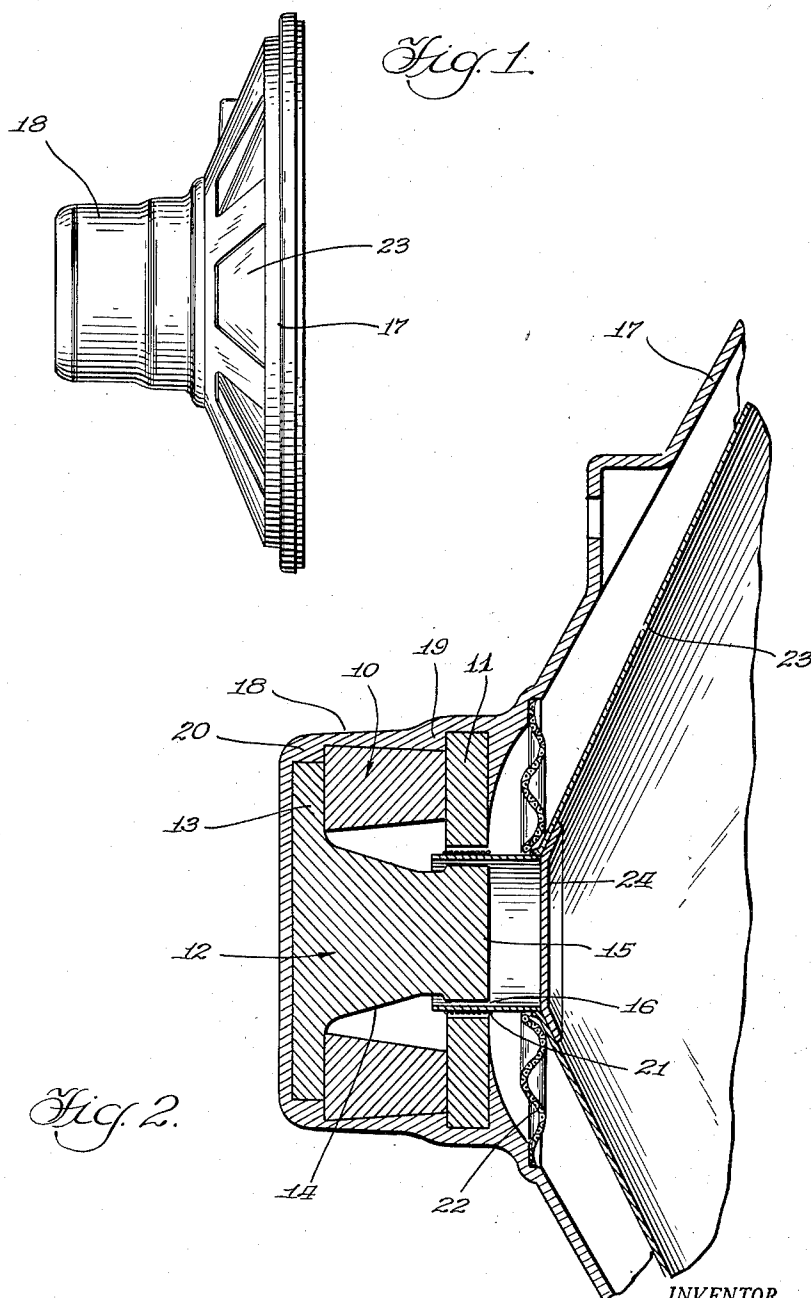


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SPEAKER CONSTRUCTION
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SPEAKER CONSTRUCTION

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1 Claim. (Cl. 22-203)

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The present specification discloses a loud speaker having a novel magnetic circuit which is preferably produced by a novel method of manufacturing. The broad aim of the invention is to provide a speaker having a higher degree of efficiency than heretofore attained in devices suited to mass production, yet wherein the several parts are so designed and related to each other that the speakers may be economically and rapidly produced by ordinary factory methods and on conventional types of production machinery. In short, it introduces a speaker that is simpler and cheaper, yet better, than types heretofore developed.

In introduction, it may be well to mention that in the manufacture of commercial types of speakers, manufacturers have always been confronted by a serious dilemma as to choice of design, since the maximum operating efficiency of a speaker can be attained only if the magnetic parts have their contacting surfaces clamped together under extremely high surface-to-surface pressure, yet the provision of any means heretofore devised for holding the magnet, the pole piece and the pole plate firmly enough to attain the best magnetic coupling inevitably increases the cost of the units to such an extent that they are more expensive than conventional types, and are consequently at a serious disadvantage in a highly competitive market. On the other hand, conventional speakers wherein the magnetic slug, yoke and pole piece are held together only by a light spring washer or by an adhesive not only fail to accomplish the highest efficiency of which the magnetic parts are capable, but all too frequently are incapable of withstanding the ordinary shocks, jolts or vibration to which they are subjected in shipping. The result may be that a substantial percentage of the speakers passing final inspection at the factory will be found to be defective or completely inoperative when they reach the purchaser or user. These problems have vexed engineers in the industry for years, but have heretofore defied successful solution.

The present invention abandons the use of any known expedients heretofore employed for securing the magnetic parts of a speaker to each other, and provides what is believed to be an entirely novel means and method for clamping the contacting surfaces of the speaker magnet and pole pieces into intimate pressure engagement. This is done without the use of any screws, bolts or clamping devices, yet the method here disclosed is capable of bringing the contacting

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surfaces of the magnetic parts into engagement with greater pressure per square inch than is ordinarily possible by the use of conventional clamps. Specifically, the invention contemplates assembling the magnetic parts of the speaker in their predetermined relative positions, clamping them together within the die cavity of a die-casting machine, and die casting a metal jacket completely around the magnetic parts so that the contraction of the die casting metal in cooling forces the magnetic pieces against each other with a high degree of force. This brings about an extremely high surface-to-surface pressure between the magnetic parts so that the magnetic reluctance of the joints is at a minimum. The die cavity is formed to cast the basket of the speaker as an integral part of the jacket, so that the casing unites all of the metal parts of the speaker into a single, integral piece. Thus the unit requires no further machining, assembling or fitting than to insert the voice coil, the spider and the sound cone.

The invention is illustrated in the drawings herein wherein:

Figure 1 is a side elevational view of a typical speaker structure constructed in accordance with these teachings; and

Figure 2 is an enlarged fragmental sectional view through the speaker cone, voice coil, pole piece and magnet.

The magnetic circuit of the form of speaker chosen to illustrate the invention uses a flux generator in the form of a ring magnet 10, which may be of uniform cylindrical cross section or tapered as shown. The pole pieces consist of a pole plate 11 and a flanged center pole generally designated at 12. These are both of magnetically permeable material, the center pole 12 including a flat flange 13 having a forwardly extending body 14 and a head portion 15 extending into an aperture in the pole plate 11 to define an annular flux gap 16. The flange 13 has a smooth, flat forward face bearing against the end of the ring magnet 10, and the magnet surface is also smoothly finished so that the joint will present minimum reluctance to the lines of force flowing from the magnet into the pole piece. The forward end of the ring magnet and the rear face of the pole plate 11 are also flat and smoothly finished, so that these surfaces also fit in intimate surface-to-surface contact in the joint at the forward end of the ring magnet.

The parts thus far described comprise the magnetic circuit of the speaker, and it is contemplated by this invention that these parts will not

only be held in assembled relationship by a single die casting surrounding them, but will be actually clamped into high pressure surface-to-surface contact by the shrinkage of the metal of the die casting as it solidifies from its molten state. To this end the invention contemplates assembling the speakers by inserting the magnet 10, pole plate 11 and center pole 12 into the die cavity of the die casting machine, centering the pole plate and center pole on a sleeve gage in the voice coil gap, and clamping the pole parts in surface-to-surface engagement with the magnet. The die cavity not only surrounds and encloses the magnetic parts, but also is preferably formed to cast a sound cone basket 17 of any desired size, shape and configuration. The speaker may be completed by merely inserting the voice coil 21, spider 22, speaker cone 23 and dust cap 24, which may be held in place in any conventional manner, as by the use of adhesives.

It is obvious, of course, that the speaker basket may be provided with bosses, projections or mounting brackets where desired, so that it is unnecessary to resort to the conventional practice of spot welding or riveting mounting brackets for the transformer or for mounting the speaker in its cabinet.

The cavities of the die may be formed with any desired clearance around the magnetic parts, and it is contemplated that the die casting be of non-magnetic material. The walls of the cavities are preferably spaced away from the magnetic parts enough so that the molten metal flows entirely around the magnetic pieces and forms a non-magnetic jacket 18 of substantial thickness extending entirely around the magnetic parts, so that the layer of die cast metal extending across the joints in the magnetic circuit will have ample strength to exert the desired pressure. It will be clear to those acquainted with the art that as the molten metal of the die casting cools and solidifies it will shrink, and in so doing will exert considerable force, clamping the flange of the center pole to one end of the magnet and clamping the pole plate to its opposite end.

It will be remembered, of course, that since the parts are initially clamped together in the cavity of the die, or magnetized before being placed in the die so that they hold themselves together, there will be no lost motion between the parts and no possibility of the molten metal flowing into the crevices between the magnetic parts with the result that the cooling and contraction of the metal jacket will exert a much higher degree of surface-to-surface pressure on the abutting faces of the magnetic parts than it is practicable to attain by conventional expedients employing bolts or clamping devices, yet the result is attained by an expedient that reduces the manufacturing costs of the speaker below the cost of conventional types. The cast jacket may be formed of uniform thickness throughout, if desired, but in the form of the invention shown it has a thicker cross section, or bridge, at the points 19 and 20 where it extends across the joints in the magnetic circuit than at other points, and it is believed this is of advantage in accomplishing the firmest possible grip and best clamping action on the parts.

It is thus unnecessary that the metal of the die cast jacket be intimately bonded or fused to the magnetic parts, as the jacket functions to contract over and mechanically grip these parts as it draws them together.

From the foregoing it is seen that the teachings of this invention provide not only a new, economical, efficient and rugged speaker, but also introduce a new method for assembling speakers and for exerting a high pressure clamping action between the individual parts of a magnetic circuit. In addition, the teachings of this invention simplify conventional manufacturing process considerably by departing from past teachings and providing a device wherein all screws, bolts, clamps, springs or adhesives in the magnetic circuit are eliminated, yet wherein all of the working parts are secured to each other firmly, permanently and in precise alignment.

Having thus described the invention, what I claim as new and desire to protect by United States Letters Patent is:

The method of building a speaker having a magnetic circuit comprising a plurality of parts including a center pole, a magnet and a pole plate, consisting of the steps of assembling the parts in their relative positions with the magnet between the center pole and pole plate and with the center pole and pole plate having parallel outer faces, holding said center pole, magnet and pole plate in pressure-engagement with each other by magnetic attraction between said parts, casting a jacket of molten non-magnetic metal around said center pole, magnet and pole plate so as to provide comparatively thin portions of said non-magnetic metal along said parallel outer faces of said center pole and pole plate and thickened portions adjacent the meeting edges of the center pole and magnet, and the magnet and pole plate, and thereafter cooling said jacket including said thickened portions thereof, whereby the contraction of the non-magnetic metal will exert additional clamping force to press the magnetic parts in surface-to-surface contact with each other.

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