Jan. 26, 1926. 1,571,050

W. H. GERNS

ELECTROMAGNETIC DRIVING APPARATUS

Filed April 29, 1925 2 Sheets-Sheet 1

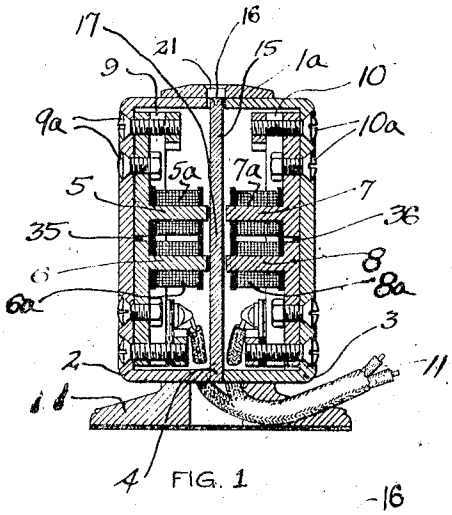


FIG. 1

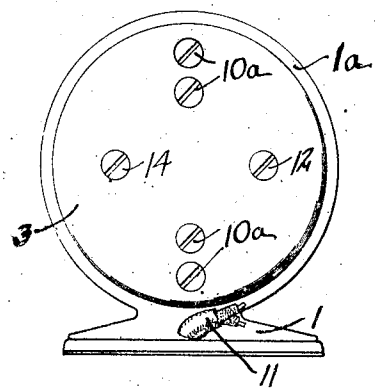


FIG. 2.

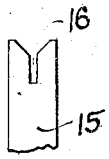


FIG. 3

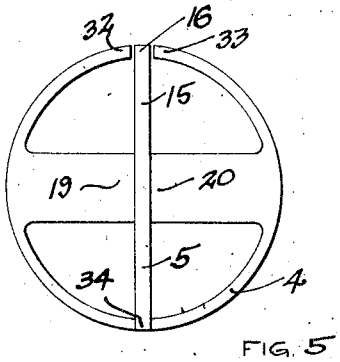


FIG. 5

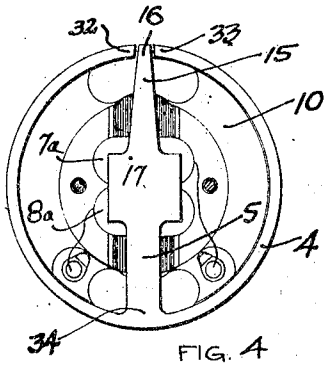


FIG. 4

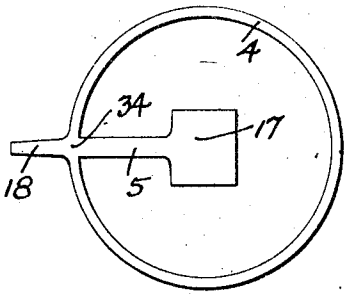


FIG. 7

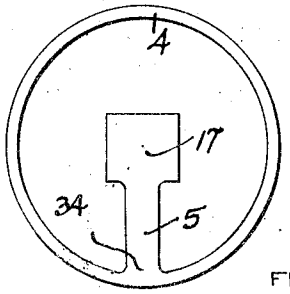


FIG. 6

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W. H. GERNS

ELECTROMAGNETIC DRIVING APPARATUS

Filed April 29, 1925 2 Sheets-Sheet 2

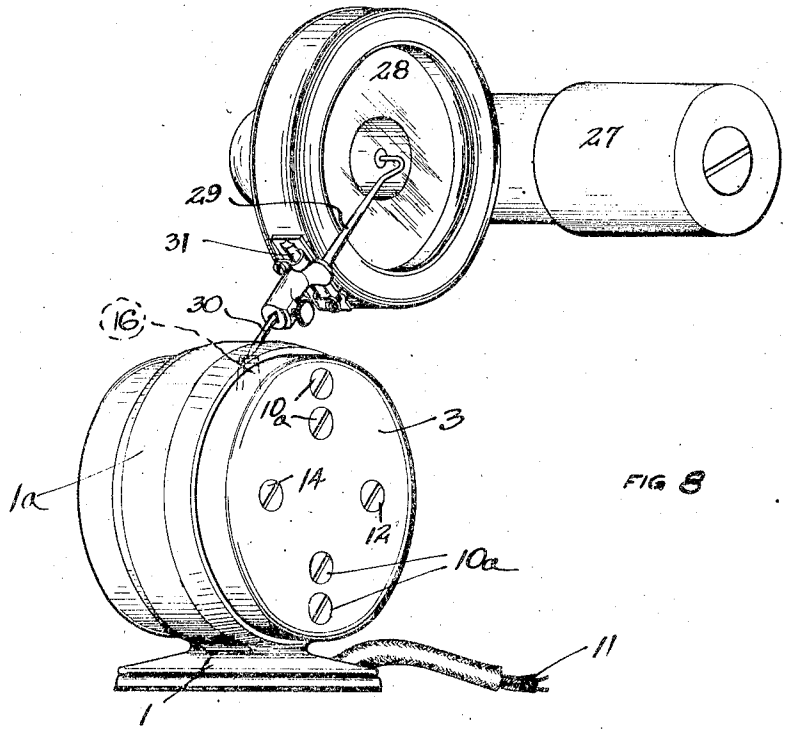


FIG 8

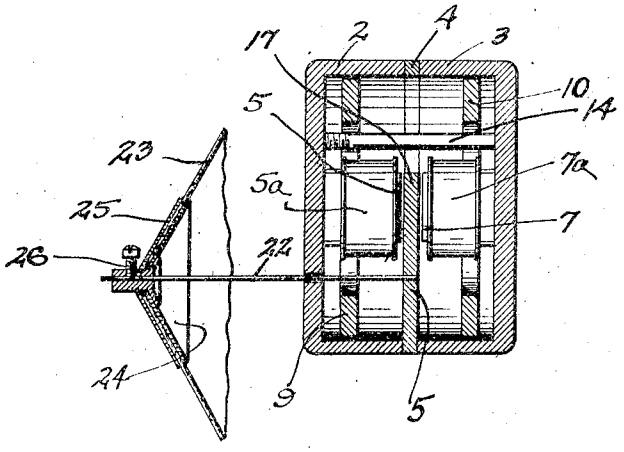


FIG. 9

WILLIAM. H. GERNS. INVENTOR.

BY John B. Brady

ATTORNEY

Patented Jan. 26, 1926. 1,571,050

UNITED STATES PATENT OFFICE.

WILLIAM H. GERNS, OF EAST ORANGE, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, TO BRANDES LABORATORIES, INC., OF NEWARK, NEW JERSEY, A CORPORATION OF NEW JERSEY.

ELECTROMAGNETIC DRIVING APPARATUS.

Application filed April 29, 1925. Serial No. 26,707.

To all whom it may concern:

Be it known that I, WILLIAM H. GERNS, a citizen of the United States, residing at East Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Electromagnetic Driving Apparatus, of which the following is a specification.

My invention relates broadly to the reproduction of sound from electrical vibrations, and more particularly to the construction of a driving unit for transforming electrical vibrations into a mechanical movement.

One of the objects of my invention is to provide a driving unit in which variations in electrical energy may be employed to develop a mechanical movement of relatively large amplitude for driving various types of sound reproducing devices.

Still another object of my invention is to provide a construction of driving force for transforming electrical vibrations into sound vibrations which consists of two separate magnetic systems actuating a common armature suspended between the magnetic systems and formed and mounted in such manner with respect to the magnetic systems that mechanical movements of large amplitude may be developed.

Still another object of my invention is to provide a construction of armature for a push pull type of electromagnetic sound reproducer in which the armature serves to develop mechanical vibrations imparted by push pull forces from either side thereof with means whereby the vibrations of said armature may be usefully employed for the reproduction of sound.

A still further object of my invention is to provide a construction of driving force which utilizes a pair of standard watch case telephone receiver units located on opposite sides of a common armature having a portion thereof serving to space the telephone receiver units one from another and position the oppositely directed pole faces in such manner that electromagnetic push pull forces are imparted to said armature in such manner that the resulting vibrations may be usefully employed for the reproduction of sound.

My invention may be employed as a driving force in a variety of different ways as, for example, an attachment for phonographs wherein the driving force actuates the stylus of the usual phonograph reproducer for reproducing sound vibrations through the usual amplifying horn which is connected with the reproducer. The driving force may also be used to vibrate a conical or other shaped sound reproducing diaphragm.

My invention will be more clearly understood by reference to the following specification and the accompanying drawings forming a part thereof, in which:

Figure 1 is a cross-sectional view taken through the driving unit and showing the arrangement of the push pull electromagnetic structure; Fig. 2 is a side view of the driving force illustrated in Fig. 1; Fig. 3 is a fragmentary view of the extended end of the armature used in the driving force shown in Fig. 1; Fig. 4 is a plan view illustrating one of the electromagnetic driving units and the relation of the armature with respect thereto; Figs. 5, 6 and 7 show modified forms of the armature construction; Fig. 8 is a perspective view illustrating the application of my invention as a loud speaker attachment for phonographs; and Fig. 9 is a diagrammatic view partially in cross-section showing the application of the driving force described herein to a conical diaphragm sound reproducer.

Referring to the drawings in detail, reference character 1 designates a base having an integral annular rim 1^a forming a support for the watch case telephone receiver units 2 and 3 containing electromagnetic operating devices therein which are directed towards each other. The watch case telephone receiver 2 is spaced from the watch case telephone receiver 3 by means of the spacing member 4 forming an integral part of an armature member 5. The armature member extends centrally within the device while the spacing member is formed by a peripheral rim which contacts with the peripheral edges of the casings of the telephone receiver units 2 and 3. The telephone receiver unit 2 contains pole piece 5 and 6 upon which bobbins 5^a and 6^a are wound. A permanent magnetic system 9 is secured within the telephone receiver casing by means of screws 9^a. The telephone receiver casing 3 includes therein the pole pieces 7

and 8 on which are wound the bobbins 7ª and 8ª and about which the permanent magnetic means 10 is anchored by means of securing screws 10ª. The telephone receiver units 2 and 3 are secured in spaced relationship by reason of the armature spacing member 4 and fixed in position by binding screws 12 and 14. The peripheral portions of the spacing member 4 terminate in ends 32 and 33 directed towards each other but spaced to enable an upwardly extended end 15 of the armature portion 5 to project therebetween. The armature portion 5 has a substantially rectangular portion 17 centrally within the driving unit positioned directly over the pole tips. The armature is fulcrumed at 34 and in order to enable the device to be used for the driving of a phonograph sound reproducer a slot 16 is cut in the extended end 15 to receive the pick or stylus 30 of the phonograph sound reproducer 28 as illustrated more clearly in Fig. 8. A gap is provided between the adjacent peripheral edges of the telephone receiver casings 2 and 3 and in the housing 1ª as represented at 21 to enable the phonograph stylus to be inserted therein.

As represented more clearly in Fig. 8, the driving force when used as a loud speaker attachment for phonographs is mounted adjacent the phonograph sound box 28 which is carried upon movable tone arm 27. The extended end 15 of the armature vibrates in such manner that stylus 30 is rocked about its pivot 31 imparting vibrations to the diaphragm of the sound reproducer 28 whereby sound may be delivered through the usual phonograph sound amplifying horn. When employed in this manner the device may be connected in the output circuit of a radio receiving apparatus to utilize the phonograph as a reproducer of radio concerts, lectures, news, and other entertainment. Connecting wires 11 lead from the driving unit to the output circuit of the radio receiving apparatus.

In order to adapt the driving force to either a loud speaker attachment for phonographs or as a driver for conical or other shaped diaphragms, I provide various shapes for the armature: For example, in Fig. 5 the armature has a portion 5 fulcrumed at 34 with an extended portion 15 and an end 16 to receive the pick of the phonograph while the telephone receiver casings 2 and 3 are spaced about their peripheries by means of members 19 and 20 with the extended peripheral portions 4. When the driving force is used in connection with conical diaphragms the peripheral portion 4 of the armature is completely closed, as represented in Figs. 6 and 7, and serves to space casings 2 and 3 one from another as more clearly shown in Fig. 9. The mechanical movement developed by the armature is impressed upon the cone 23 through a connecting rod 22 which may be placed at some point along the portion 5 of the armature where the conditions of speed or power are best suited to the particular cone or diaphragm to be vibrated. The cone 23 is suitably secured to the connecting rod 22 through members 24, 25 and 26. In some instances I find it desirable to extend one end of the armature portion 5 as represented at 18 in Fig. 7 and derive mechanical motion from the extremity thereof.

In the operation of the unit, the bobbins 6, 62, 5ª, 7ª and 8ª are connected in series in such manner that the poles normally attract the armature portion 17 with a permanent flux in mid position. That is to say, the pole piece 5 would be normally south while the pole piece 7 is normally north, and the pole piece 6 would be normally north while the pole piece 8 is normally south. When current flows in the coils it alternately strengthens one pair of magnets and weakens the other pair, causing vibration of the armature and a push pull effect thereon. By reason of the opposed relation of the magnets a considerable amplitude of vibration may be developed. It will be observed that very small reluctance gaps 35 and 36 are provided between the poles to provide a path of low permeability for the alternating flux.

It will be observed that the construction of driving force which I have described is capable of inexpensive manufacture on a quantity production basis from practically standard parts of telephone receiver units. I have found the driving force described herein to be particularly effective in operation. While I have described the invention in certain particular embodiments and referred to certain applications thereof, I desire that it be understood that modifications may be made and that no limitations upon the invention are intended other than are imposed by the scope of the appended claims.

What I claim and desire to secure by Letters Patent of the United States is as follows:

1. An electromagnetic driving apparatus comprising in combination a pair of telephone receiver units each including a casing, permanent magnetic means and electromagnetic means, a substantially flat peripheral face on the edge portions of each of said telephone receiver casings, and an armature member consisting of an inwardly extending tongue positioned centrally between said electromagnetic means, and a ring shaped portion formed integral with said inwardly extending tongue having flat faces arranged to abut with the flat peripheral fact of said casings whereby said electromagnetic means may be properly spaced from said inwardly

extending tongue for developing mechanical motion in said armature member from electrical vibrations.

2. An electromagnetic driving apparatus comprising in combination sets of electromagnetic driving devices, an armature member arranged to be actuated by each of said devices, said armature member being interposed between said sets of electromagnetic driving devices and comprising a magnetic ring shaped member, a tongue protruding inwardly from one side thereof, and an enlarged armature portion formed on said tongue, said tongue being arranged to fulcrum about the junction portion of said tongue with said ring shaped member whereby mechanical forces may be developed in said armature member from electrical vibrations introduced in said electromagnetic driving devices.

3. An armature member for electromagnetic apparatns comprising in combination a substantially ring shaped portion, a tongue extending inwardly from said ring shaped portion and an enlarged central portion formed on said tongue, said tongue being arranged to fulcrum about the junction of said tongue and said ring shaped portion whereby mechanical movement of said armature may be secured for developing sound vibrations therefrom.

In testimony whereof I affix my signature.

WILLIAM H. GERNS.