Sept. 9, 1930. F. CARBENAY 1,775,190

LISTENING APPARATUS FOR RADIO TELEPHONY

Filed April 4, 1924

Fig. 1

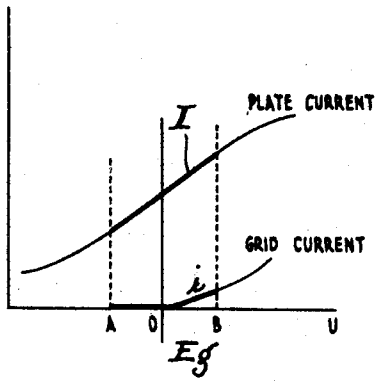


Fig. 1a

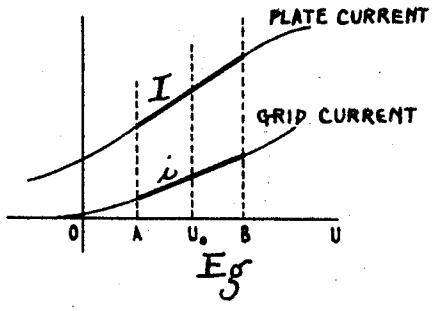
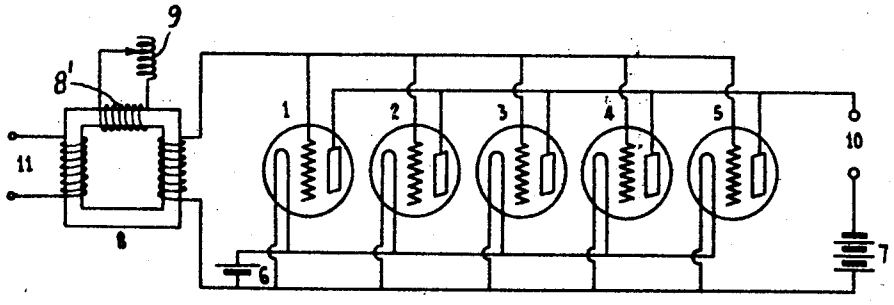


Fig. 2



Inventor
FERNAND CARBENAY

By his Attorney
Ira J. Adams

Patented Sept. 9, 1930 1,775,190

UNITED STATES PATENT OFFICE

FERNAND CARBENAY, OF PARIS, FRANCE

LISTENING APPARATUS FOR RADIOTELEPHONY

Application filed April 4, 1924, Serial No. 704,246, and in France June 4, 1923.

The present invention relates generally to loud speaking apparatus for wireless telephony and more particularly to energy amplifiers.

For the purpose of making radio telephone messages audible to a large number of persons, it has been heretofore the practice to provide either a single sound producer or a group of sound producers combined in a single apparatus, one or a plurality of horns being used for sending the sound waves to the most distant parts of the auditorium. In accordance with the present invention instead of concentrating at one point the sound wave emitting source, a certain number of emitting sources are suitably distributed in the auditorium. Preferably, each of these sound sources consists of a loud speaking apparatus which diffuses the sound waves uniformly in all directions, e. g., by connecting a large vibrating diaphragm with a telephone receiver having a movable coil. The spacing and therefore the number of such devices is determined by the useful carrying capacity of each device.

These devices are fed from the radio receiving stations through the agency of an energy amplifier. In the radio art this term is applied to all arrangements which are provided beyond the usual receiving amplifier and the purpose of which is to transform the receiving current, the intensity of which is only that of the telephone currents, into a more powerful current which is adapted to produce sufficient electrodynamic effect in the special receiving apparatus.

In accordance with the present invention these energy amplifiers consist of triodes connected in cascade through iron core transformers in accordance with well known circuit arrangements used in radio electric amplifiers, this combination being completed in a manner to be hereinafter set forth for adapting the apparatus to amplify without distortion the currents which vary within wide limits.

In accordance with one modification of my invention third or auxiliary windings are disposed on the cores of the transformer, the impedances of said windings being so chosen as to reduce the time constant of the transformers when the auxiliary windings are short circuited on themselves or thru variable impedances of suitable values. The reduction of the time constant substantially eliminates all deformation.

In accordance with another modification of my invention the third or auxiliary winding is dispensed with and the magnetic circuit of the transformer designed so as to produce comparatively large iron losses. The time constant of the transformer is reduced in this manner to substantially eliminate deformation.

My invention is illustrated in the accompanying drawing, in which

Figures 1 and 1[a] are curves explaining my invention, and

Figure 2 is a schematic diagram of my invention.

These arrangements for energy amplifiers will be found justified if we consider the characteristics of the functioning of the triode tubes. Certain types of triodes to which the arrangement provided in accordance with the present invention should be applied, have characteristics which are graphically illustrated by the curves in Fig. 1. In this figure I and i are the respective curves of the plate and grid currents in function of the grid potential. The operating condition should be selected between the ordinates A and B for the purpose of operating the tubes in the rectilinear portion of the characteristic of the plate. However, in this neighborhood the characteristic of the grid potential blends with the x-axis i. e., that for a certain phase of the operation the impedance of the grid-filament circuit is infinite. The transformer feeding this circuit operates then with an open circuit and has a considerable time constant whereby the reproduction of the tone vibrations will be considerably deformed.

In accordance with the present invention the time constant of the transformer is reduced by the provision of an auxiliary winding, or by designing the core of the transformer for large iron losses, to thereby substantially eliminate deformation. It should be understood that if triodes are used of a

type the operating characteristic of which do not have the above stated peculiarities, (i. e. a type for which, as shown in Fig. 1ª, the characteristic curve of the plate has a rectilinear portion in the neighborhood A, B where the grid circuit has constantly a finite impedance,) then the proper functioning of the amplifier will be insured if the grid potential is fixed at a mean value u^0 in this region. This may be accomplished by means of a battery or by an auxiliary battery or an auxiliary potentiometer which introduces the necessary potential between the grid and the filament.

Obviously the amplifier may be composed of a plurality of triode stages arranged in cascade and one or a plurality of triodes may be provided in parallel or their unitary strength increasing with the degree of the stage under consideration.

The invention will be better understood by referring to Fig. 2, which shows an arrangement of a single stage energy amplifier.

In Fig. 2, five triodes 1–5 are used connected in parallel. 6 is the heating source, and 7 is the plate current supply source. The grid circuits of the triodes are fed by the input transformer 8, which in accordance with the present invention is provided with an auxiliary winding 8′ for the reduction of the time constant of the transformer as explained above. A variable impedance 9 is inserted in the circuit which contains the coil 8′, the inductance of the variable impedance being in series with the coil 8′ and being independent of the core of the transformer. The external variable impedance 9 is interposed in the circuit containing the third winding 8′ in order to adjust the current flowing therein, in order that the inductance and resistance of the transformer 8 may be varied to obtain any desired time constant value. It will be obvious that this offers a refinement over prior devices of this nature because it supplies a degree of freedom which is quite important in audio transformer practice, it being particularly noted that the independency of the inductance 9, from the iron core of the transformer renders the adjustment of the winding 8′ very accurate. The amplified current is collected at the outgoing terminals 10. These terminals may be connected to the final apparatus or they may constitute the input of a new stage. The input terminals 11 may be connected to the output circuits of a usual receiver or may constitute the output terminals of a preceding stage of the same apparatus.

It should be understood that the arrangements herein discussed are not intended to limit the scope of the invention and may be variously modified or adapted by suitable circuits for the purpose of attaining the desired object without departing from the spirit of the present invention. Furthermore, the energy amplifiers herein described may be used for other purposes than for feeding telephone loud speakers as exemplified in the specification.

Having described my invention, what I claim is:

1. In a low-frequency amplifier, an interstage coupling transformer comprising an iron core, primary and secondary windings mounted on said core for transferring energy from one work circuit to another, and a third winding mounted on said core short-circuited through a variable inductance for adjusting the time constant of the transformer for effecting said energy transfer without distortion, said inductance being independent of the core.

2. In a low-frequency amplifier, an interstage coupling transformer comprising a core, primary and secondary windings mounted on said core for transferring energy from one work circuit to another, and a third winding mounted on the core having its terminals variably connected to an inductance for reducing the time constant of the transformer for effecting said energy transfer without distortion, said inductance being in series with the third winding and independent of the core.

FERNAND CARBENAY.