heated to harden the cement and covering to produce a good electric insulator, thereof, leaving, preferably, the bare ends 10 and 11, which are to be connected together or connected to commutator segments, free of the insulating material referred to. I then preferably build up the core 8 around the previously insulated conductors by application of laminae or segments provided with registering openings or slots 7.

As one manner of building the structure and for convenience of construction I provide a practically round block 14, having perforations around its periphery, similar in kind and number to the perforations 7, and adapted to register therewith, and into these perforations 15, I place the conductors 5 and 6 in upright position, in the same relative positions they will occupy in the completed armature or stator. The perforations 15 extend around the periphery of and through the block 14, and are of the same general form and shape as the perforations 7 in the rings or segments 12 and are the same in number as in the completed armature and register therewith. The uncoated ends of the conductors 5 and 6 are placed in the perforations 15 in the block

14, the lower ends of the conductors coming in contact with the upper surface of another underlying block 16 so that the lower and upper ends of the conductors are in the same respective transverse planes. The thickness of the block 14 is just sufficient to permit the uncovered surfaces of the conductors 5 and 6 to enter therein leaving coating 9, of the conductors to begin at approximately the upper surface of the block 14. The block 16 is preferably rotatable for convenience of placing the laminae on the conductors and is located upon a ram 17 of a cylinder 18, of a hydraulic press. The frame 19 carries upon its upper end, an anvil or abutment 20, which is likewise perforated, as at 21, to admit the upper ends of the conductors 5 and 6, when the rings or segments are being pressed together by the instrumentality of the vertically movable piston or ram 17 of the press. When the conductors are placed in the positions shown, the rings or segments are threaded over the conductors and preferably just before, or, as they are threaded over the conductors, in their respective positions, they are coated with a liquid, cementitious, insulating material, such as bakelite, or the like, which hardens and becomes adhesive, after the application of heat, and which thereby produces a self supporting structure. The segments 12 are placed in circumferential sequential series, as shown in Fig. 3, and are preferably of uniform size. The joints 22, between adjacent segments when segments are used to compose a ring, are broken or circumferentially spaced apart from the joints 23, of the ring immediately adjacent. After the core has been built up, as shown in Fig. 1, by threading the rings or segments in circumferential sequence over the bars, until sufficient thickness of core has been thus constructed, of greater linear dimensions than the final dimensions of the core, to allow for a certain amount of contraction, by the pressure to which the laminae of which the core is made, are to be subsequently subjected, pressure is applied.

Near the lower end of the cylinder 18 of the hydraulic press is a pipe 24, for the introduction of a fluid under pressure, into the cylinder, below the ram 17. A globe valve 25 controls the motive fluid. When the core has been built up in the manner described, the valve 25 is opened, which controls the motive fluid and causes the ram 17 to be raised in a vertical direction and thereby causing the conductors 5 and 6 to enter the respective perforations 21, in the abutment 20, of the press. Thus pressure will be applied in an axial direction to the members of the core, and cause them to adhere with each other, and will express the surplus amount of adhesive liquid, that has previously been applied to the laminae,

causing a part thereof to pass into the perforations 7 surrounding the conductors and to fill up spaces 13 in said perforations. After the core has been thus compressed, to the desired extent, with the core, of the proper linear dimensions, heat is applied to the structure as by closing the oven doors 27 and 28, as shown in Fig. 1, and in open positions in Fig. 2, in dotted lines. These doors are hinged to a vertically extending bar 29, as at 30 and 31, respectively. A latch 26 holds the doors in their closed positions.

Located in the annular space, between the block or table 14, and the doors 27 and 28, is a gas burner 32 to which gas or other fuel may be fed, through the pipe 33. The gas burner is then lighted and the armature structure heretofore described is thus baked while under pressure. After the baking process the liquid insulating cement becomes hardened and holds the parts of the self supporting structure in their proper relations without the necessity for further holding means. It also serves to cement the conductors 5 and 6 firmly in place with the core so there can be no relative movement between the conductors and the core, or between the conductors themselves, and therefore the insulating material, with which the conductors were previously coated unites with the subsequently applied liquid cement, thus securely securing the conductors by a surrounding cushioning insulation.

After the structure described has been compressed, in the manner heretofore pointed out, the parts may be temporarily held in any suitable manner and the structure removed from the press and heated in an entirely different oven, if desired, so that the press may, in this way, be maintained in use for a longer period of time or, in other words, to be used to build up other structures while the previously formed structures are being baked in cheaper ovens, or the conductors may be heated by electric current or the entire structure may be heated by a draft of heated air, or otherwise.

Having described my invention, what I claim is:—

1. The method of building self supporting inductive structures for dynamo electric machines, which consists in inclosing the core-covered portions of each conductor with an insulating absorbent separator, and cementing the covered conductors in openings within the core and cementing the laminations of the core together with a liquid insulating cement which hardens by application of heat, then heating the structure to harden the cement.

2. The method of building self supporting inductive structures for dynamo electric machines, which consists in inclosing the

core-covered portions of each said conductor, with an insulating absorbent separator and cementing the conductors in openings within said core and cementing the laminations of the core together by application of a liquid, insulating cement that hardens by application of heat applying pressure to the core, and while under pressure, heating said structure to harden the cement.

3. The method of building self supporting inductive laminated structures for dynamo electric machines, which consists in inclosing the core-covered portions of each conductor with a coating of insulating material saturating said coating with an insulating cement of the same character as that used between the laminæ and cementing the conductors in openings within said core and the core laminæ together with a liquid cement which hardens by application of heat, and heating the liquid cement.

4. The method of building self supporting inductive structures for dynamo electric machines which consists in inclosing the core covered portion of each said conductor with a separating coating of insulating material; embedding the coated portion of said conductors in openings provided in a suitable laminated core; filling in between said conductor coatings and the wall of said openings and between the laminations with a liquid cement which hardens by application of heat, then applying heat to harden said cement.

5. The method of building inductive structures for dynamo electric machines, which consists in coating portions of each of a series of conductors, to be inclosed within the core, with an insulating covering; stacking said conductors in the positions they will occupy in the completed structure; threading over said conductors, thin segments of magnetically-inductive material in circumferential sequence, to form rings; applying a liquid-cement, which hardens by application of heat, to said segments; applying pressure, to said composite core thus made, to express the excessive cement and to bring the segments into substantially intimate contact with each other, and heating the structure to harden the cement.

6. A method of building self supporting cores of magnetic material for inductors of dynamo electric machines which consists in applying a cementitious material directly to the adjacent sides of magnetic laminations composing the core; temporarily supporting the laminæ in axial positions they will occupy when the core is completed; placing conductors on said core; applying pressure to axially compress the laminæ to dimensions required, thereby forcing out the excessive cement into contact with said conductors; heating the structure while under pressure, to harden the cement; maintain-

ing the pressure until the structure becomes cool and removing the temporary supports whereby a core of magnetic material and adhesive is rendered self supporting.

7. A method of building self supporting structures for dynamo electric machines which consists in applying cementitious material to the adjacent sides of the laminæ composing the core; stacking the laminæ, each having a series of openings to receive conductors; supporting the laminæ in axial positions they will occupy when the structure is completed; causing registration of the openings by insertion of the conductors; applying pressure to axially compress the laminæ to the dimensions required; heating the structure while under pressure, to harden the cement; maintaining the pressure until the structure becomes cool and removing the temporary supports.

8. An armature core comprising a series of impenetrable laminæ having registering spaced-apart wire-receiving openings near their peripheral edges; conductors cemented in said openings; heat resisting cement adhesively securing together adjacent laminæ to render the core self supporting.

9. The method of constructing dynamo structures, of the character described, which consists in covering the core-inclosed portions of the conductors with a coating of insulating material; stacking and supporting the conductors in substantially the positions they will occupy in the completed structure; assembling perforate, segmental laminæ of inductive material, to constitute, when built up, a core for supporting said conductors; coating said segments and conductors with a liquid cement that becomes hardened after the application of heat, at a relatively low temperature; applying pressure to axially contract the core and heating the core.

10. The method of building inductive structures for dynamo electric machines, which consists in covering core-contained portions of the inductive conductors with fibrous material impregnated with a liquid cement which hardens by application of heat; compressing said covering to compact it; heating the cement to harden it; introducing the conductors so prepared into openings in a suitable core; applying a liquid cement to fill the interstices between said conductors and the boundaries of said openings and heating the structure to harden the liquid cement.

11. The method of building self supporting armatures which consists in cementing the core laminæ together and cementing the conductors to the core, then applying heat to harden the cement.

12. A self supporting armature core comprising a series of laminæ having openings near their peripheries arranged with said

openings registering; conductors in said openings, means cementing said conductors and laminae together to thereby make a self supporting armature without requiring further means of support.

13. The method of building self supporting armature cores which consists in superficially coating a series of armature core laminae with cement that hardens by application of heat and is sufficiently strong to constitute the sole binding means for holding the laminae together; compacting the laminae and heating the structure to harden the cement.

14. The method of building self supporting armature cores which consists in superficially coating a series of armature core laminae with cement that hardens by application of heat and is sufficiently strong to constitute the sole binding means for holding the laminae together; compacting the laminae and heating the structure to a temperature higher than that attained by the core in its normal operation, to harden the cement.

15. The method of building self supporting armature cores which consists in superficially coating a series of core laminae of substantially uniform thickness, with cement that hardens by application of heat and is sufficiently strong to constitute the sole binding means for holding the laminae together; arranging the laminae in axial alinement; compacting the laminae; heating the laminae to a temperature above that normally attained by the core in use, to harden the cement and removing all supporting means from the structure when the cement hardens.

16. The method of building self-support-

ing armature cores which consists in superficially coating the laminae with a cement that hardens by application of heat and is sufficiently strong to constitute the sole binding means for holding the laminae together; arranging the laminations in circumferential and axial register; compacting the laminae to predetermined dimensions; heating the structure to a temperature above that normally attained by the core in use and removing the temporary supports from the structure.

17. A self supporting armature comprising a series of laminae of substantially uniform thickness cemented together with a cement that will not soften at the temperature which the core attains during normal operation and is sufficiently strong to constitute the sole binding means for holding the laminae together.

18. A self supporting armature core comprising a series of impenetrable laminae of substantially uniform thickness having registering spaced-apart wire-receiving openings near their peripheral edges, said laminae cemented together with an adhesive material that will not soften by heat and is sufficiently strong to constitute the sole binding means for holding the laminae together whereby to make and maintain a self supporting core without end plate or bolt supports.

In testimony whereof I hereunto set my hand in the presence of two subscribing witnesses.

VINCENT G. APPLE.

In the presence of—
E. V. MARTIN,
F. W. COTTERMAN.