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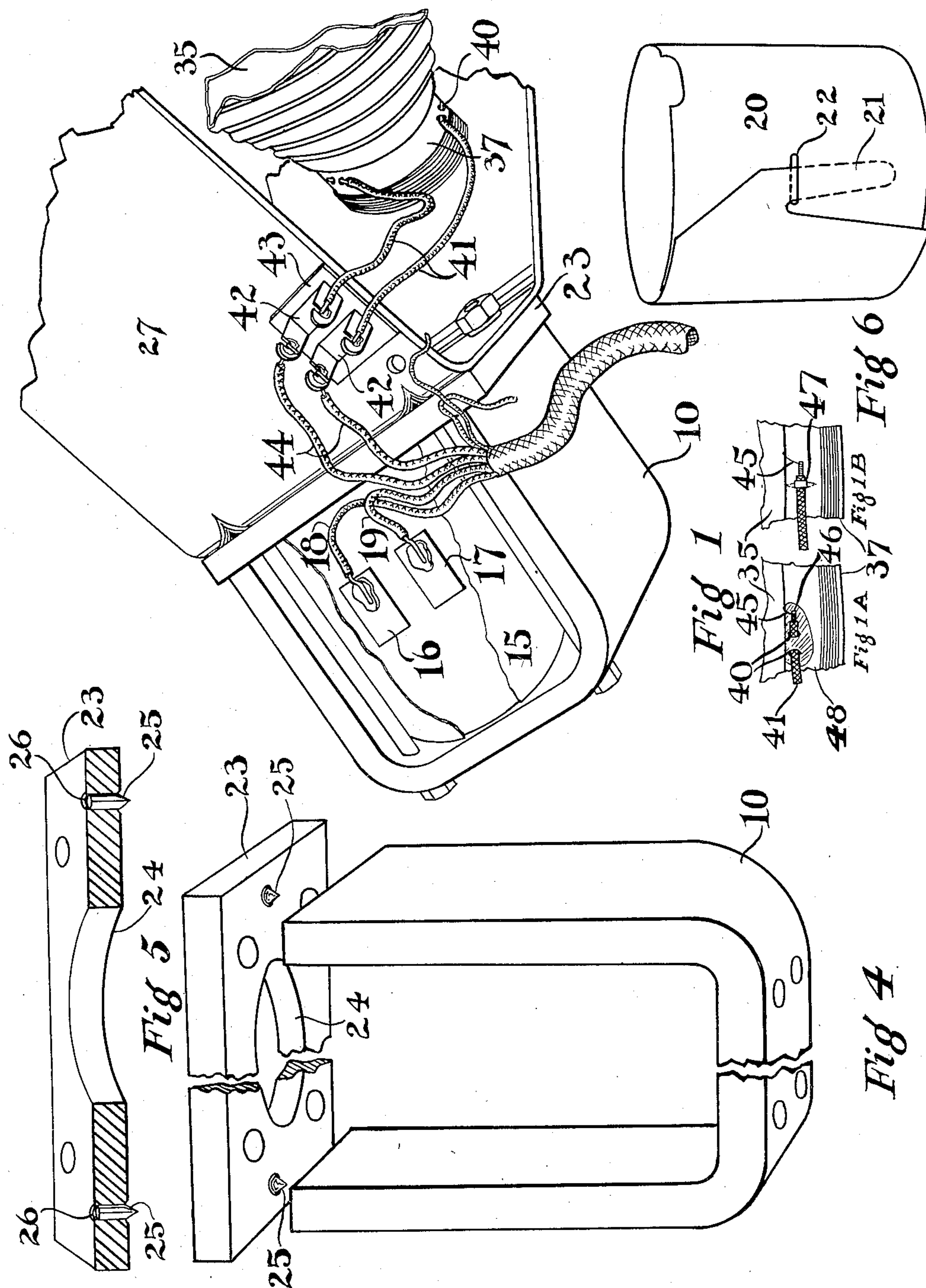
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LOUD SPEAKER STRUCTURE AND METHOD OF MAKING THE SAME

Filed April 13, 1931

2 Sheets-Sheet 1



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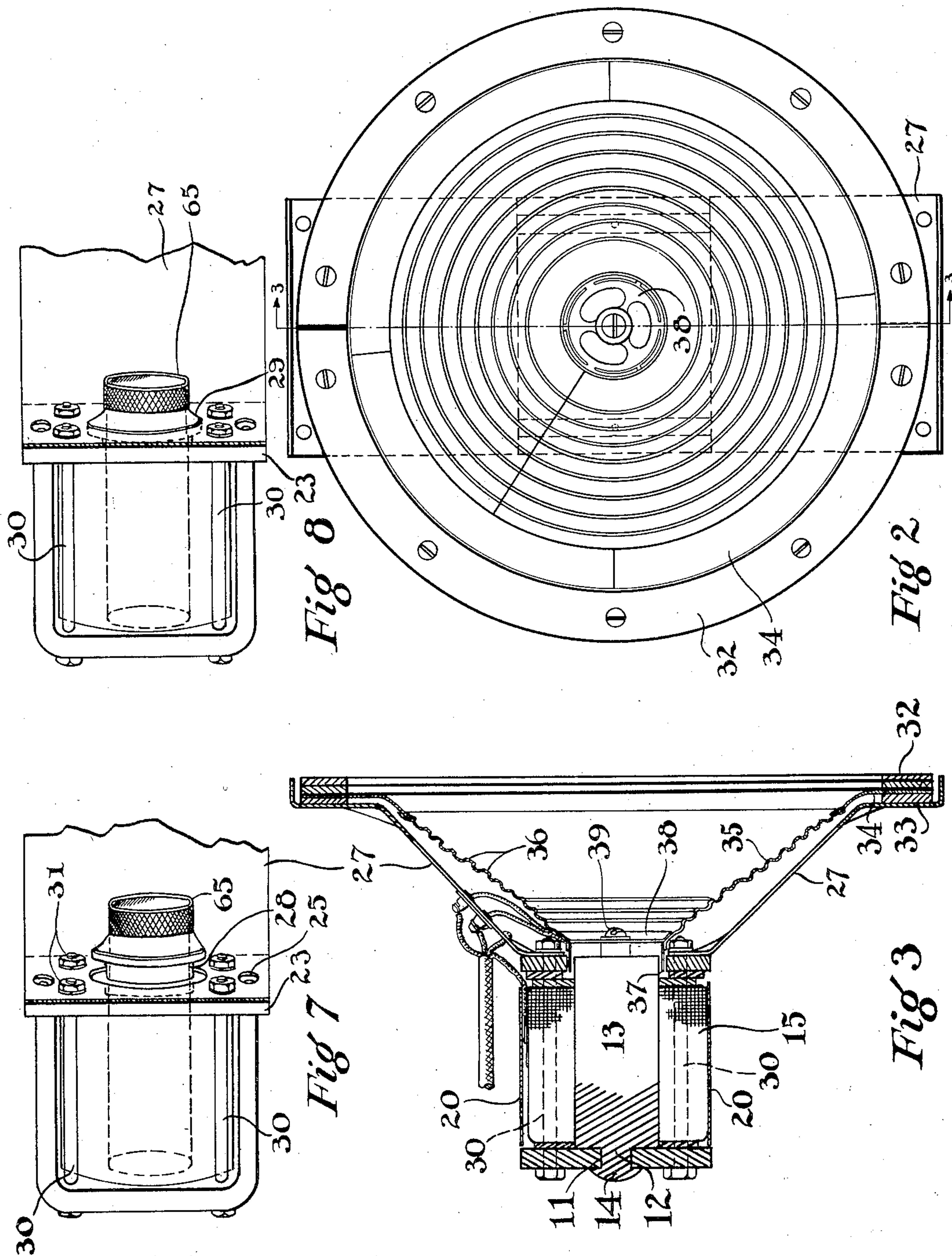
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LOUD SPEAKER STRUCTURE AND METHOD
OF MAKING THE SAME

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1 Claim. (Cl. 179—115.5)

This invention relates to the method of manu-
facturing and the structure of a loud speaker.

In loud speakers of the moving coil type where-
in there is employed an inner-polepiece or core
5 and a surrounding outer polepiece or yoke spaced
therefrom to receive a moving coil attached to a
diaphragm, it is essential that this space between
these polepieces be uniform at all points and fur-
ther that this space should be restricted as much
10 as possible consistent with the movement of the
coil therein without engaging either of said pole-
pieces. In the past, these results have been ob-
tained by providing a spacing ring or other ele-
ment which preserves the annular space between
15 the polepieces in exact uniform relation or else
the core constituting the inner polepiece has been
made adjustable so that the desired exact annu-
lar space between the polepieces might be ob-
tained.

The use of a spacing ring or other spacing ele-
ment in addition to the cost of material, results
in the additional cost of manufacturing and at-
taching such a ring to certain of the elements.
Where the central core constituting the central
25 polepiece is adjustable, much difficulty has been
encountered in locking the core in the exact posi-
tion to which it has been adjusted. Furthermore
if it is desired to repair the driving unit, and then
reassemble it, this reassembly could not be effected
30 without the use of a gage.

In accordance with the present invention, the
loud speaker driving unit has been designed and
a method of manufacturing it has been developed
in which the need of a spacing ring or other spac-
ing element has been obviated and this has been
35 accomplished without making the central core
element adjustable. A further feature of the in-
vention resides in the method of holding the outer
polepiece in laterally fixed, uniformly spaced, an-
nular relation to the core and yet permitting re-
40 pair and reassembly of the unit without the need
for centering instruments. Other features will
appear from the detailed description and the ap-
ended claim.

Referring to the drawings, Fig. 1 is a perspec-
tive view of a loud speaker of the present inven-
tion with parts thereof broken away to simplify
disclosure and with the cone-shaped diaphragm
displaced from its normal position; Figs. 1A and
1B represent different forms of moving coil ter-
50 minals; Fig. 2 is a plan view of the loud speaker;
Fig. 3 is a vertical section taken on the line 3—3
of Fig. 2; Fig. 4 is a perspective view of the U-
shaped magnet and the yoke or polepiece (both
55 having portions broken away) showing in detail

the arrangement for holding the yoke against lat-
eral movement with respect to the magnet; Fig. 5
is a cross-sectional view of the yoke showing how
the centering pins are held in position; Fig. 6 is a
perspective view of a protective collar for the
energizing field coil of the loud speaker; Fig. 7 is a
view partially in section showing how a gage may
be used to center the yoke with respect to the core
of the magnet; Fig. 8 is a similar view except that
it shows the same gage used to center the cone-
10 diaphragm bracket with respect to the yoke and
the remainder of the driving unit assembly.

Referring to Fig. 1, 10 designates a U-shaped
magnet which is apertured at 11 to receive the
reduced end 12 of a cylindrical core 13 as shown
15 in Fig. 3. The reduced end of this core is riveted
in position as shown at 14 to hold the core sub-
stantially in equally spaced relation from each of
the uprights of the magnet. An energizing field
coil 15 surrounds the core 13, which coil, as is
20 well-known, comprises many turns of wire, each
end of which terminates in flat terminals 16 and
17 arranged to be substantially flush with the
outer surface of the coil. These terminals enable
the conductors 18 and 19 (which may lead to a
25 suitable power device) to be soldered directly
thereto. When these conductors have been at-
tached in this manner, an insulating strip 20 of
paper or other suitable material is placed sur-
rounding the coil with a tab 21 inserted in the slit
30 22 to hold the ends in position to form a collar.
In practice, the length of the collar 20 is just about
equal to the length of the inner space between
the magnet and the yoke so that it is impossible
to remove the collar 20 unless the driver unit is
35 disassembled.

On the free ends of the U-shaped magnet 10,
there is fastened a yoke or polepiece 23 having an
opening 24 of slightly larger diameter than that
of the core 13. In assembling the yoke on the
40 magnet, a gage 65, engaging the outer surface of
the core 13 and the surface of the opening 24,
(Fig. 4), serves to center the yoke 23 with respect
to the core 13 thereby forming an air gap of exact
annular dimensions. With the yoke in proper
45 position, an angular shaped bracket 27 for sup-
porting the cone-diaphragm is mounted on the
driver unit with its opening 28 (Fig. 7) substan-
tially concentric with the opening 24 in the yoke.
This concentric relation is obtained as shown in
50 Fig. 8 when the edge of the shoulder 29 on the
gage 65 engages the inner surface of the opening
28 in the bracket. When the yoke and bracket
are thus properly centered, they are held clamped
in this relation by means of bolts 30 passing 55

through apertures in the magnet, yoke and bracket, as best shown in Figs. 4, 7, and 8. After the yoke and bracket are thus properly centered, hardened steel pins 25 are driven through apertures 26 into the unpierced, free ends of the magnet 10, and thereafter the gage 65 is withdrawn. These pins are then forced into the ends of the magnet until their heads are below the upper surface of the yoke. Subsequently the edges of the apertures 26 are peened to hold the pins in the desired position. These pins when thus driven into the ends of the magnet prevent any lateral movement of the yoke and yet permit the driving unit to be disassembled and then subsequently reassembled while assuring an exact centering of the yoke with respect to the coil without any additional use of a gage. Nuts 31 engage the bolts 30 to permit the respective parts just mentioned to be tightly clamped in place. On the outer ends of the bracket 27, there are mounted two clamping rings 32 and 33, between which there is clamped a flexible mounting 34 attached to the free edge of the cone-diaphragm 35. As herein disclosed, this flexible mounting comprises sections of soft leather glued or otherwise attached to the edge of the cone-diaphragm. Although leather is mentioned as a flexible mounting, it will be understood that any other material which is flexible and which has substantial damping characteristics may be used instead. It is also understood that instead of leather, an annular ring formed as an extension of the cone-diaphragm and of the same or similar material may be used as the flexible coupling between the diaphragm and the clamping rings. The diaphragm 35 may be formed of any light, rigid material such as paper which is embossed with corrugations such as 36. It has been found that better results are obtained if the material in the space between the adjacent corrugations has a flat contour instead of being of rounded contour as is usual where corrugations are embossed into a diaphragm surface to give it rigidity. As best shown in Fig. 3, the diaphragm 35 is in the form of a truncated cone on the smaller end of which there is fastened a cylindrical coil support 37 of paste board or other similar material on which there is wound a coil of fine wire. This coil and its support are adapted to move in the annular air gap formed between core 13 and the side of the opening 24 in the yoke 23. It is essential that the coil and its support move in the mentioned air gap only in a direction parallel to the axis of the core 13 and in order to insure this movement, there is fastened to the diaphragm at its truncated end a spider 38 of rigid material which is mutilated as shown in Fig. 2 to permit portions thereof to move in a direction parallel to the axis of the core and yet insure that there will be substantially no movement of the spider at right angles to this axis. This spider is fastened by means of a screw 39 to the free end of the core 13 after the coil has been properly spaced or centered in the mentioned airgap.

By reference to Figs. 1, 1A and 1B, it will be noted that the terminals 45 of the coil on the support 37 are fastened to the support and are electrically connected to flexible leadout conductors such as 41, each of which is preferably formed

of strands of flexible conducting tinsel. In order to fasten each terminal 45 of the coil and the connected end of the lead-out conductor 41 to the support, spaced apertures such as 40 are formed in the material of the support. Thereafter, the end of the flexible conductor 41, engaged by an annular, metal tip 46, is threaded through the pair of apertures and then soldered to a terminal 45 of the coil. A drop of adhesive such as shellac is applied to the terminal 45 and the portion of the conductor 41 threaded through openings 40 to attach the junction of these conductors to the support. Instead of fastening the junction of these two conductors to the support by threading each conductor through a pair of openings such as 40, a metal clip 47 engaging the end of the conductor 41 and piercing the material of the support may be provided, as shown in Fig. 1B. In order to insure that the terminals of the coil 45 snugly engage the support 37, a strip of paper 48 is fastened to the support covering a portion of the terminal as best shown in Fig. 1A. In this way, the lead-out from the moving coil is in no way secured to the diaphragm proper and yet the coil may be moved back and forth indefinitely without danger of breakage in the connection. The conductors 41 at their free ends are fastened to conducting clips 42 mounted on a strip of insulation 43 in turn fastened to bracket 27. Other conductors 44 leading to a signal current source (not shown) are respectively fastened to the other ends of the clips 42.

While in this disclosure, the magnet is referred to as U-shaped, it will be understood that a cylindrical or pot-shaped magnet which is U-shaped in cross section may be likewise used. Also the free end of the core and the opening 24 in the yoke instead of being circular, as herein shown, may be of other contour such as a rectangle or other geometric figure provided these parts are so related that they define a narrow airgap in which a movable coil may be moved.

The present disclosure is merely illustrative of the invention and is not to be construed in a limiting sense except as specifically defined in the appended claim.

What I claim is:

In an acoustical device comprising a magnet U-shaped in cross section, a core fastened to said magnet extending intermediate of and substantially parallel to the free ends of said magnet, a yoke provided with an opening of similar contour but slightly larger area than the free end of said core to form therewith an airgap, a bracket, a cone-shaped diaphragm supported at its edges by said bracket, the smaller end of said cone-shaped diaphragm having attached thereto a driving coil, the method of assembling said device and preserving uniform spacing in said airgap for said coil which comprises pinning said yoke to the previously unpierced, free ends of said magnet to retain a uniform relation between said yoke and said coil, fastening said bracket and said yoke to said magnet with said coil centered in said airgap, and flexibly supporting said coil for movement substantially parallel to the axis of said core and without any substantial movement in a direction away from said axis.

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