

April 16, 1940.

R. ANDRIEU
ELECTRODYNAMIC LOUDSPEAKER, MORE ESPECIALLY FOR
TELEVISION RECEIVER WITH BRAUN TUBE
Filed June 12, 1937

2,197,329

3 Sheets-Sheet 1

Fig. 1

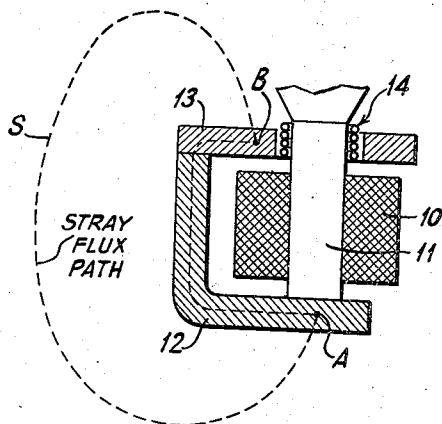


Fig. 1a

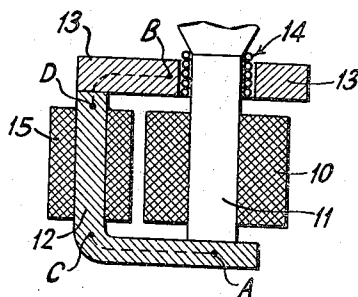
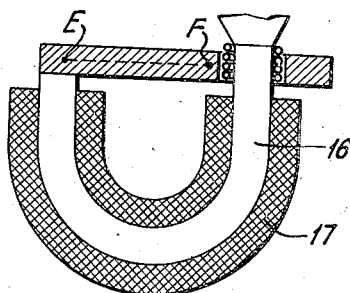


Fig. 1b



INVENTOR
ROBERT ANDRIEU
BY *H.S. Brover*
ATTORNEY

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Fig. 2

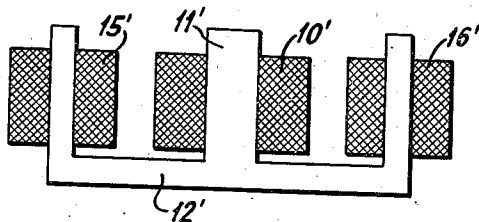


Fig. 2a

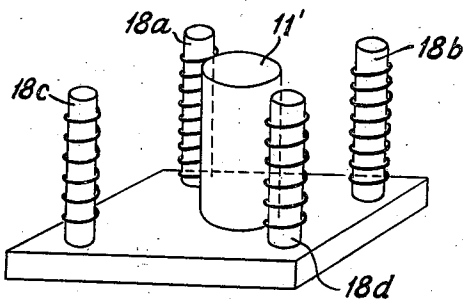


Fig. 2b

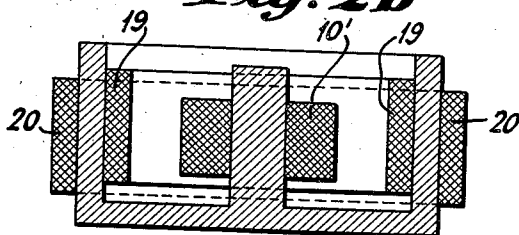
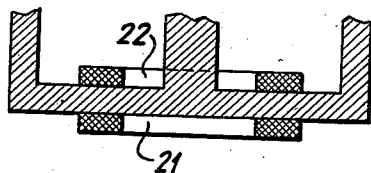


Fig. 2c



INVENTOR
ROBERT ANDRIEU
BY *H. S. Hoover*
ATTORNEY

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Fig. 3

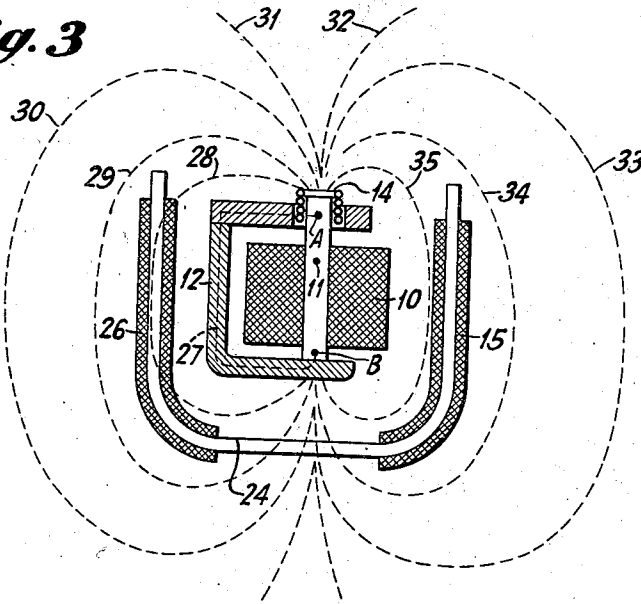


Fig. 3a

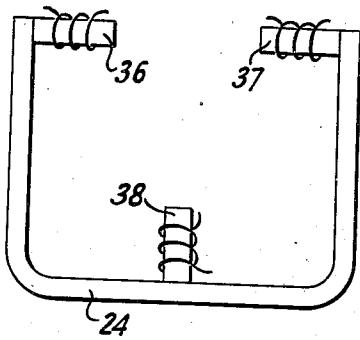


Fig. 3b

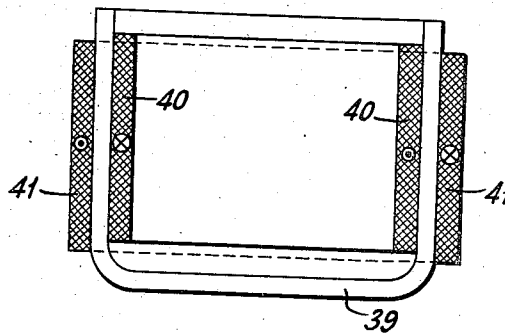


Fig. 3c

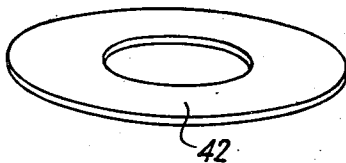
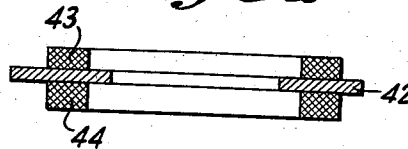


Fig. 3d



INVENTOR
ROBERT ANDRIEU
BY *H. S. Grover*
ATTORNEY

UNITED STATES PATENT OFFICE

2,197,329

ELECTRODYNAMIC LOUDSPEAKER, MORE
ESPECIALLY FOR TELEVISION RECEIVER
WITH BRAUN TUBE

Robert Andrieu, Berlin, Germany, assignor to
Telefunken Gesellschaft für Drahtlose Tele-
graphie m. b. H., Berlin, Germany, a corpora-
tion of Germany

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In Germany June 17, 1936

1 Claim. (Cl. 179—115.5)

In using electrodynamic loudspeakers the stray field of the exciter coil sometimes leads to disturbances. This is especially the case when using such loudspeakers in television receivers with Braun tube in which case a deviation of the cathode ray by the stray field can be observed which varies in magnitude from point to point so that the shape of the image and the image content are distorted in an undesirable manner.

This drawback is avoided in accordance with the present invention in that several separate exciter or field windings are mounted on the iron yoke which magnetize in the same sense, or by providing a single coherent exciter winding extending over the greater part of the iron path.

In the drawings Fig. 1 discloses the stray field associated with the magnetic circuit of a conventional loudspeaker, Figs. 1a and 1b show constructions according to the invention for overcoming such stray fields, Figs. 2 to 2c disclose several modifications of the invention applied to magnetic systems having a plurality of turned paths, and Figs. 3 to 3d disclose other modifications utilizing the principle of this invention.

It will now be explained with reference to Figure 1 which represents an ordinary dynamic loudspeaker, the manner in which the stray field can develop. The loudspeaker consists of the exciter winding 10, an iron core 11 within this winding, the L-shaped iron yoke 12, and an iron plate 13 having a bore whose diameter is larger than that of the coil core 11. In the air gap between plate 13 and core 11 there is arranged the winding 14 passed by the alternating speech currents and which is fastened to the loudspeaker cone in the usual way. In order to produce in this air gap a constant exciting field, the magnetic resistance in the L-shaped yoke 12 and plate 13 must be overcome. Therefore, there exists a magnetic voltage drop through the path indicated by a dotted line between the points A and B, i. e., a magneto-motive force must exist between the points A and B to be supplied by the exciter coil 10. The path A—B passed by the magnetic flux however, has parallel thereto the stray flux path indicated in Figure 1 by the dash line S. The magnitude of the stray flux thus is determined by the magneto-motive force between the points A and B, i. e., by the so-called magnetic tension and by the magnetic resistance of the entire stray flux path. When dividing the stray flux path into so-called flux tubes, the magnetic flux within these individual tubes is likewise determined by the magneto-motive force between

the points A and B and by the magnetic resistance of the respective flux tubes.

In view of this fact in accordance with a mode of construction embodying the invention in addition to the exciter winding 10 at least one additional exciter winding is provided whose magnetizing action has the same sense as that of the winding 10. Such embodiment is represented in Figure 1a. A winding 15 is arranged on the L-shaped yoke, said winding being fed with direct current and its flux passes in the same direction as the flux produced by the winding 10. The other reference characters have the same significance as those in Figure 1.

In Figure 1a the magnetic resistance along the greater part of the L-shaped yoke is overcome by the ampere turns of the coil 15 so that a magnetic tension drop exists only between the points A—C and D—B. This drop however, is considerably smaller than the magneto-motive force in the case of Figure 1 between the points A and B, so that likewise also the stray flux parallel to the path A—C on the one hand, and D—B on the other hand will be considerably smaller than in the case of Figure 1, not to mention that at a distance which is great as compared with the dimensions of the iron yoke, the two magneto-motive forces between the points A—C and D—B practically eliminate each other.

In certain loudspeaker constructions it may be advisable aside from the additional winding 15, to provide one or more windings by which the magnetic tension drop along other parts of the iron path will be still further reduced.

Figure 1b shows an embodiment of the invention in which a U-shaped iron yoke 16 is used and in which the exciter coil 17 extends over the greater part of the yoke. In this construction a magnetic tension drop exists only along the short path E—F so that also the magnitude of the stray flux is correspondingly small.

In the above described modifications, what was particularly concerned with was a loudspeaker in which the iron path was roughly U-shaped.

According to another modification the invention is concerned with the problem of effecting compensation of the stray flux whenever the iron path of the loudspeaker has several return paths for the exciting flux. According to the invention, each one of the return paths is to be provided with a D. C. winding designed to compensate the magnetic drop of potential in this path.

Referring to Figure 2, the magnetic part of a loudspeaker system is shown and is of E-form. The iron body which is designated by 12' supports

upon its middle leg or limb 11' the normal exciting or field winding 10', while upon the two outer limbs of the said body are provided the additional windings 15' and 16' according to this invention.

5 Figure 2a is a perspective view of another exemplified embodiment. The central upright 11' carries the customary field winding, while upon each of the four corner or outer uprights 18a to 18d distinct windings have been wrapped, each
10 of these being designed to compensate the magnetic potential fall in the respective uprights.

If in an arrangement as shown in Figure 2a, the number of columns is greatly increased, there results finally a so-called pot-shaped loudspeaker
15 as shown in Figure 2b in which the wall of the pot, as it were, consists of a plurality of connected uprights. In the case of this embodiment, according to the invention, in addition to the usual exciting winding 10' upon the central upright,
20 two windings 19 and 20 are provided, disposed concentrically in reference to each other and to the axis of the pot-shaped member. The said two windings 19 and 20 compensate the fall of potential of the magnetic flux inside the whole
25 wall of the pot with the result that also the leakage flux will disappear almost entirely.

If the magnetic falls of potential also in the bottom of the pot are to be compensated, two further windings 21 and 22 as illustrated in Figure
30 2c may be disposed, and also these are arranged concentrically to each other as well as to the axis of the pot.

In the arrangements above described, elimination of the magnetic stray field is insured by the
35 provision of one or several additional exciting windings, or of a single exciting winding of special design. According to still another modification the invention is predicated upon the identical arrangement of eliminating the stray field by
40 use of the same principle, however, without necessitating any changes in the loudspeaker system itself. For this purpose, the loudspeaker system is disposed inside a roughly U-shaped or
45 pot-shaped iron body on which are placed one or several D. C.-fed windings as shall hereinafter be described in more detail by the aid of several exemplified embodiments of the idea.

Figure 3 shows a standard loudspeaker of the electro-dynamic type. The same comprises the
50 iron-core 11, the exciting or field winding 10, and a bow-shaped piece (yoke) 12 to close the iron path. 14 denotes the voice coil fed with the A. C. signal currents, which is disposed in the air-gap and to which the loudspeaker cone is
55 attached. The said loudspeaker system is accommodated inside an iron body 24 which may be roughly of U-shape and which has a size preferably larger in the direction at right angles to the plane of the drawing than the dimensions of the loudspeaker system in the same direction.
60 Wrapped on the said body 24 are the coils 25 and 26 energized by direct current.

To explain more fully the operation of the arrangement, the iron body 24 carrying the windings 25 and 26 shall for the time being be assumed to be absent. The ampere turns to create the constant magnetic flux in the iron closure clip 12 and in the air-gap are supplied by the field winding or coil 10. As a result a magnetomotive force (M. M. F.) is set up between the
70 points A and B seeing that in addition to the air-gap also the iron clip or closure path 12 possesses a (magnetic) reluctance that is not negligibly low. Hence, in shunt or parallel relation to the
75 flux along the broken line 27 through the clip 12

which closes and completes the iron path, there arises a stray or leakage flux which is closed through the air space seeing that the latter, as it were, is parallel to the path through the iron, the size of the said stray flux being governed by the magnetomotive force across the points A and B and the reluctance of the entire air space. This leakage flux is indicated in the drawing Figure 3, by the broken lines 28 to 35.

But if, as suggested in one of the exemplified
10 embodiments of this invention, an iron body 24 on which D. C.-fed windings 25 to 26 are wrapped, is provided, there is no doubt that conditions can be made so that the part of the magnetic flux which enters at the two upper ends of body 24
15 and which leaves it below, in the middle, will not be called upon to overcome any reluctance in the iron. All that is necessary to insure this condition is to so proportion the current energizing the windings 25 and 26 that the magnetic potential drop of the said portion of the stray flux in the iron body 24 will be covered by the ampere
20 turns of the coils 25 and 26. But this means that the path of the leakage flux under consideration in the body 24 is of zero reluctance. A further
25 inference is that by choosing a suitable value for the D. C. flowing through the coils 25 and 26, it is not only feasible to compel the portion of the stray flux here considered to pass through the iron body 24, but also that practically the entire stray flux leaving at point A will enter the iron body 24 while leaving it at the bottom portion and returning to point B. In this manner the magnetic leakage flux of the loudspeaker as
30 it were may be short-circuited by providing a wound iron-body having a form as hereinbefore described.

Figure 3a shows an exemplified embodiment of the U-shaped body in which the extension pieces
36, 37, 38, which optionally may be provided with coils as shown in the figure will still further improve the action of the iron yoke of short-circuiting the leakage flux. The loudspeaker is mounted
40 inside the said body or yoke 24 in the case of Figure 3a in a similar way as in Figure 3.

Another exemplified embodiment as shown in Figure 3b comprises a pot-shaped body 39 instead of the U-shaped body or yoke shown in Figures 3 and 3a, and two windings 40 and 41
50 being both of cylindrical shape. The axes of the two cylinder windings coincide with the axis of body 39.

Also, the exemplified embodiment of Figure 3b may be furnished with extension pieces, and these have here the identical purpose as the extension pieces 36 to 38 of Figure 3a. The extension piece 38, Figure 3a, would be provided in Figure 3b in practically the same form. But in lieu of pieces 36 and 37 there would here be used a circular disk 42 having a central hole as shown in Figure 3c. If desired, concentric windings 43 and 44 may be wrapped on this disk. These would be disposed in a way as shown in Figure 3d and would correspond to the arrangement of windings 40 and 41 in Figure 3b.
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The embodiment shown in Figures 3b, 3c and 3d would offer this further advantage over the scheme Figure 3 that not only the flux which leaves the iron path of the loudspeaker in the plane of the drawing is short-circuited, but that also the flux emerging at right angles to the said plane is short-circuited. It will be understood that the same result could be insured in the case of Figure 3 only by choosing disproportionately large dimensions for the iron body in the direc-
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tion at right angles to the plane through the drawings.

What I claim is:

5 An electrodynamic loudspeaker provided with an air gap, means comprising a center core and a return path for the magnetic flux, for producing an intense magnetic field within said air gap, said return path being in the form of a pot-shaped yoke and having a substantial mag-

netic fall of potential resulting in the creation of a large stray flux externally of said magnetic return path, and means associated with said pot-shaped return path for reducing the extent of stray flux, comprising a pair of concentric wind- 5 ings, one disposed within and the other externally of said pot-shaped return path.

ROBERT ANDRIEU.