March 30, 1965 A. L. COEN 3,176,086

TRANSDUCER FIELD STRUCTURE ASSEMBLY

Filed March 27, 1964

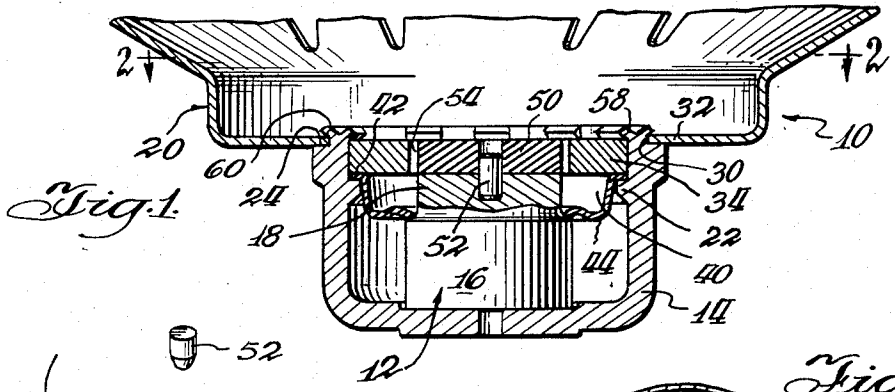


Fig. 1.

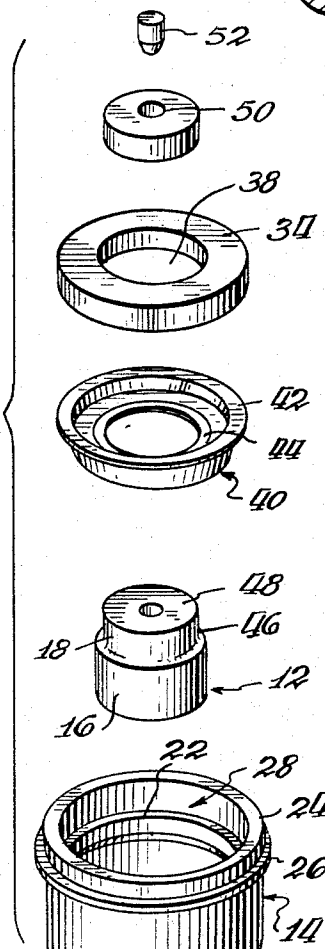


Fig. 4.

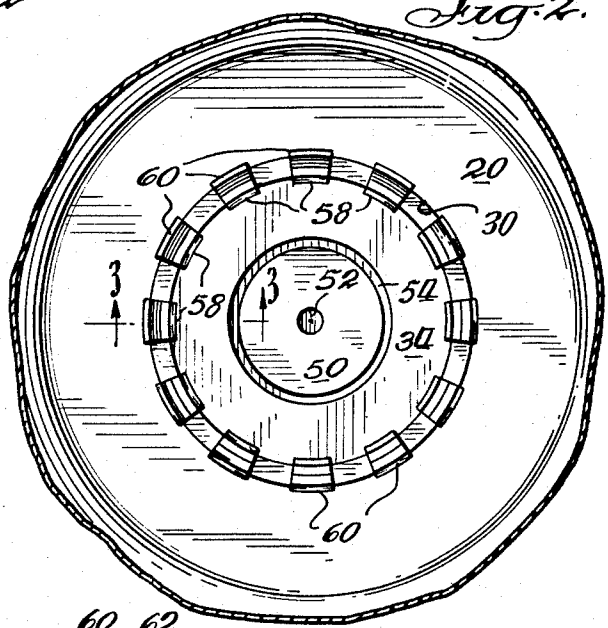


Fig. 2.

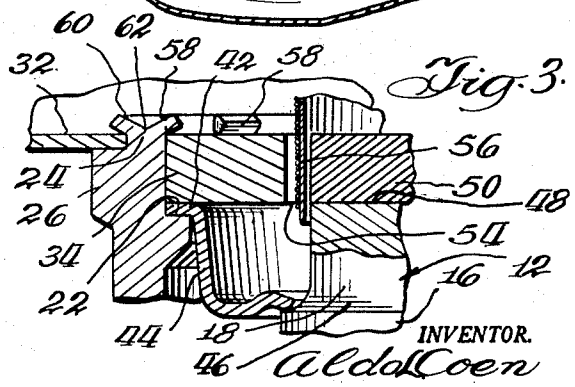


Fig. 3.

INVENTOR.

Alda Coen

BY

Silverman, Mullin & Cass

Attorneys

United States Patent Office 3,176,086 Patented Mar. 30, 1965

3,176,086

TRANSDUCER FIELD STRUCTURE ASSEMBLY

Aldo L. Coen, 1640 E. 50th St., Chicago, Ill.

Filed Mar. 27, 1964, Ser. No. 355,504
10 Claims. (Cl. 179—119)

This invention relates generally to audio reproducing devices and more particularly is concerned with structural improvements in the loud speaker of the permanent magnet type. While particularly described with respect to loud speakers, since a loud speaker is capable of functioning as a microphone, reference is made in the claims to electromagnetic transducer construction in order not to limit the scope thereof.

This application is a continuation-in-part of my copending application Serial No. 169,575 filed January 29, 1962 for the invention entitled "Transducer Construction," which has been abandoned.

In the permanent magnet type of loud speaker, a strong magnetic field is established between pole pieces by means of a powerful permanent magnet. The magnet is a part of a magnetic circuit which includes a magnet housing or "pot" as frequently referred to in the trade, having a magnetizable iron core disposed therein, the magnet housing being rigidly secured to a metal basket which mounts the cone to which the voice coil is secured. The general construction of a speaker of this type is well known.

The invention herein relates to a type of loud speaker in which the magnet is a cylindrical member having a reduced diameter pole piece which has been found to give a highly concentrated flux density. This type of magnet requires the use of an additional field member in the form of an annular ring having a circular hole in the center, the diameter of which is substantially less than the diameter of the body of the magnet so that it is necessary in the assembly of the field structure to secure the ring after the magnet is in place.

The primary object of the invention is to provide a structure in which the magnet housing or pot, speaker basket, magnet, and what will be termed the field ring, are all secured in permanent assembled relationship by means of deformations produced by staking, either as a single operation staking the parts all together at the same time simultaneously or progressively, or as a pair of operations in which the magnet housing, and its parts are first assembled to make a complete speaker field structure assembly or "motor" as it is often called in the trade. In the latter case, the motor may be stocked pending its later assembly to the speaker basket.

Other objects will become apparent as a description of the preferred embodiment of the invention is set forth in connection with which reference will be made to the several figures of the drawing.

FIG. 1 is a fragmentary sectional view taken through a loud speaker structure, having been assembled utilizing the invention, no portion of the speaker cone, voice coil, etc. being shown.

FIG. 2 is a fragmentary top plan view of the structure of FIG. 1.

FIG. 3 is an enlarged fragmentary sectional view taken along the line 3—3 of FIG. 2 and in the direction indicated.

FIG. 4 is an exploded perspective view showing the components of the field structure or motor.

Referring now to FIG. 1, the speaker or transducer structure is designated generally by the reference character **10**. Since the invention relates primarily to the manner in which the field structure is assembled, no portions of the cone, voice coil, etc. are shown except in FIG. 3, wherein a fragment of the voice coil is illustrated

in order to show how it is disposed within the gap formed in the field structure.

The magnet **12** is seated in the bottom of a cup-like magnet housing or pot **14** with its larger diameter portion **16** at the bottom, and its narrower diameter portion **18** at the top. Prior to assembly to the speaker basket **20** the pot has the appearance shown in FIG. 4. There is an interior shoulder **22** spaced below the lip **24** and there is an exterior shoulder **26** also spaced below the lip **24**. The end **28** is of a diameter snugly to engage within a circular opening **30** which is punched in the flange **32** at the bottom of the speaker basket **20**. A portion of this end **28** therefor will extend upwardly past the flange **32** when the device is being assembled, so that the lip **24** is presented to the interior of the basket.

The field structure consists of the pot **14**, the field ring **34** and the pole piece **50**. The field ring **34** is an annular disc with a center hole **38**, this disc being mounted on the shoulder **22**, but overlying a brass pressure ring **40** whose function it is to hold the magnet **12** in properly aligned position. The pressure ring **40** has a flange **42** that is engaged upon the shoulder **22** and is sandwiched between the field ring **34** and said shoulder when the device is assembled. The ring **40** includes a depending skirt portion **44** which is integral with the flange **42** and engages against the shoulder **46** formed on the magnet **12** at the point where the cylindrical portions **16** and **18** join.

The dimensions of the parts are chosen so that the upper surface **48** of the magnet **12** is of the same plane as the lower surface of the field ring **34**. A disc-like pole piece **50** is mounted upon the upper end of the magnet **12** being engaged to the surface **48** by any suitable means such as a plug **52** driven in place in the aligned openings provided in the upper end of the magnet **12** and in the pole piece **50**. The diameter of the pole piece **50** is somewhat less than the inner diameter of the hole **38**, thereby to provide an annular gap **54** which will have high flux density when the magnet **12** is magnetized. The gap **54** will accommodate the voice coil **56** that is secured to the speaker cone (not shown) in a manner illustrated in FIG. 3.

With this construction, the parts of the field structure including the magnet are all assembled in the order shown in FIG. 4, and this assembly is inserted through the opening **30** in the flange **32** of the speaker basket. A suitable circular staking tool is brought down on the lip **24** thereby upsetting metal onto the adjacent edges of the flange **32** and the field ring **34**. This single staking operation, therefore, permanently secures the speaker basket **20** to the pot **14**, the ring **34** within the pot **14**, and the magnet **12** within the pot. As seen, there will be deformations such as **58** engaging over the ring **34** and deformations **60** engaging over the flange **32**. This is especially achieved if the staking tool teeth are of V formation to provide a V-shaped groove **62** at the points of staking to cause the outward flow of the metal. Obviously the invention is not limited to this form of staking. Also, small staking tools may cause the parts to be joined by making several strokes. If desired the entire field assembly of FIG. 4 may be assembled first, using staking means which peen over the lip **24** to form the inwardly extending stakings **58** only. These motors may then be stocked pending later assembly to baskets. In assembly to the basket, the staking tool need only deform the lip **24** outwardly to form the stakings **60**. The finished article **10** is the same regardless of whether the motor is preformed, but the same part **24** of the pot **14** provides the means for assembly.

It will be noted that because of this manner of construction, it is feasible to make the pole piece **50** and

field ring 34 of the same thickness and hence they may be punched out of the same blank with an economy of material.

The shoulders 22 and 26 may be formed during the drawing of the pot 14 by burnishing, coining, etc.

The invention may be utilized in the combination with the construction described and claimed in my copending application Serial No. 136,361, filed September 6, 1961, entitled Loud Speaker Structure.

Variations are possible without departing from the spirit or scope of the invention as defined in the appended claims.

What it is desired to secure by Letters Patent in the United States is:

1. An electromagnetic transducer which includes a sheet metal basket structure having a central annular flange forming a circular opening, an open top cup member of ferrous metal having an interior coaxial magnet therein, an annular ferrous metal ring in the cup member disposed in the upper end thereof with the ring spaced from the magnet to provide an annular gap, said cup member being fitted in said circular opening and said cup member having means holding said ring in assembly within said cup member while simultaneously holding said cup member in assembly upon said annular flange.

2. A structure as claimed in claim 1 in which said cup member has interior and exterior shoulders formed in the circumferential wall thereof and said ring and flange are respectively seated on said shoulders, and in which said holding means comprise at least some deformed portions of said cup member engaging upon the upper surfaces of said ring and flange adjacent the edges thereof and clamping same axially against said respective shoulders.

3. A structure as claimed in claim 1 in which said magnet includes a pole piece and the pole piece and ring are coaxially aligned at the same axial location and are formed of the same metal stock whereby to have substantially the same axial thickness.

4. In a transducer construction which includes a speaker basket adapted to support a voice coil, a magnet housing of open cup formation secured to said basket and having a coaxial magnet therein presenting a disc-like pole piece to the open end of the cup, an annular ring mounted in the cup end and aligned with said disc-like pole piece to provide an annular gap, and the voice coil adapted to be suspended in said gap coaxially with said pole-piece; the invention herein which comprises said basket having an annular flange providing a circular opening and the cup end axially extending into said circular opening and having an exterior shoulder formed thereon spaced from

the cup lip, the flange being seated on said shoulder with a substantial portion of the end extending past the flange on the axial side thereof opposite the shoulder so that said lip is spaced from said flange, said cup end having an interior shoulder formed thereon spaced from said lip, said annular ring being seated thereon and the ring being of a thickness less than the axial distance from the interior shoulder to said lip whereby said lip is also spaced from the exterior surface of said ring, and said lip having integral formations thereon tightly engaging said ring and flange to force same against their respective shoulders and thereby holding the basket, ring and cup in assembly.

5. The invention claimed in claim 4 in which said integral formations comprise stakings providing radially inwardly and outwardly extending protrusions.

6. The invention claimed in claim 4 in which said integral formations comprise a plurality of stakings at least some of which each have a part of the same formation protruding radially inwardly and radially outwardly relative said cup end.

7. A field structure for an electromagnetic transducer adapted to be pre-assembled for later introduction and securement into a sheet metal basket structure having a central annular flange forming a circular opening; said field structure comprising: an open top cup member of ferrous metal having an interior coaxial magnet therein, an annular ferrous metal ring in the cup member disposed in the upper end thereof with the ring spaced from the magnet to provide an annular gap, said cup member having a deformable annular lip adapted to be engaged within the circular opening and staked therein to secure said field structure to said basket structure, said lip having means holding said ring in assembly within said cup member.

8. A field structure as claimed in claim 7 in which said last means comprise radially inwardly extending stakings engaging said ring, and said cup has interior support means for said ring whereby said ring is sandwiched between said support means and stakings.

9. A field structure as claimed in claim 8 in which there is an annular non-ferrous pressure member engaging said magnet and aligning same with said ring and cup member and having its circumference engaged between said ring and interior support means so as to be permanently secured with said ring in said cup member.

10. A structure as claimed in claim 7 in which said cup member has external shoulder means to limit the extent to which said lip is capable of entering said circular opening.

No references cited.

ROBERT H. ROSE, *Primary Examiner.*