A. E. SEINECKE.

DYNAMO ELECTRIC MACHINE CONSTRUCTION.

APPLICATION FILED FEB. 3, 1917.

1,362,543. Patented Dec. 14, 1920.

Fig. 1.

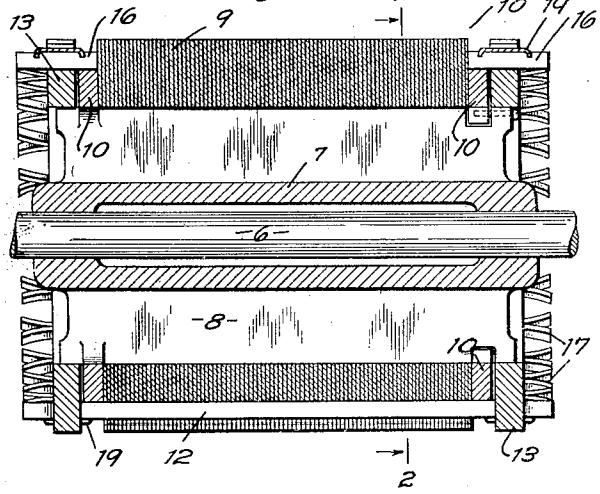


Fig. 2.

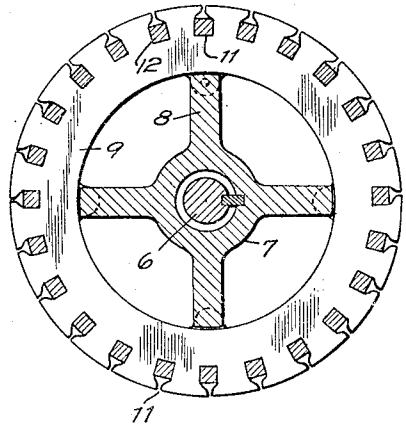


Fig. 3.

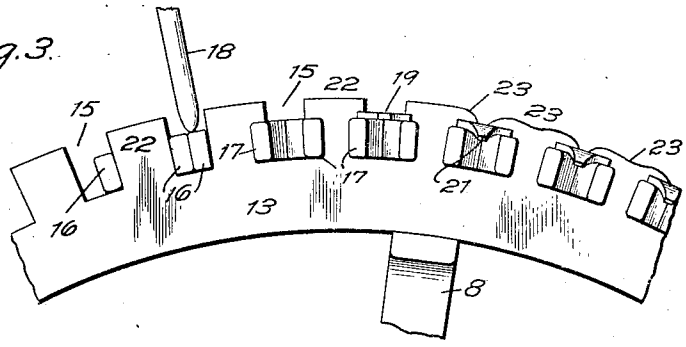


Fig. 6.

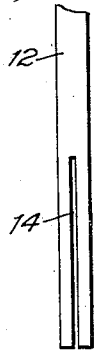


Fig. 4.

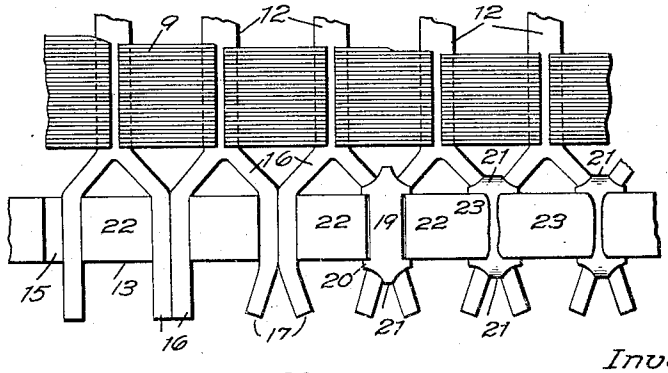
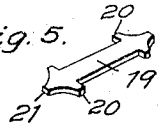


Fig. 5.



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UNITED STATES PATENT OFFICE.

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DYNAMO-ELECTRIC-MACHINE CONSTRUCTION.

1,362,543. Specification of Letters Patent. Patented Dec. 14, 1920.

Application filed February 3, 1917. Serial No. 146,498.

To all whom it may concern:

Be it known that I, ADOLPH E. SEINECKE, residing at Cincinnati, Hamilton county, State of Ohio, have invented certain new and useful Improvements in Dynamo-Electric-Machine Construction, of which the following is a clear, full, and exact description, attention being called to the drawing which accompanies this application and forms a part thereof.

This invention relates to improvements in the construction of electric motors or other dynamo-electric machines of the induction or alternating current type and it concerns more particularly the rotor of such motors.

These rotors consist substantially of a laminated core built up of a number of circular, flat, ring-shaped plates seated side by side on a frame which is mounted upon a shaft whereby it is rotated.

Parallel conductor bars, circumferentially spaced, pass through this laminated core near the periphery thereof and extend at each end beyond the same where they are rigidly connected to the frame.

In view of the high rotative speed of the rotor it is essential that this connection be a substantial one. The fact that these rotors become hot and assume changing temperatures which affects their metallic parts causing them alternately to shrink and to stretch, subjecting thereby the various joints to strain, limits the available means and methods for forming connections and for this reason joints are required which are substantial for the purpose and not affected by the adverse conditions produced by changeable temperatures.

Therefore it is the object of my invention to construct a rotor in which these requirements as to construction are satisfied, this construction being described and pointed out in the claims hereinafter and illustrated in the accompanying drawing in which:

Figure 1 is a longitudinal section of a rotor constructed in conformity with my invention.

Fig. 2 is a vertical cross-section of the same taken between opposite ends thereof.

Fig. 3 shows a portion of an end view enlarged.

Fig. 4 is a top view of the parts shown in the preceding figure and as viewed from the periphery of the rotor, the view being arranged in the nature of a diagram, that is to say the parts are shown in a flat plan of view instead of being projected to follow the periphery of the rotor, the object being to render a clear illustration of the method of construction possible.

Fig. 5 is a detail perspective view of one of the clips; and

Fig. 6 is a detail plan view of one end part of one of the bars before it is secured in the rotor.

In the drawing character 6 indicates the shaft upon which the rotor frame or spider is mounted and whereby the rotor is rotated.

This frame or spider consists substantially of an elongated hub 7 from which a number of arms 8 project radially.

The laminated core which consists of a number of flat, iron rings 9, closely packed against each other, is supported upon the free edges of these arms, they being all of equal radial extent and held between two end rims 10—10 which form connected parts of the frame.

Near their outer peripheral edges the rings 9 have circumferentially arranged spaced openings 11, all alike and all alined in the various rings so as to form elongated recesses which extend lengthwise through the core parallel to its axis and are open at both ends of the core.

Conductor bars 12, usually of copper, occupy these recesses and project at each end of the core where their ends are connected to the rotor frame by means of conductor rings 13 which are provided at the ends of the frame of the rotor structure.

The joints whereby the ends of these bars are connected to these rings must be substantially formed to maintain mechanical connection as well as electrical contact against the mechanical effects due to the rotation of the rotor as well as to the alternate stretching and shrinkage of the metal produced by variations in temperature when the rotor becomes hot and cools again.

Heretofore it has been customary to effect electrical communication between the conductor bars by means of the conductor rings mentioned and to which they are connected so that perfect electrical contact is dependent upon a mechanically perfect joint at each end of each bar.

One feature of my invention is the improved construction whereby adjacent conductor bars are brought into direct contact and so secured that, for electrical conduc-

tion, intermediate parts need not be relied upon and electrical communication is not necessarily dependent upon a perfect mechanical joint and therefore is not affected by any imperfections in such a joint or by axial expansion and contraction of the rotor structure as a whole.

For such purpose a portion of each conductor bar at each end is separated as shown at 14 in Fig. 6. This may preferably be done by a saw cut, the cut being by preference in a radial direction having reference to the bars when they are assembled in the rotor.

The rings 13 are provided with spaced notches 15 in their outer periphery and the width of each one of these notches is such that when the split end portions of the bars 12 are spaced apart to assume fork-shaped formation which results in two branches 16, one of these branches of each of two adjacent bars may be received in these notches as shown in Fig. 4.

These branches 16 extend outwardly beyond the rings. This permits these extending end portions to be spread away from each other as shown at 17 whereby the position of the bars 12 becomes lengthwise defined and fixed with reference to the rings 13.

This completes the electrical connection of the bars to each other, it being by direct contact and it remains now to complete their connection to the rings 13 by formation of a perfect mechanical joint.

The next step in the attainment of this purpose consists of laterally spreading and upsetting these branches in their recesses so that they fully occupy them, this being accomplished by means of a calking tool as indicated at 18 in Fig. 3.

This act, in addition to the intended mechanical effects obtained, also serves to perfect for electrical purposes the direct contact between the adjoining branches.

To render the connection of the bars to the rings 13 perfectly secure against endwise movement, I next apply clips 19 shaped as illustrated in Fig. 5.

These clips have pairs of lugs 20 on each edge and lugs 21 at opposite ends and the space between the lugs 20 of each pair is so that when the clips are placed in position as shown in Fig. 4, they will be held in place by these lugs by engaging the opposite sides of the parts of rings 13 between notches 15.

Next the end lugs 21 of these clips are hammered down so as to wedge into the triangular spaces between the spread portions of each pair of contacting branches 16 where they extend beyond notches 15.

This wedging action, by tending to force the contacting branches of adjoining bars 12 still farther apart on each side of rings 13, increases the connective effect of the joint.

Finally the radially outer ends of the metal of the rings 13 between notches 15, which extend radially beyond the branches of bars 12 as shown at 22, are hammered or peened down into these notches over clips 19, whereby these clips are held radially inward against the conductor bars in the notches 15 with absolute security.

It will now be seen that the conductor bars are connected by means of a substantial joint which is, by virtue of the diagonal extent of the bifurcations, sufficiently flexible to permit contraction and expansion of the metal under heat conditions without being impaired thereby, especially because the contacts are mainly in planes parallel to the rotor axis, generally the direction of greatest dimension, and consequently of the greatest degree of expansion and contraction.

Electrical conducting contact between the bars is absolutely assured and tendencies favoring overheating are counteracted by the split ends of the conductor bars whereby surfaces susceptible to air cooling are increased, while excess of metal at the joints is avoided.

Having described my invention I claim as new:

1. A rotor for a dynamo-electric machine comprising the combination of the laminated core, a rotary structure upon which this core is mounted and which is provided with circumferentially spaced notches beyond the ends of the core, conductor bars spaced circumferentially about said core and extending beyond said core where they are bifurcated and provided with fork-shaped branches which occupy the notches mentioned and means to connect these branches in position.

2. A rotor for a dynamo-electric machine comprising the combination of the laminated core, a rotary structure upon which this core is mounted and which is provided with circumferentially spaced notches beyond the ends of the core, conductor bars spaced circumferentially about said core and extending beyond said core where they are bifurcated and provided with fork-shaped branches which occupy the notches mentioned, the bifurcated ends of the bars being clenched to the structure between the notches.

3. A rotor for a dynamo-electric machine comprising the combination of the laminated core, a rotary structure upon which this core is mounted and which is provided with circumferentially spaced notches beyond the ends of the core, conductor bars spaced circumferentially about said core and extending beyond said core where they are bifurcated and provided with branches which oc-

cupy the notches mentioned, so that one branch of each of the bars is in electrical contact with one branch of each of the adjoining bars, and means to secure these branches in the notches.

4. A rotor for a dynamo-electric machine comprising the combination of a laminated core, a rotary structure upon which this core is mounted, conductor bars spaced circumferentially about said core and extending beyond said core, with their extensions bifurcated and having their bifurcations laterally spread so that one bifurcation of each bar contacts with one of the bifurcations of each adjacent bar, and connecting rings for these bars at the ends of the structure which have circumferentially spaced notches which are occupied by the contacting bifurcations of the bars, said bifurcations being held in these notches by metal of the rings between these notches which is forced into said notches so as to extend over these bifurcations.

5. A rotor for a dynamo-electric machine comprising the combination of a laminated core, a rotary structure upon which this core is mounted, conductor bars spaced circumferentially about said core and extending beyond said core, the extending portions being longitudinally separated and laterally spread apart into fork shape with two branches, and connecting rings for the bars at each end of the structure which are circumferentially notched, the branches of each bar being clenched to the upstanding metal between said notches.

6. A rotor for a dynamo-electric machine comprising the combination of a laminated core, a rotary structure upon which this core is mounted, conductor bars spaced circumferentially about said core and extending beyond said core, the extending portions being longitudinally separated into fork shape with two branches which are laterally spread so that one branch of each bar contacts with one of the branches of each adjacent bar, connecting rings for the bars at each end of the structure having spaced circumferential notches which are occupied by the contacting portions of these branches, the two branches of each bar being clenched to the metal of the rings upstanding between the notches, and wedging clips in these notches and bearing on the contacting branches and extending beyond said notches where their ends are wedged in between these branches, where they diverge, said clips being held in position against these branches by metal of the rings between the notches being spread to engage these clips.

7. In the construction of rotors for dynamo-electric machines, the method of effecting direct electrical contact between the conductor bars which in spaced relation extend longitudinally through and beyond the core, said method consisting of bifurcating the extending ends of the bars in lateral direction so that the bifurcations of one bar contact with one of the bifurcations of each of the adjacent bars on each side, and upsetting other parts of said rotor structure into engagement with said contacting bifurcations.

8. In the construction of rotors for dynamo-electric machines, the method of effecting direct electrical contact between the conductor bars which in spaced relation extend longitudinally through and beyond said core, said method consisting of providing a ring with circumferentially spaced notches opposite each end of the core, of positioning the end parts of said bars in the notches of said rings so that end parts of adjacent bars occupy one notch, and upsetting and spreading these end parts in said notches so as to force them into close contact with each other.

9. In the construction of rotors for dynamo-electric machines, the method of effecting direct electrical contact between the conductor bars which in spaced relation extend longitudinally through and beyond said core, said method consisting of providing a ring with circumferentially spaced notches opposite each end of the core, bifurcating the parts of the bars that extend beyond the core, positioning these bifurcations in the notches of said rings so that two bifurcations, one of each two adjacent bars, occupy one notch, and upsetting and spreading these bifurcations in the notches so as to force them into close contact with each other.

In testimony whereof I hereunto affix my signature.

ADOLPH E. SEINECKE.