March 27, 1951 S. E. LEVY 2,546,344

MAGNET STRUCTURE

Filed Dec. 31, 1946

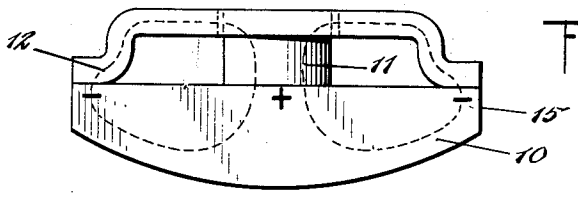



Fig. 1.

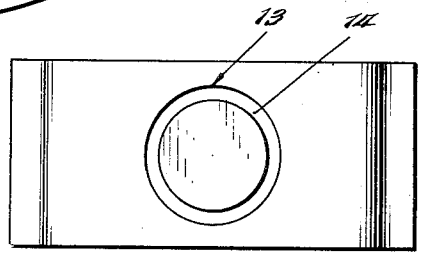



Fig. 2.

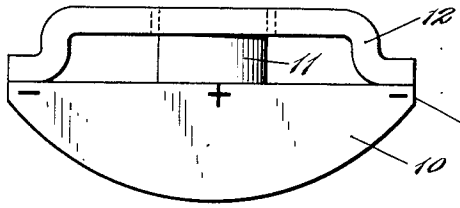



Fig. 3.

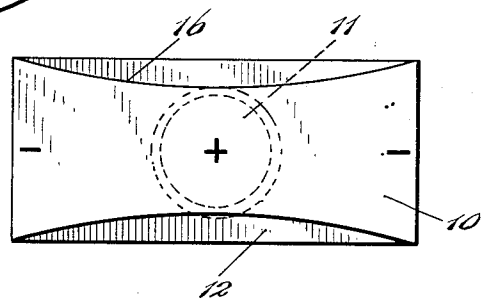
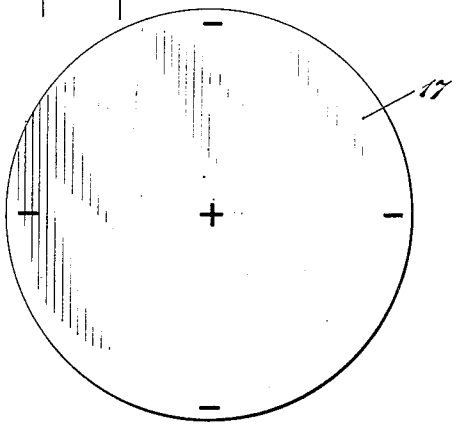



Fig. 4.

Fig. 5.



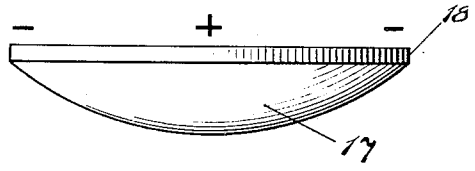




Fig. 6.

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# UNITED STATES PATENT OFFICE

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## MAGNET STRUCTURE

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Application December 31, 1946, Serial No. 719,432

2 Claims. (Cl. 175—21)

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The present invention relates to magnet structures, and particularly to plate magnets for utilization in loudspeakers of the permanent magnet type. In my copending application, Serial No. 684,064, filed May 31, 1946, now abandoned, I have described a magnet of the plate type having doubly polarized magnetization and adapted to be utilized in a loudspeaker. My present invention is an improvement upon the structure shown in the above mentioned application and provides for a more even distribution of the magnetic flux than could be achieved in the structure shown in that application. This application is, therefore, a continuation-in-part of my prior copending application above mentioned.

By plate magnet is meant a structure having at least one flat surface and wherein the magnetic orientation lies in substantially a plane which is the plane of the structure's flatness. This is to be distinguished from a magnetic structure which is bent or curved or has a cylindrical or shell shape or one wherein the flux lines flow in more than one plane, or where the flow is not generally parallel to the flat surface of the magnet.

It is an object of the present invention to provide doubly polarized plate magnets, including bar magnets, of varying thickness, whereby the flux distribution in the magnet proper will be uniform.

It is another object of my invention to provide such a bar magnet and cooperating keeper or pole piece in which the bar magnet is shaped to eliminate unused portions and thereby concentrate the flux across the magnetic gap.

Other objects and features of the invention will be apparent when the following description is considered in connection with the annexed drawings, in which:

Fig. 1 is a side elevation of a variable thickness bar magnet in accordance with my invention showing inner and outer pole pieces mounted thereon;

Fig. 2 is a top plan view of the structure of Fig. 1;

Figs. 3 and 4 are, respectively, a side elevation and bottom plan view of the structure of Fig. 1 showing particularly the mode of eliminating substantially unused portions of the magnet proper;

Fig. 5 is a top plan view of a circular magnet in accordance with my invention; and

Fig. 6 is a side elevation of the circular magnet of Fig. 5.

Referring now to the drawings, there is shown

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at 10 the magnet of my invention having mounted thereon and centrally thereof an inner pole piece 11 and having likewise mounted thereon the outer pole piece 12, the said outer pole piece being provided with the circular aperture 13 forming with the inner pole piece 11 the usual magnetic gap 14.

In the construction indicated in my copending application above mentioned, the flux is concentrated in the area of the magnet immediately beneath the inner pole piece 11 and becomes less concentrated as the periphery 15 of the magnet is approached. By my present invention, the magnet is made thicker at its center, so that the cross-sectional area of the magnet at the center point thereof is substantially twice the cross-sectional area at the outer edge 15. In this way, as will be seen by reference to the dotted lines in Fig. 1, the flux concentration is substantially uniform throughout the magnet, and the entire strength of the magnet is utilized to produce a flux across the magnetic gap 14. In other words, it is possible to utilize a magnet of considerably lesser mass in producing the same result, or to produce a much better result with a magnet of equivalent mass.

Referring now to Figs. 3 and 4, it will be seen that in this instance the magnet 10 of Figs. 1 and 2 has been cut away along its side edges, as indicated at 16 so that at its center, the magnet width is approximately equal to the center pole diameter. Otherwise, the material in these regions would be substantially useless, due to the fact that the flux circuit extends outwardly from the inner pole piece 11 along curved lines representing the pole piece diameter and does not take sharp bends such as would be required of any flux flowing through the area which has been cut away. In order to compensate for the cross-sectional area of material removed, the magnet 10 proper of Figs. 3 and 4 is made thicker at its central part, and in a particular instance in which the width of the magnet was one inch and the diameter of the inner pole piece 11 half an inch, the vertical dimension at the periphery 15 of the magnet was made a quarter of an inch and that at its center point approximately an inch. By this modification the cross-sectional area of the magnet at its periphery is again substantially half the cross-sectional area at its center, and thus provision is made for a uniform flux density throughout the doubly polarized magnet.

The variations in thickness and in width above described will realize the maximum flux density

in the air gap in applications of a bar magnet possessing one polarity at the center and the opposite polarity at its periphery. In these applications the magnetic flux density at the center is twice that at any one end, hence the cross-sectional magnet area at the center should be double the area of one end.

In Figs. 5 and 6 there is shown a circular magnet 17 which is so magnetized as to have one polarity at its center and the opposite polarity at its edges. In this form of the magnet of my invention, the magnet is so designed that the ratio of the cross-sectional area of the periphery 18 of the magnet to the cross-sectional area of the annulus subtended by the circumference of the center pole piece, to be used therewith, is in the neighborhood of 2:1, thus assuring uniform density throughout the magnet.

While I have described a preferred form of my invention, it will be understood that alternate forms may be devised without departing from the spirit of the invention. Consequently, I wish to be limited not by the foregoing description, which was given solely for the purpose of illustration, but only by the appended claims.

What is claimed is:

1. A plate magnet generally rectangular in plan having one polarity at its center and the opposite polarity at its ends, said magnet being relatively thick at its center and diminishing to approximately half the thickness at the said ends, whereby when a magnetic circuit is completed through said magnet the flux density throughout said magnet is substantially uniform.



2. A plate magnet generally rectangular in plan having one polarity at its center and the opposite polarity at its ends, said magnet being substantially twice as thick at its center as at its said ends, said thickness variation being in the form of a circular arc, whereby the cross sectional area varies so that when a magnetic circuit is completed through said magnet the flux density throughout said magnet is substantially uniform.

SIDNEY E. LEVY.


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