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T. A. HUNTER
LOUD SPEAKER CONSTRUCTION
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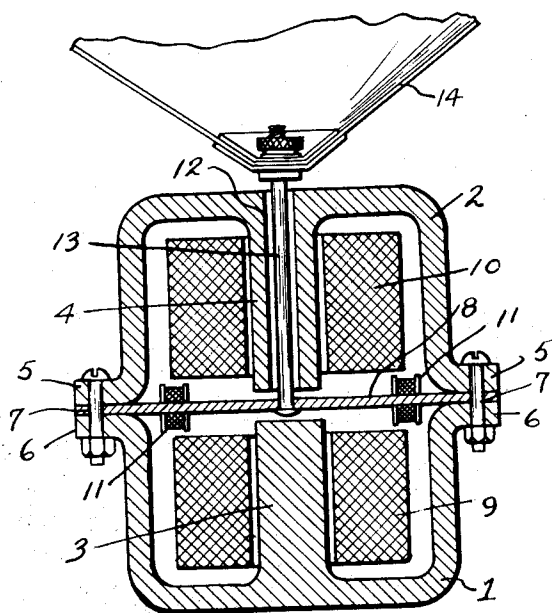


Fig. 1.

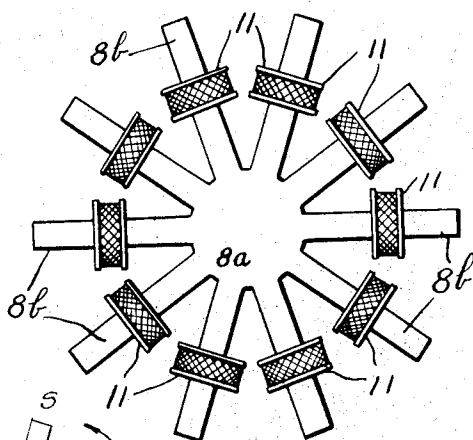


Fig. 2.

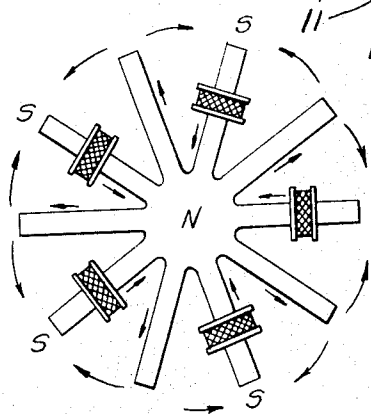


Fig. 3

INVENTOR.
Theodore A. Hunter
BY *Allen & Allen*
ATTORNEYS.

UNITED STATES PATENT OFFICE

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LOUD SPEAKER CONSTRUCTION

Theodore A. Hunter, Cincinnati, Ohio, assignor
to The Crosley Radio Corporation, Cincinnati,
Ohio, a corporation of Ohio

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My invention relates and is applicable to loud speakers in general, and its fundamental object is to secure more power by increasing the effective magnetization of the armature. In addition, in constructions embodying my invention, I gain certain mechanical and electrical advantages which will be more fully set forth hereinafter, and which also constitute objects of my invention.

These and other objects will be entirely apparent to those skilled in the art from the ensuing description in connection with which reference is now made to the drawing forming part hereof.

In this drawing:—

Figure 1 is a sectional view of an exemplary embodiment of my invention.

Figure 2 is a plan view of an armature employed in the speaker of Figure 1.

Fig. 3 is a plan view of a modified armature.

In loud speakers it is relatively easy to produce a field of the power desired, either by means of permanent magnets or by an electromagnetic field assembly, which for obvious reasons is to be preferred wherever the circumstances will permit. It is not so easy to produce a powerful excitation of the armature. It is desirable, of course, to have as close a magnetic coupling as possible between the armature itself and the voice coil or coils. In endeavoring to secure as powerful a magnetic excitation of the armature as can be obtained, an obvious expedient is to increase the size of the voice coil. This is not always possible, due to space requirements in the motor. Were there no physical limitation on the size of the voice coil, however, its size could not be made very large without a certain attendant disadvantage as follows: Since the armature is actuated primarily by a fluctuating or alternating current, the number of turns in a voice coil cannot in many instances be made very large without giving the coil an impedance which materially reduces the value of the actuating current. The effect is heightened the closer the coupling between the coil and the armature.

The problem, then, is to secure the largest effective number of ampere turns in an armature voice coil assembly before the limiting value of impedance is reached. I have discovered that this problem may be met, and the object attained through employing a plurality of voice coils located essentially upon different magnetic portions of the armature, and distributing through these coils a relatively large number of ampere turns. The useful magnetic effect of the several coils may be made additive, while the combined

impedance is markedly less than would be the case if the same number of ampere turns were placed in a less number of coils or a single coil.

The employment of a number of voice coils as set forth requires and facilitates a different construction of armature from those hitherto employed. In a preferred embodiment of my invention, I provide an armature having a series of arms upon a plurality of which I mount voice coils in such a way as to produce an additive magnetic effect in the armature while having a total impedance much less than if the same number of ampere turns were employed. In some instances this type of armature permits me, as hereinafter to be explained, to provide a return path for the alternating flux of the armature, which path does not coincide with the field flux in the field structure.

In the exemplary embodiment of my invention shown in the drawing, I have indicated a field structure comprising a pair of cup-shaped members 1 and 2 having central posts 3 and 4 forming pole pieces. The cup-shaped members have flanges 5 and 6 out-turned upon their edges. The flanges are perforated for the reception of bolts 7 at intervals, and these bolts are used to fasten the cup-shaped members together in opposed relationship. An armature 8 is mounted in this assembly by being clamped between the flanges, so that its central portion lies between the pole ends of the posts 3 and 4. The ends of these posts are interspaced sufficiently to permit the central portion of the armature to vibrate. Within each cup-shaped member I have shown circular field coils 9 and 10 surrounding the posts 3 and 4. These will be so connected to a source of direct current as to magnetize the pole pieces 3 and 4 strongly, and to give them an opposite magnetic polarity. Voice or armature coils 11 are mounted upon the armature, as will be more fully explained. They are so connected that they have a combined effect in magnetizing the armature with a magnetic pole at the center thereof. Thus the central portion of the armature will be attracted toward the field pole piece 3 or 4, whichever is of the opposite polarity, and will be repelled from the outer pole piece. The strength of the attraction and repulsion, for a given strength of field, will be proportionate to the magnetic force produced in the armature by the voice or armature coils; and if the current in these coils is fluctuating or alternating in character, the armature will vibrate in accordance therewith. The post 4 is provided with a perforation 12, through which passes a drive rod 13. At one end this rod is connected to the arma-

ture 8, and at the other it may be connected to a cone 14 or other vibratile device, either directly, or through some suitable motion transmitting device. My armature may center itself through its own resilience, or separate centering means may be employed. It will be noticed that the particular type of construction shown enables me to produce a motor which is completely self-contained and is dust-proof. It will be understood that I have omitted to show mounting means for my motor body and such other constructional details as are not necessary to a complete understanding of my invention.

My armature, in its preferred form comprises a central portion 8a and a plurality of arms 8b radially disposed with reference to the central portion. The voice coils 11 are mounted upon these arms; and in one construction I mount a relatively small coil upon each of the arms. The coils 11 are so connected that the passage of a current through them will have an additive effect in magnetizing the central portion 8a of the armature to one polarity. In the aggregate the number of ampere turns in all of the coils taken together will be relatively large. Each coil is, however, mounted upon a separate armature arm or magnetic portion of the armature; and the combined impedance of the coils is less than would be the case were the same number of ampere turns placed in one or two coils, as has been the practice hitherto. It is also less than would be the case were the coils all located together upon the same magnetic portion of the armature. By this means I am able to employ more ampere turns and secure a stronger magnetization of my armature for any given excitation current before the impedance in the armature cuts down the useful value of the impressed current.

In another construction shown in Fig. 3, particularly a construction in which the number of the radial arms 8b is even, I may mount coils 15 upon alternate arms 16, the intervening arms 17, which in this instance are not provided with voice coils, serving as return means for the alternating or fluctuating flux in the armature, the path being completed between arms by the clamping portions or flanges of my field assembly. Thus a path is provided for the armature flux which does not coincide with the path of the field flux.

Modifications may be made in my invention without departing from the spirit thereof; and my invention may be adapted to motors of different types than that shown in the exemplary embodiment described.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In a loud speaker, a vibrating armature having a plurality of magnetic vibrating portions, and voice coils mounted upon more than two of said portions.

2. In a loud speaker, a vibrating armature having a central portion, and radial arms forming part of the vibratile system, and voice coils mounted on more than two of said arms, said voice coils being connected so as to produce a cumulative magnetic effect upon one portion of said armature.

3. In a loud speaker, an armature having a central portion, and a plurality of radially disposed arms, voice coils mounted on some of said arms, other of said arms adapted to form a return path for the magnetic flux in said armature, and mounting means connecting the outer ends of said arms to complete the magnetic circuit.

THEODORE A. HUNTER.