

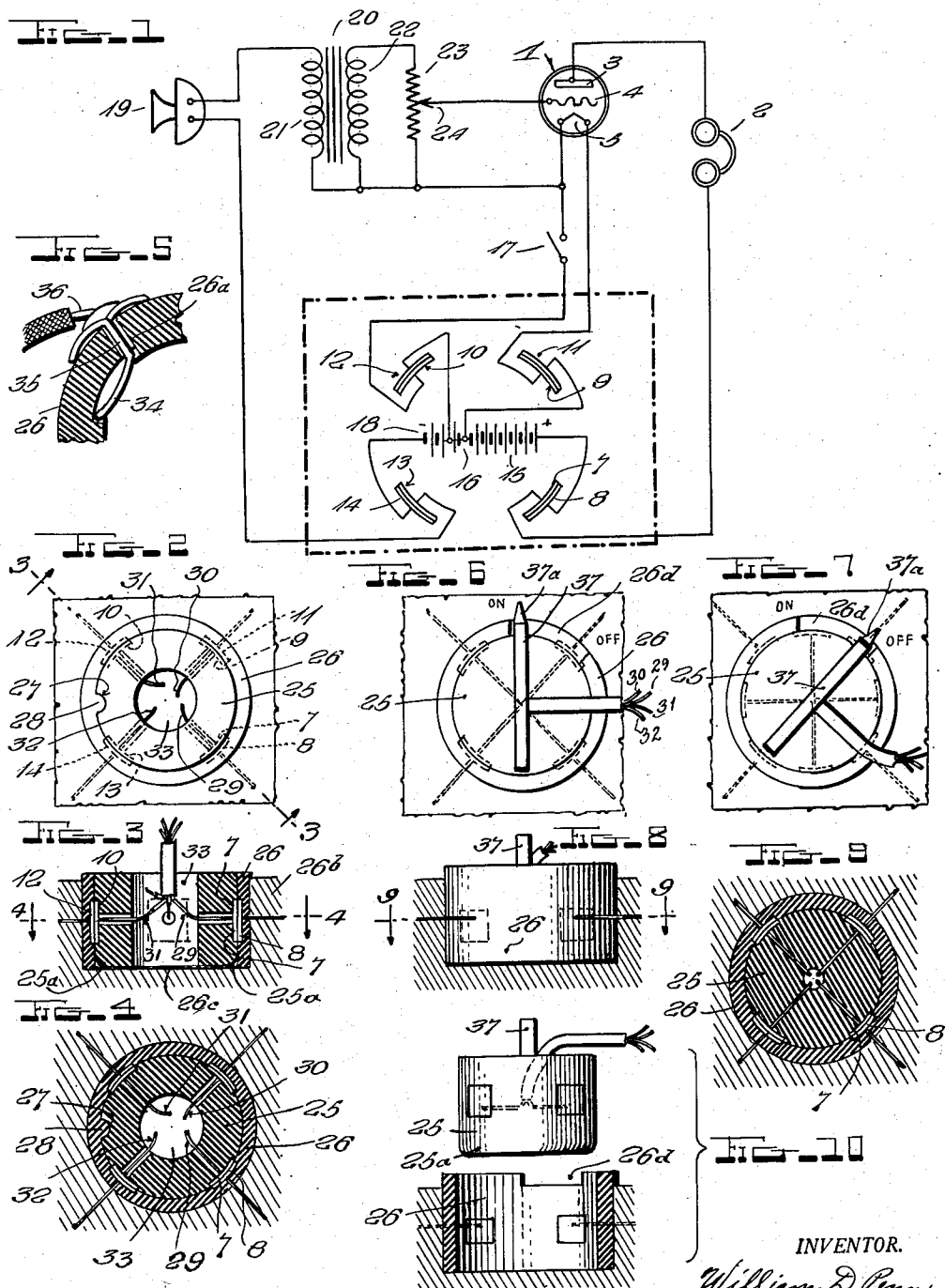
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W. D. PENN

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HEARING AID APPARATUS

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INVENTOR.

William D. Penn

BY

Ben J. Browne
ATTORNEY.

UNITED STATES PATENT OFFICE

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HEARING AID APPARATUS

William D. Penn, Dallas, Tex.

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1 Claim. (Cl. 179—107)

This invention relates to electrical apparatus generally. More particularly, this invention relates to electric discharge device amplifier apparatus of the hearing aid type.

5 An object of this invention is to provide an electric discharge device amplifying apparatus, adapted to be operated from batteries, with a unitary contact arrangement to facilitate the changing of the batteries or to dispense with the use of auxiliary switches necessary for interrupting the battery circuit when the amplifier device is not in use.

10 Another object of this invention is to provide an amplifier circuit arrangement adapted to be energized from a set of batteries which must be renewed periodically, said batteries and amplifier circuit being provided with a plug and receptacle device adapted to connect the circuits of the amplifier to the proper section or sections of the battery.

15 A further object of this invention is to provide a battery made up of a number of sections, each section being of sufficient size to adapt it for properly energizing a certain circuit of a vacuum tube amplifier, said battery being provided with a plug and receptacle device constructed so that each of said sections may be connected to the proper circuit of the amplifier which it is designed to energize.

20 Another object of this invention is to provide a battery made up of a number of sections, each having a voltage sufficient to energize a certain circuit of the vacuum tube amplifier, said battery being provided with a plug and receptacle device for connecting the battery sections to the vacuum tube amplifier circuits and simultaneously acting as a switch for interrupting the circuits between said battery sections and the vacuum tube amplifier.

25 Other and further objects of this invention will be apparent to those skilled in the art to which it relates from the following specification and claim.

30 In accordance with this invention I provide an arrangement particularly adapted for hearing aid amplifying circuits in which it is necessary to employ a compact source of current supply usually made up of a number of small dry cells of a portable nature, which must be periodically changed or renewed. My invention facilitates the changing or renewing of these batteries and enables persons not skilled in the servicing of electrical devices to change or renew the batteries in their hearing aid amplifiers without any difficulty or possibility of error. According to my invention,

I arrange the battery adapted for certain hearing aid amplifier circuits into sections, each of which is connected to a suitable contactor of a plug and receptacle contacting device. The amplifier apparatus is provided with a suitable plug which is adapted for insertion into the receptacle of the battery. The plug may be removed from the receptacle and permanently connected to the circuits of the amplifier through a suitable flexible cord. Thus when a new battery is to be inserted for use in the amplifier, the battery is merely inserted into the cabinet of the amplifier and the plug which is permanently connected to said amplifier is inserted into the battery receptacle.

15 It will thus be observed that complications in connecting a new battery into the amplifier circuit are avoided, especially in cases where a number of different battery sections are employed. That is, when one battery section is employed for energizing the microphone circuit another section is employed for energizing the filament circuit, and another section for the anode circuit.

20 Further details of this invention are set forth in the following specification and the drawing in which, briefly, Figure 1 illustrates schematically, an amplifier employing this invention; Figure 2 is a top plan view of the plug and receptacle arrangement; Figure 3 is a sectional view taken along the line 3—3 of Figure 2; Figure 4 is a sectional view taken along the line 4—4 of Figure 3; Figure 5 is a detail view of the spring contact employed in the plug and receptacle contact arrangement; Figures 6 and 7 are top plan views of a modified form of plug and receptacle arrangement; Figure 8 is a vertical fragmentary sectional view of the embodiment of this invention shown in Figure 6; Figure 9 is a sectional view taken along the line 9—9 of Figure 8, and Figure 10 is a view showing the plug being withdrawn from the receptacle.

25 Referring to Figure 1 in detail, reference numeral 1 designates an amplifier tube having an anode 3, a grid 4, and a filament 5. Other forms of amplifier tubes other than those employing just three electrodes may be used. For example, amplifier tubes employing several grid electrodes in place of the single grid electrode 4 may be used to obtain higher voltage amplification in a single vacuum tube, thus saving on current consumption. Furthermore, the vacuum tube 1 may be of the indirectly heated filament type in which case the filament 5 would serve as the heater electrode for the cathode.

30 The sound reproducing device 2, which may be of the telephone type or the bone conduction type,

is connected to the anode 3 of the vacuum tube 1 and to the contact 7 of the battery contactor device. The contact 8 which engages the contact 7 is connected to the positive terminal of the anode current supply source 15. The filament 5 is connected to the contacts 9 and 10 which are associated with the contacts 11 and 12 connected to the filament battery section 16. A switch 17 may be employed in one of the filament connections to interrupt the circuit of the filament when the amplifier is not in use. One end of the battery section 18 is connected to the contact 14 which is associated with the contact 13 connected to the microphone 19. This microphone 19 is also connected to the primary 21 of the transformer 20. One terminal of the primary 21 is connected to the secondary 22 and the filament 5, and the microphone circuit to the battery section 18 is thus completed through the contactors 10 and 12 of the filament circuit. A volume control 23 employing a variable contact 24 connected to the grid electrode 4 is connected across the secondary 22.

The plug and receptacle device employing the contacts 7, 8, 9, 10, 11, 12, 13, and 14 is described more fully in the following paragraphs of the specification. This plug and receptacle arrangement includes a plug 25 and a tubular receptacle 26 both made of insulation material such as Bakelite, hard rubber, synthetic porcelain, and the like. The plug 25 is notched as designated by the reference numeral 27 and the tube 26 is provided with a small projection 28 which fits into the notch 27 in such a way that the plug 25 can be inserted into the tubular receptacle 26 in only one predetermined manner, thus insuring proper alignment of the electrical contacts of the plug and receptacle. The electrical contacts 7, 9, 10, and 13, illustrated schematically in Figure 1, are attached to the plug 25 and the conductors 29, 30, 31, and 32 are connected to these contacts respectively. These conductors are provided with insulation covering and are brought out through the central opening 33 of the plug. The electrical contactors 8, 11, 12, and 14 are attached to the insulation tube 26 and are connected to the battery sections 15, 16, and 18, respectively. This insulation tube 26 may be attached to the top, sides, or bottom of the battery including the battery sections 15, 16, and 18. The manner in which this tubular member is attached to the battery is not important, except that it should be rugged and withstand ordinary use so that the battery may be inserted into the hearing aid amplifier cabinet and the plug 25 disengaged from the receptacle 26 readily. The plug 25 may be firmly attached to the hearing aid amplifier cabinet in such a way that the battery may be removed from the cabinet simply by grasping the body of the battery and pulling the receptacle 26, which is carried by said battery, out of engagement with the plug 25. Where the different sections of the aforesaid battery are to be subjected to different current drains, the battery may be made up of a plurality of cells of different sizes. For example, the cells comprising the battery section 15 can be constructed of a smaller size than the cells comprising the filament section 16 and the microphone section 18 may be made of still a different size. If desired, the section 16 may be made up of two or more sets of cells connected in parallel and the same size cells used throughout in the construction of the battery. A grid bias or "C" battery section may be provided to the bat-

tery connected to one side of the section 16. In that case another set of contacts is provided to the plug and receptacle device increasing the contacts to five sets and this additional set is connected to the "C" battery section and into the grid circuit of the tube 1 by opening the lower secondary connection or the volume control circuit and connecting this to the aforesaid fifth plug contact.

In the construction of the plug and receptacle arrangement it is highly desirable that the electrical contacts engage each other properly in order to eliminate high resistance contacts and prevent noises from being introduced into the circuit of the reproducing device 2 as the result of any such poor contacts. For this reason it is desirable to have the electrical contacts carried either by the tube 26 or the plug 25, resilient in nature. It is not necessary to make both sets of contacts resilient. I have shown in Figure 5 a simple form of contact which is relatively inexpensive to manufacture. This contact may be mounted either upon the tube 26 or the plug 25 and employs a resilient section 34 supported on the insulation tube 26. The section 35 passes through the hole 26a in the insulation tube and is bent against the outside surfaces of the insulation tube. The wire 36 is soldered to the bent portion of the section 35 on the outside of the aforesaid tube. In the form of this invention shown in Figures 1 and 2, four of these contacts are attached to the sleeve 26 and connected to the battery sections 15, 16, and 18. The sections 34 of these spring terminals are positioned in small recesses formed in the tubular member 26 and extend outwards slightly from these recesses when they are not in engagement with the contacts supported by the plug 25. When the plug 25 is inserted into the sleeve 26 the rounded lower portion 25a of said plug engages the springs 34 and presses them inward into their corresponding recesses. The resilient nature of these spring contacts 34 forces them to engage the terminals of the plug 25 when this plug is fully inserted and insures a satisfactory electrical contact.

Figure 3 illustrates the manner in which the sleeve 26 is supported by a wall 26b of the battery. This wall 26b may consist of the sealing compound ordinarily used to seal the tops of the battery containers and wires leading to the contacts supported by the sleeve 26 from the battery sections may be sealed into the aforesaid sealing compound at the same time as the sleeve itself is mounted therein. A layer of paper 26c may be placed at the bottom of the sleeve 26 so that the sealing compound will not flow into the sleeve and tend to fill the interior of said sleeve.

A modified form of this invention is shown in Figures 6 to 10 inclusive. According to this form of this invention the plug 25 is rotatable through a small angle inside of the sleeve 26. For this purpose the aforesaid plug is provided with a handle 37 attached to the top thereof. The end 37a of this handle extends over the sleeve 26 into the cut-away portion 26d. This cut-away portion 26d defines the angle through which the plug 25 may be rotated and is more clearly illustrated in Figure 10. When the pointer 37a of the handle points to the "on" position, the contacts of the plug 25 are in engagement with the proper contacts of the sleeve 26 and complete the circuits between the battery sections and the amplifier tube. However, when this pointer is in the "off" position as shown in Figure 7, the con-

tacts are no longer in engagement and the circuits between the battery and the vacuum tube amplifier are interrupted. The handle 37 is made in such a manner that the contacts of the plug 25 cannot engage the contacts of the sleeve 26 unless the end 37a of this handle 37 is in the cut-away portion 26d of the sleeve, thus eliminating the possibility of making incorrect the connections between the battery and the battery-energized circuits of the vacuum tube. This form of this invention also eliminates the necessity of the switch 17 in the filament circuit of the vacuum tube inasmuch as the plug and receptacle arrangement itself may be employed as a switch simply by rotating the plug with respect to the receptacle.

What I claim as my invention is:

A portable self-contained hearing aid amplifier in which the circuits are adapted to be energized from a readily interchangeable plug-in battery and controlled by a switch built into the plug-in device, comprising: a vacuum tube having filament, grid, and plate electrodes, input and output circuits connected to said filament, grid, and plate electrodes respectively, a microphone connected to said input circuit, a battery current supply source comprising a casing housing a plurality of battery sections connected together properly polarized inside of said casing, each of said battery sections having a voltage suitable for

energizing one of said vacuum tube circuits and said microphone, a plug-in switching device for connecting said battery sections to said vacuum tube circuits, said plug-in switching device comprising a plug and receptacle contactor having a tubular insulation receptacle attached to a wall of said battery, terminals attached to the inside of said tubular insulation receptacle, connections between said battery sections and predetermined ones of said terminals, a plug of insulation material fitting into said tubular insulation receptacle in a predetermined manner, contacts on the outer surface of said plug for engaging selected ones of said terminals for impressing the voltage from predetermined ones of said battery sections upon said filament, grid and plate circuits of said vacuum tube and upon said microphone when said plug is inserted into said receptacle in said predetermined manner, a handle on said plug for moving said plug with respect to said receptacle so that the circuits between said contacts and said terminals may be completed or broken without removing said plug from said receptacle, and means to prevent insertion of said plug into said receptacle in circuit completing relation in other than the proper manner to prevent applying incorrect battery potentials to the vacuum tube circuits.

WILLIAM D. PENN. 30