Mar. 13, 1923. 1,447,993.

A. D. T. LIBBY.

METHOD OF CONSTRUCTING ELECTRODYNAMIC ARMATURES.

FILED SEPT. 22, 1919.

Fig-2

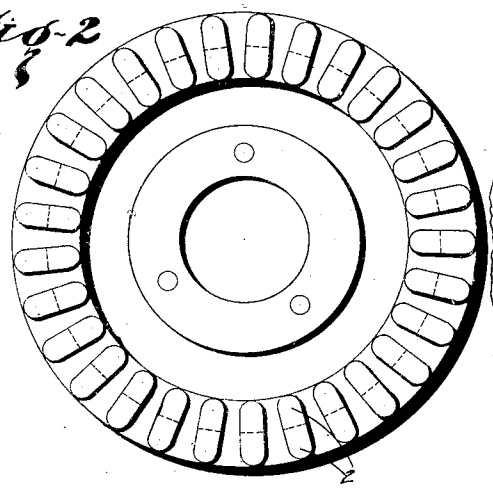


Fig-3

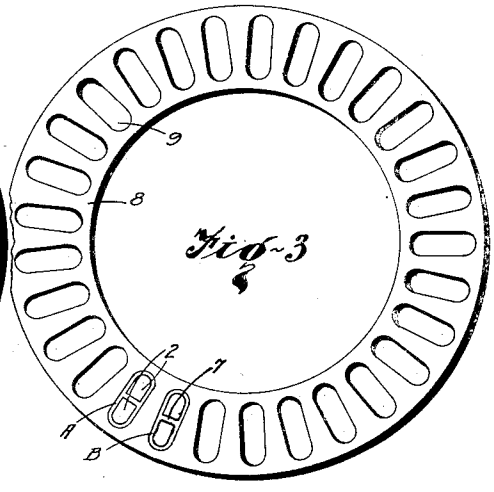


Fig-1

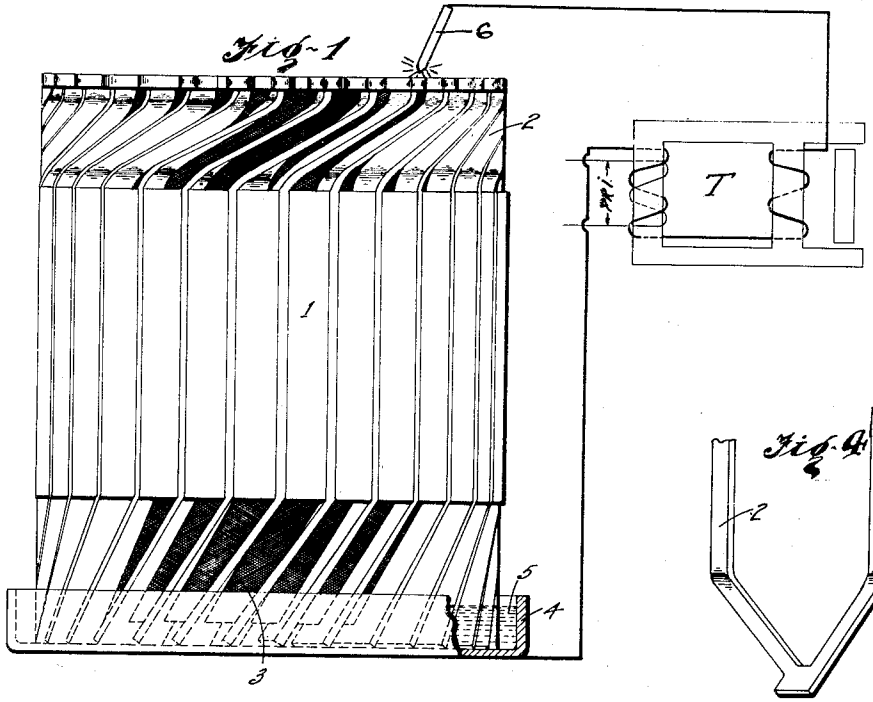


Fig-4

INVENTOR

Albion D. T. Libby

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UNITED STATES PATENT OFFICE.

ALBION D. T. LIBBY, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO SPLITDORF ELECTRICAL COMPANY, OF NEWARK, NEW JERSEY.

METHOD OF CONSTRUCTING ELECTRODYNAMIC ARMATURES.

Application filed September 22, 1919. Serial No. 325,445.

To all whom it may concern:

Be it known that I, ALBION D. T. LIBBY, a citizen of the United States, residing at East Orange, in the county of Essex, State of New Jersey, have invented certain new and useful Improvements in Method of Constructing Electrodynamic Armatures, of which the following is a description, reference being had to the accompanying drawing and to the figures of reference marked thereon.

This invention relates to a method of constructing an electro-dynamic armature which may be used in a motor or generator. The method is particularly adapted for use in the construction of armatures for starting motors used on internal combustion engines, although it is to be understood that I do not limit myself to this particular adaptation of the method herein described as it may be employed in the construction of other dynamo electric machines, such as rotors of induction motors and the like.

In the construction of starting motors for automotive vehicles, the armature conductors are of relatively large cross section, as in some cases the current at the instant of closing the starting switch may run as high as 500 or 600 amperes and in most cases exceeds 100 amperes during the cranking period. Many of these motor armatures are less than 3" in diameter and it will thus be seen that the amount of work delivered by them is enormous for short intervals of time.

In the construction of armatures for motors of the character above described, a great deal of difficulty has been experienced in soldering the heavy armature conductors to the commutator bar risers. The usual construction provides for two of these heavy conductors being soldered to one commutator bar and many times it is found that the conductor lying in the bottom of the slot in the commutator bar riser is not securely soldered to the said riser. A bad joint of this kind immediately effects the torque of the motor and is a very annoying trouble to find because of the fact that after the conductors are all in place the joint may look perfectly good while when the armature is rotated in the motor field the forces acting on the conductor will move it in the said slot of the commutator bar riser and the motor will show defective on tests. Sometimes it has happened that the motors have to be torn down two or three times before a defect as above outlined can be overcome.

It is, therefore, the principal object of my invention to provide a method of uniting the armature conductors so as to do away with all soldered joints and thereby reduce the armature resistance to a minimum which means greater current through the armature and an increased torque. The method outlined herein is such that while the conductors are being united the conductor ends are open and visible to the operator so that he can see exactly what kind of a union he has made between the proper conductor ends.

In the application of Henry E. Borger, S. N. 139719, filed December 30, 1916, there is shown and described a dynamo electric armature in which the end turns of the conductors are bare so that the brushes may be operated directly on said conductor end turns. The present invention is directed to a method of uniting the conductor ends, such as shown in said Borger application, in a speedier and more satisfactory manner than therein shown and described.

The method claimed herein will be readily understood by reference to the drawing, wherein—

Figure 1 illustrates an armature core with the conductors assembled thereon and placed in a position to have the open ends of the conductor joined, the welding transformer and the welding electrode being shown diagrammatically.

Figure 2 is a top view of Figure 1 showing the complete conductor ends.

Figure 3 is a view of a spacing member which may be used in the welding operation and also shows two sets of conductors in position therein.

Figure 4 is a partial view of the preferred form of conductors used on the armature shown in Figure 1.

As shown, 1 illustrates the core lamination having slots either open or closed in its periphery and in which conductors 2 are placed. In the type of armature shown there are two conductors per slot as will be indicated in Figure 2. Where the end turns are brought out the top and bottom layers are preferably separated by a sheet of insulation, as indicated at 3. I have

found that a minimum amount of work is required on an armature of this character when a hairpin type of conductor is used, same as shown in Figure 4. This type of conductor is made from one piece and formed at one end as shown in Figure 4. The open ends are bent to bring them out at the proper places, as indicated in Figure 1.

In the form of core structure shown, I have illustrated that shown and described in Tomlinson Patent #1262873, issued April 16, 1918. After the core has been assembled in a similar manner to that described in said patent and the conductors placed in the core slots, being insulated from the core in any well known manner, the armature is set into a vessel 4 which contains some liquid conductor 5, such as mercury, through the medium of which all of the bare conductor ends at this end of the core are short circuited. To the vessel 4 I attach one terminal of a source of welding current, such as an alternating current welding transformer similar to that shown and described in Patent #1305363, issued June 3, 1919, to Claude J. Holslag, the other terminal of said source being connected to an electrode 6 preferably metallic and of the same material as the conductors 2. After the open ends of the conductors 2 have been aligned in proper order, I then strike an arc with the electrode 6 between a pair of the conductors which are to be joined together, as indicated at 7 in Figure 3. In order to assist in the alignment of the open conductor ends and in the welding operation, I may use a spacing member 8 having slots 9 therein which is adapted to drop over the end of the conductors 2 which are in a position to be welded as indicated at A, Figure 3. The complete welding operation is indicated at slot B in Figure 3. The complete welded conductor ends are indicated in Figure 2.

While I have shown one method of connecting the source of welding current to the bare conductor ends, it will be understood that any other suitable method of connecting said terminal to the conductors to be welded may be adopted as well as any other type of spacing member for the open ends. It is also to be understood that in some cases the autogenous form of welding may be used, such as oxy-acetylene burners, but I prefer to use an electric arc in the manner herein described, although I wish it to be understood that a carbon arc with a separate copper stick may come within the scope of my invention.

While I have shown and described one form of applying my invention to the construction of an electro-dynamic armature, it will be understood that numerous changes and alterations may be made in the details without departing from the spirit of my invention and the scope of the appended claims.

Having thus described my invention, what I claim is:—

1. The method of constructing an electro-dynamic armature which consists in placing on the core thereof but insulated therefrom a series of conductors having bare open end turns at one or both ends of the core, arranging said end turns in spaced relationship and alignment to produce an operative winding when connected, and then welding said end turns together with an open arc in which one of the electrodes consists of said end turns and the other a metallic rod preferably of the same composition as said conductors.

2. Steps in the method of constructing an armature which consists in placing on the core thereof, but insulated therefrom, a series of bare conductors of the hairpin type in such a manner that the open ends of said conductors all come at one end of the core, grouping the ends of the armature conductor in closely adjacent pairs, connecting the closed ends of the conductors with one terminal of a source of current, connecting the opposite terminal of said source with an electrode of the same material as the conductor, and striking an arc between the conductors and the electrode, thereby melting the ends of the conductors and a portion of the electrode together.

In testimony whereof, I affix my signature.

ALBION D. T. LIBBY.