May 19, 1925. 1,538,196

A. V. LIVINGSTON

CONSTRUCTION FOR DYNAMO ELECTRIC MACHINES

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Fig. 1.

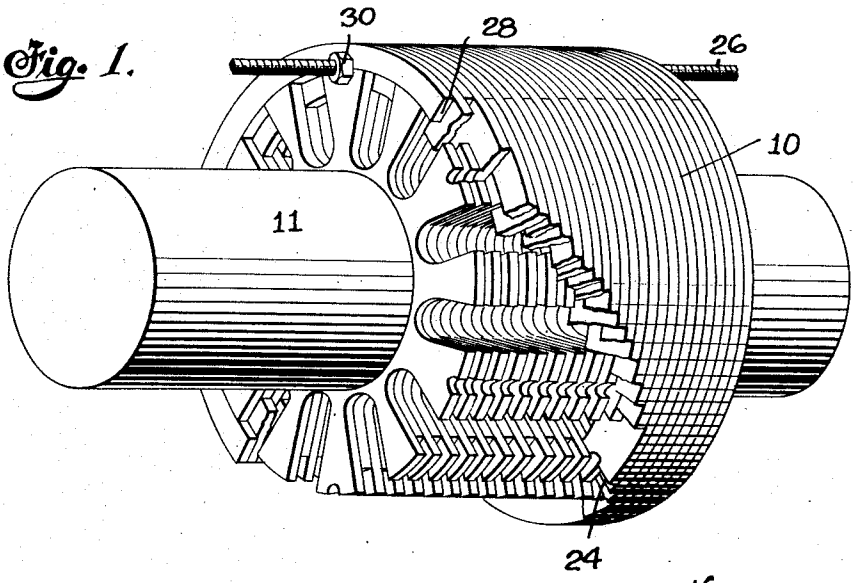


Fig. 2.

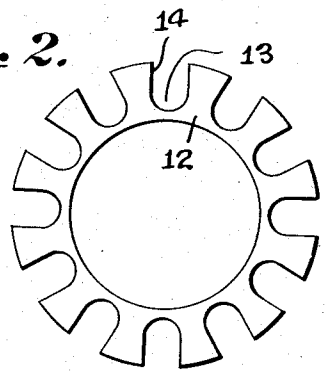


Fig. 3.

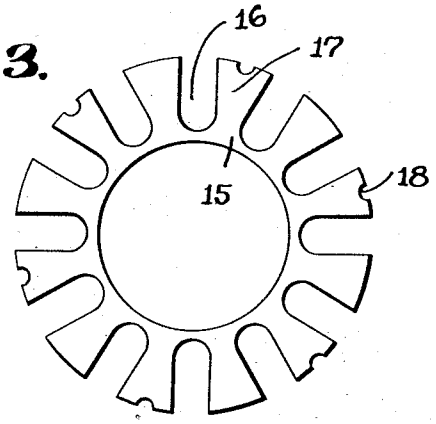


Fig. 4.

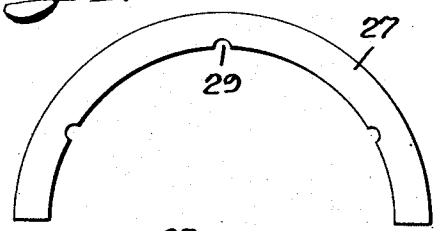


Fig. 5.

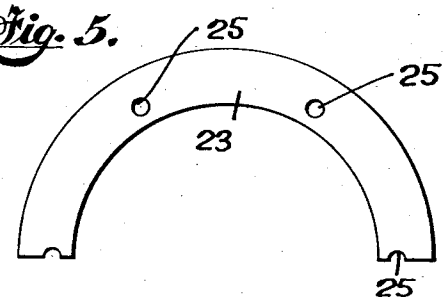
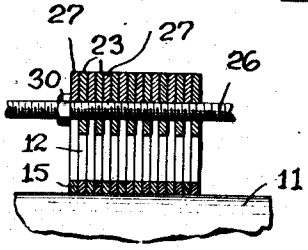


Fig. 6.



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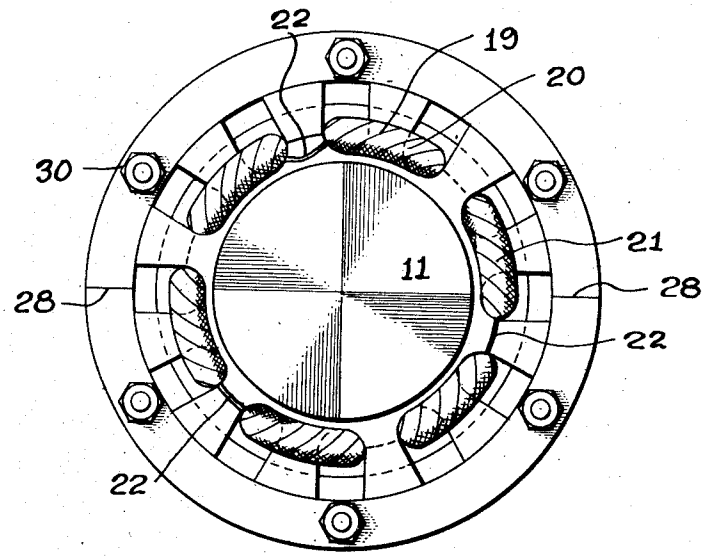
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Fig. 7



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Patented May 19, 1925. 1,538,196

UNITED STATES PATENT OFFICE.

ALAN VARLEY LIVINGSTON, OF NEW HAVEN, CONNECTICUT, ASSIGNOR TO SAFETY CAR HEATING & LIGHTING COMPANY, A CORPORATION OF NEW JERSEY.

CONSTRUCTION FOR DYNAMO-ELECTRIC MACHINES.

Application filed December 6, 1921. Serial No. 520,213.

To all whom it may concern:

Be it known that I, ALAN VARLEY LIVINGSTON, a citizen of the United States, and a resident of New Haven, in the county of New Haven and State of Connecticut, have invented an Improvement in Constructions for Dynamo-Electric Machines, of which the following is a specification.

This invention relates to the construction of dynamo electric machinery and more particularly to the electro-magnetic portions thereof. One of the objects thereof is to provide a simple and practical construction of the above type of low cost and dependable action. Other objects are to provide constructions of the above type in which the parts are readily assembled without danger of injury and compactly disposed, and in which the parts may be so formed as to resist hard conditions of practical use. Another object is to provide an art for forming the electro-magnetic portion of a dynamo which may be quickly and efficiently carried on at low cost. Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, arrangement of parts and in the several steps and relation and order of each of the same to one or more of the others thereof, all as will be illustratively hereinafter set forth and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings in which is shown one of various possible embodiments of the mechanical features of this invention,

Figure 1 is a perspective view of the same, in part diagrammatic;

Figure 2 is an elevation of a coil-supporting stamping;

Figure 3 is a similar view of another form of stamping used in conjunction with that of Figure 2;

Figure 4 is a similar view of one form of an enclosing stamping;

Figure 5 is a similar view of another form of enclosing stamping;

Figure 6 is a partial longitudinal sectional view showing the parts in assembled relation; and

Figure 7 is an end view of the complete device showing the windings in position.

Similar reference characters refer to similar parts throughout the several views of the drawings.

As conducive to a clear understanding of certain features of this invention, it may first be noted that in the construction of the electro-magnetic portions of dynamos, it is often difficult to mount the coils in position rapidly and efficiently without injury thereto. It is also to be noted that in apparatus of this nature, compactness of disposition of the parts such as the conductors of the coil, and full protection thereto, are of marked importance. This is particularly true in the construction of certain parts of small dynamos such as the stators of alternating current motors. The achievement of these results without sacrifice of ruggedness and practicality of the construction is among the dominant aims of this invention.

Considering now in detail the construction set forth in the drawings, there is shown a coil-supporting part 10 which may form the stator of an alternating current dynamo, it being understood that the term "dynamo" is broadly used to comprise both generators and motors. Within this portion 10 is shown a mandrel 11 on which the parts are fitted during their assembly as hereinafter described. The portion 10 is built up of stampings, alternately of the forms shown in Figures 3 and 2. As shown in Figure 2 there is an annular member 12, the outer portion of which is provided with a number of inwardly directed radial recesses 13 curved at their inner end and having parallel side walls 14. The stamping 15 shown in Figure 3 is of a generally similar form and its central opening is of the same size as that of the stampings 12. Its outer diameter is somewhat in excess of that of the stamping 12 and the parallel portions of its recesses 16 are correspondingly longer. Furthermore, alternating teeth 17 bounding these recesses are provided with notches 18 to receive bolts as hereinafter described.

When these stampings 15 and 12 are assembled, their inner openings are brought into exact registry and their notches 13 and 16 into alignment, as shown in Figure 1 of the drawings. With the parts thus assembled, the complete coils are inserted in the resultant recesses in such manner that each coil substantially fills a pair of contiguous recesses up to the outer diameter of the stamp-

ings 12. These coils may be not only wound in their final form before insertion, but taped, as indicated at 19 in Figure 7 of the drawings. As shown in the latter figure, a complete coil 20 fills two of the upper recesses, and a complete coil 21 the next two recesses, and so on around the device. Furthermore, if so desired, the individual coils are not only wound and taped in complete form but are connected end to end as indicated at 22 in Figure 7, so that the necessity for supporting connections is reduced to a minimum. During this step of inserting the coils there is no necessity for distorting them or deranging the component conductors for they are simply freely inserted in the various slots or recesses and may thus be placed in position without injury and with a minimum of time. Also when they are mounted as shown, the conductors lie precisely parallel, thus giving a compact arrangement with a maximum number of ampere turns for the space provided and they are amply protected against short circuiting either during construction or during later use.

With the parts as above described, the stampings 23 shown in Figure 5 of the drawings, are fitted about the stampings 12 with their ends in alignment as indicated at 24. These stampings thus rest within the recesses formed by the upwardly projecting ends of the stampings 15 and are securely held against longitudinal movement. They are furthermore provided with bolt holes 25 so that each pair of stampings 23 forms a complete annulus with provision for the insertion therethrough of bolts 26.

Similarly fitted about the stampings 15 are stampings 27 shown in Figure 4 of the drawings, these latter stampings being arranged in pairs with their ends in alignment, as shown at 28. Furthermore, these stampings 27 alternate with the stampings 23 and are of such radial dimension that their outer surfaces when assembled are substantially flush with the outer surface of the stampings 23.

On the inner edges of the stampings 27 are notches 29 which register with the notches 18 in the stampings 15 thus conjointly providing bolt holes 25 as in the stampings 23. Through these various bolt holes, here shown as six in number, are passed the bolts 26 each provided with a pair of nuts 30 by which the entire mass of stampings may be clamped into rigid form with the coils securely mounted therein. With the device thus formed, the parts are so rigidly held that if desired its outer surface may be turned up in a lathe or its inner surface reamed out.

The extending ends of the bolts 26 may serve to support the end bells of the dynamo and the ends of the part 10 may be turned to fit exactly the inner surfaces of these bells. The coils being taped before assembly permit the end turns to be kept extremely short and fit against the ends of the stator, thus economizing in wire and gaining in compactness of construction at this point.

From the above description of the method of assembling the parts, not only will the resultant construction be clear, but the features of this invention which comprise an art will also be understood. This art or method may not only be carried on at a high rate of speed as compared with prior practice, but results in a construction having many desirable characteristics as hereinbefore set forth. Furthermore by the adoption of this art, the chances of injury to the parts while it is carried on, are reduced to a minimum for the conductors are undisturbed and are fully protected by taping while being placed in position.

It will thus be seen that there is provided apparatus and an art in which the several objects of this invention are achieved.

As various changes might be made in the construction above set forth and as the art herein described may be varied, all without departing from the scope of this invention, it is intended that all matter herein set forth or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim as my invention:—

1. In a dynamo, in combination, a plurality of stampings having outwardly opening recesses about their circumference, a plurality of stampings of lesser outside diameter having similar recesses, the closed ends of which are at a radial distance from the center of the stampings substantially equal to that between the closed ends of the recesses of said first members from their centers, means holding said members in alignment, with said first members and second members alternately disposed and said recesses in registry, coils mounted within said recesses, and a device of magnetic material surrounding said assembled members and interlocking therewith against relative lengthwise movement.

2. In a dynamo, in combination, a plurality of annular stampings having central openings formed of magnetic material, a plurality of annular stampings alternately disposed with respect to said first stampings and formed of magnetic material and having openings registering with those of said first stampings, said several stampings having outwardly opening recesses spaced about their circumferences and arranged in alignment, coils positioned within said recesses, a plurality of annular stampings formed in sections and fitted about said first stampings, a plurality of annular stampings formed in sections and fitted about said second stampings, the joints between the sec-

tions of said last outer stampings being arranged out of alignment with the joints between the sections of the remaining outer stampings, and means adapted to clamp said various stampings together.

3. In a dynamo, in combination, a plurality of annular stampings having central openings formed of magnetic material, a plurality of annular stampings alternately disposed with respect to said first stampings and formed of magnetic material and having openings registering with those of said first stampings, said several stampings having outwardly opening recesses spaced about their circumferences and arranged in alignment, coils positioned within said recesses, a plurality of annular stampings formed in sections and fitted about said first stampings, a plurality of annular stampings formed in sections and fitted about said second stampings, the joints between the sections of said last outer stampings being arranged out of alignment with the joints between the sections of the remaining outer stampings, and means adapted to clamp said various stampings together, said second coil-receiving stampings being of lesser outer diameter than said first coil-receiving stampings, whereby said outer stampings interlock with said inner stampings as a whole against longitudinal movement.

4. In a dynamo, in combination, a coil-receiving member of magnetic material having disposed thereabout a plurality of recesses with substantially unrestricted openings, coils mounted within said recesses, and means of magnetic material substantially closing the open ends of said recesses, said means comprising a plurality of stampings formed in sections and fitted about said coil-receiving member, the joints between the sections of one stamping being arranged out of alignment with the joints between the sections of a preceding stamping.

5. In a dynamo, in combination, a coil-receiving member of magnetic material of curved outer contour having disposed thereabout a plurality of recesses with substantially unrestricted openings and provided with spaced exterior grooves running in the direction of curvature of said member, coils mounted within said recesses, a plurality of curved stampings fitting the exterior of said member for substantially closing said recesses and a plurality of curved stampings of lesser inner radius of curvature than said last-mentioned stampings and substantially alternated therewith, but seated within said spaced grooves.

6. In a dynamo, in combination, a coil-receiving member of magnetic material of curved outer contour having disposed thereabout a plurality of recesses with substantially unrestricted openings and provided with spaced exterior grooves running in the direction of curvature of said member, coils mounted within said recesses, a plurality of curved stampings formed in sections and having an inner radius of curvature substantially equal to that of said coil-receiving member for substantially closing said recesses and a plurality of curved stampings formed in sections and having a lesser inner radius of curvature than said last-mentioned stampings and substantially alternated therewith, but seated within said spaced grooves, the joints between the sections of one stamping being arranged out of alignment with the joints between the sections of a preceding stamping.

7. The herein described art of forming a portion of a dynamo electric machine, which consists in forming outwardly opening recesses in a plurality of stampings with substantially unrestricted openings, holding said stampings with their recesses substantially in alignment, inserting wound coils from the outside within said recesses, closing the recesses of each stamping with a sectionally formed transversely-extending stamping of magnetic material but, in so closing said recesses, arranging the stampings so that the joints between sections of one stamping are out of alinement with the joints between sections of a preceding stamping, and securing said several stampings together.

8. In a dynamo, in combination, a member formed of magnetic material having a plurality of outwardly opening recesses arranged thereabout, form-wound coils inserted within said recesses and with one leg of each coil in one of said outwardly opening recesses and with the other leg in another of said outwardly opening recesses, and a member formed of magnetic material secured about said first member and closing the open outer ends of said recesses, each of said members being built up of a plurality of stampings arranged in planes transverse to said conductors.

9. In a dynamo, in combination, a plurality of stampings having outwardly opening recesses about their circumference, a plurality of stampings of lesser outside diameter having similar recesses, the closed ends of which are at a radial distance from the center of the stampings substantially equal to that between the closed ends of the recesses of said first members from their centers, means holding said members in alignment, with said first members and second members alternately disposed and said recesses in registry, and coils mounted within said recesses.

10. In a dynamo, in combination, a plurality of stampings having outwardly opening recesses about their circumference, a plurality of stampings of lesser outside diameter having similar recesses, the closed

ends of which are at a radial distance from the center of the stampings substantially equal to that between the closed ends of the recesses of said first members from their centers, means holding said members in alignment, with said first members and second members alternately disposed and said recesses in registry, coils mounted within said recesses, and magnetic means surrounding said members and substantially closing said recesses, said magnetic means being provided with interior grooves with which said alternately disposed members of different diameter interlock.

11. In a dynamo, in combination, a plurality of stampings having outwardly opening recesses about their circumference, a plurality of stampings of lesser outside diameter having similar recesses, the closed ends of which are at a radial distance from the center of the stampings substantially equal to that between the closed ends of the recesses of said first members from their centers, means holding said members in alignment, with said first members and second members alternately disposed and said recesses in registry, coils mounted within said recesses, a plurality of stampings fitted about said first members, and a plurality of stampings fitted about said second members and having an external diameter substantially equal to that of the stampings fitted about said first members.

12. The herein described art of forming a portion of a dynamo electric machine which consists in forming a plurality of stampings with outwardly opening recesses and central openings, mounting a plurality of said stampings on a mandrel with said recesses in alignment, inserting coils within said recesses, encasing said stampings with said inserted coils therein in magnetic material and thereby closing the open ends of said recesses, and in simultaneously securing said material in encasing position and clamping said stampings together.

13. The herein described art of forming a portion of a dynamo electric machine which consists in forming a plurality of stampings with outwardly opening recesses and central openings, mounting a plurality of said stampings on a mandrel with said recesses in alignment, inserting coils within said recesses, encasing said stampings with said coils inserted therein in transverse stampings and thereby closing the open ends of said recesses, and in simultaneously clamping said coil-receiving stampings and said encasing stampings together.

14. In a dynamo, in combination, a member provided with a plurality of outwardly opening recesses spaced about its circumference, coils taped throughout and mounted in said recesses, a member surrounding said first member and closing the open ends of said coil-receiving recesses, one of said members being formed of a plurality of sheet metal stampings, and common means for holding said last-mentioned member in recess-closing position and for clamping said stampings together.

In testimony whereof, I have signed my name to this specification this 29th day of November, 1921.

ALAN VARLEY LIVINGSTON.