Jan. 2, 1934. A. I. ABRAHAMS 1,941,776

SOUND UNIT

Filed Sept. 24, 1931

Fig. 1.

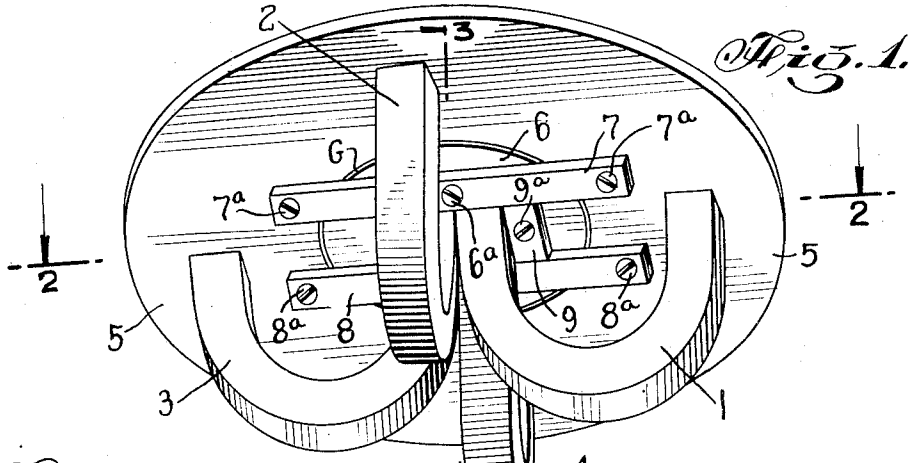


Fig. 2.

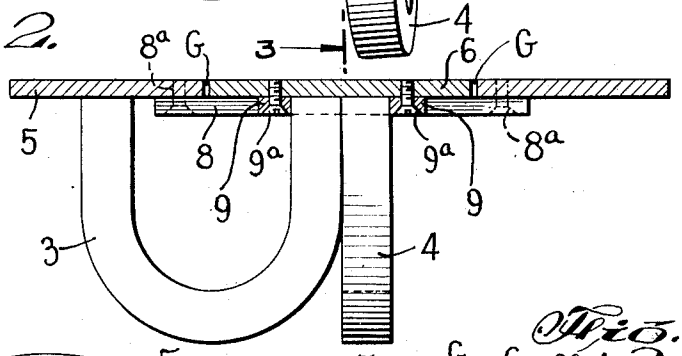
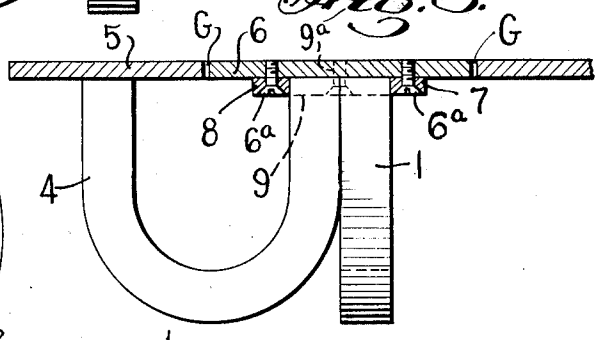


Fig. 3.



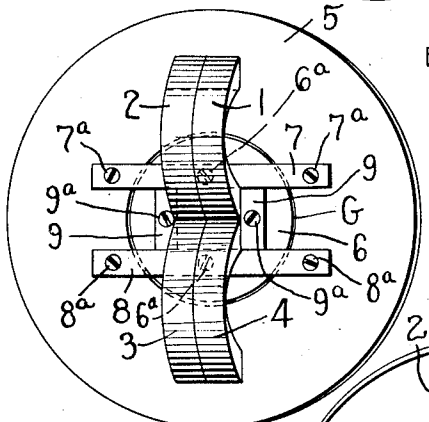
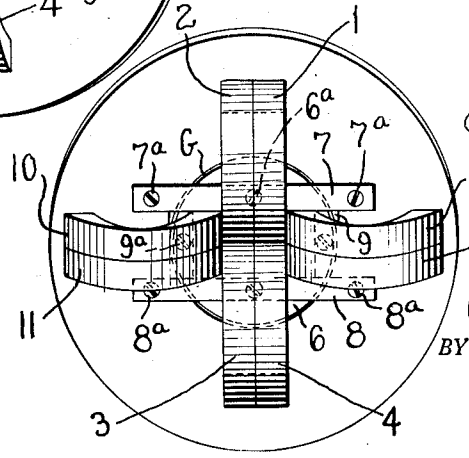


Fig. 4.

Fig. 5.



INVENTOR
Alexander I. Abrahams
BY Mock & Blum
ATTORNEYS.

Patented Jan. 2, 1934 1,941,776

UNITED STATES PATENT OFFICE

1,941,776

SOUND UNIT

Alexander I. Abrahams, New York, N. Y.

Application September 24, 1931
Serial No. 564,810

1 Claim. (Cl. 175—339)

My invention relates to improvements in a sound-reproducing unit.

One of the objects of my invention is to provide an improved sound-reproducing unit of the magnetic type. I intend to include a microphone and all sound-receiving and sound transmitting units, whenever I refer to a sound-reproducing unit.

Another object of my invention is to provide improvements in a sound-reproducing unit of the dynamic type, with the use of a permanent magnetic system.

Another object of my invention is to provide a sound-reproducing unit of the dynamic type, for use in loud speakers of all kinds, in which the expense of making the unit is greatly diminished.

Another object of my invention is to provide an improved unit of this type, in which the permanent magnetic system is produced by suitably combining a plurality of permanent magnets which can be readily shaped from ordinary bars.

Other objects of my invention will be set forth in the following description and drawing which illustrate preferred embodiments thereof, it being understood that the above general statement of the objects of my invention is intended to generally explain the same and not to limit it in any manner.

Fig. 1 is a perspective view of one embodiment of my invention, the device being shown slightly tilted, in order to more clearly illustrate its construction.

Fig. 2 is a sectional view on the line 2—2 of Fig. 1.

Fig. 3 is a sectional view on the line 3—3 of Fig. 1.

Fig. 4 is a bottom plan view of a second embodiment of my invention.

Fig. 5 is a bottom plan view of a third embodiment of my invention.

Sound-reproducing units of the dynamic type or electro-dynamic type have been known for many years. In devices of this type a diaphragm has had a coil connected thereto, and this coil was located in the flux of a field magnet. The signal current has been sent through the coil so that the variations in the signal current caused the diaphragm to correspondingly vibrate, and produce a sound which corresponded to the variations in the signal current. In devices of this type, it has been customary to use a field magnet having a field coil. In a microphone, the movement of the voice coil in the field induced a signal current in said voice coil.

It has been proposed to replace this type of field magnet, by a cast permanent magnet. This casting has been made in the form of a pot having a central projection, so that this central projection was surrounded by a metal annulus, and the projection and the annulus were of opposite magnetic polarities. Devices of this type have been very expensive to manufacture. These cast permanent magnets have been customarily made of cobalt-steel which can be very highly magnetized. In making a casting of this type, it was necessary to close the magnetic circuit by means of a keeper, and to retain the keeper which was kept on the top of the magnet in position until and as the final assembly was made, because the removal of the keeper even for a short period of time resulted in a loss of from 30–35% of the magnetism. Hence, in assembling a casting of this type with the other parts which were located at the top of the casting, it was necessary to laterally slide the keeper off the top of the magnetic casting and simultaneously slide upon the top of the casting, the other parts of the unit. This made assembly difficult, expensive and uncertain, especially in view of the very powerful magnetic attraction which is exerted by high percentage cobalt-steel.

According to my invention I can utilize a plurality of magnets of simple form, so that the cost of manufacture is greatly lowered, and the assembly is greatly simplified.

In the embodiment shown in Fig. 1, I employ four U-shaped magnets, 1, 2, 3 and 4, arranged in the form of a cross. I do not wish to be limited to the use of magnets of any particular shape, and I may utilize any form of magnet, such as a simple bar or strip, or which can be formed by bending a simple bar or strip. Likewise, I do not wish to exclude the use of magnets made from castings, although it would be much more economical to simply bend suitable bars into the shape shown in Fig. 1.

The four magnets are assembled with their corresponding poles adjacent each other.

For example in the embodiment shown herein, it may be assumed that the adjacent poles of the magnets are "north", so that the outer ends of said magnets are "south".

In order to assemble the parts of the magnetic system, and in order to provide the magnetic flux with the usual narrow air-gap, a perforated plate 5, and a filler plate 6 are utilized. The plates 5 and 6 may be made of any suitable material, such as any metal or alloy having low magnetic reluctance.

The magnets are preferably made of high co-

balt-steel alloy, as this retains its magnetism for a long period of time.

As each magnet is magnetized, the lateral faces thereof are provided with a keeper or keepers which are below the tops of the magnet, to an extent sufficient to clear the clamping bars which are afterwards located at the top of the magnet. This keeper is maintained in position until the assembly of the magnets with the remaining parts has been completed, whereupon the keeper can be readily slid off the magnets. The advantage of this is that a complete top assembly is permitted, because the keepers are not mounted at the tops of the magnets so that they are out of the way while the magnets are being assembled with the top parts. Likewise, the keepers provide a path of high magnetic leakage while the magnets are being assembled with the top parts, so that the attraction on the top parts is minimized, thus facilitating accurate and cheap assembly.

The plate 6 is located in the opening of the plate 5, so as to produce a narrow air-gap G which is of uniform width. The adjacent ends of the magnets are clamped between a pair of bars 7 and 8, and a second pair of bars 9. These bars 7, 8, and 9 may be made of brass or other suitable material, so that they do not disturb the desired path of the magnetic flux. For convenience, the bars 7 and 8 may be designated as longitudinal bars, and the bars 9 may be designated as lateral bars, although the relative positions of said bars can be varied at will. The adjacent faces of said clamping bars and of the magnets may be smooth, or they may be formed with interlocking ribs and grooves so as to permit the magnets to be firmly held in position.

The bars 7 and 8 are connected to the filler plate 6, which constitutes a central pole, by means of screws, rivets, or other fastening devices 6*a*. The lateral bars 9 are also connected to the filler plate 6 by means of fastening devices 9*a*.

It is therefore possible to form a sub-assembly between the filler plate 6 and the magnets, before the assembly with the annular plate 5 is completed. The bars 7 and 8 are connected to the annular plate 5, by means of fastening devices 7*a* and 8*a*. As shown in Fig. 2, the outer pole faces of the magnets firmly contact with the annular plate 5.

Since it is possible to make a sub-assembly between the magnets and the central pole plate 6, it is very easy for the workmen to properly locate the central pole plate 6 with respect to the annular pole plate 5, so as to form an air-gap G of uniform width, and to then insert the clamping screws 7*a* and 8*a*. The plate 5 is provided with suitable threaded openings, in order to receive the clamping screws 7*a* and 8*a*, and if desired, said screws can pass through suitable slots in the bars 7*a* and 8*a*, so as to make it possible to adjust the parts as they are finally assembled, in order to produce an air-gap G of uniform width.

In the resultant device the plate 6 is of one polarity, such as "north", and the outer plate 5 is of the opposite polarity, namely, "south". I do not wish to be limited to any particular shape of the plates 5 and 6, although I prefer to provide a circular air-gap G. The coil of the diaphragm is located in this air-gap G in the well known manner, and since this type of unit is well known, I have not illustrated the diaphragm or the coil connected thereto. The bars 7 and 8 could be provided with suitable recesses, in order to permit the coil to be located in the usual position. The diaphragm can be of the type utilized in a horn, or it can be the so-called "cone" diaphragm in which the diaphragm is of relatively large size and either vibrates in free air or in an enclosure.

By means of this improved device, I produce the same uniform intense flux as though a casting of the old type was utilized, and the improved device is much cheaper to produce.

In the embodiment shown in Fig. 4, the four magnets are arranged in parallel pairs, instead of being located at right angles to each other.

In the embodiment shown in Fig. 5, I may utilize more than four magnets. I have illustrated the use of eight magnets, but I could utilize six magnets, or any other desired number. The magnets 1–4 inclusive are arranged as shown in Fig. 4, and I also utilize additional magnets 10, 11, 12 and 14.

In order to define the invention in the claim, the pole piece 6 may be designated as the inner pole piece, and the pole piece 5 can be designated as the outer pole piece. While I prefer to have the outer pole piece 5 continuous, in order to produce a closed annular air-gap G, the invention is not limited to the use of this type of air-gap. Likewise, while it is not necessary to connect the magnets to the outer pole piece, this could be done without departing from my invention.

As previously stated, I do not wish to be limited to the use of any particular number of magnets, as I may employ one or more of such magnets. I prefer to use at least two magnets associated with the pole pieces 5 and 6, in order to secure a uniform magnetic flux across the air-gap G. For example, while I prefer to use the pole piece 5, the invention is not to be limited to the use thereof. Likewise, it is not necessary for the adjacent poles of the magnets to touch each other.

I have shown the preferred embodiments of my invention, but it is clear that numerous changes and omissions can be made without departing from the spirit of my invention.

For example, the invention may be used in connection with microphones or sound units of any type.

I claim:—

A magnetic device for use in a sound unit, comprising an inner pole piece and an outer pole piece, magnets having separated ends and disposed so that their ends of like polarity are adjacent each other, clamping bars connected to both of said pole pieces, and additional clamping bars connected only to the inner pole piece, said clamping bars engaging the lateral surfaces of the adjacent ends of said magnets, so that said adjacent ends are held against said inner pole piece and the other ends of said magnets are held against said outer pole piece.

ALEXANDER I. ABRAHAMS.