

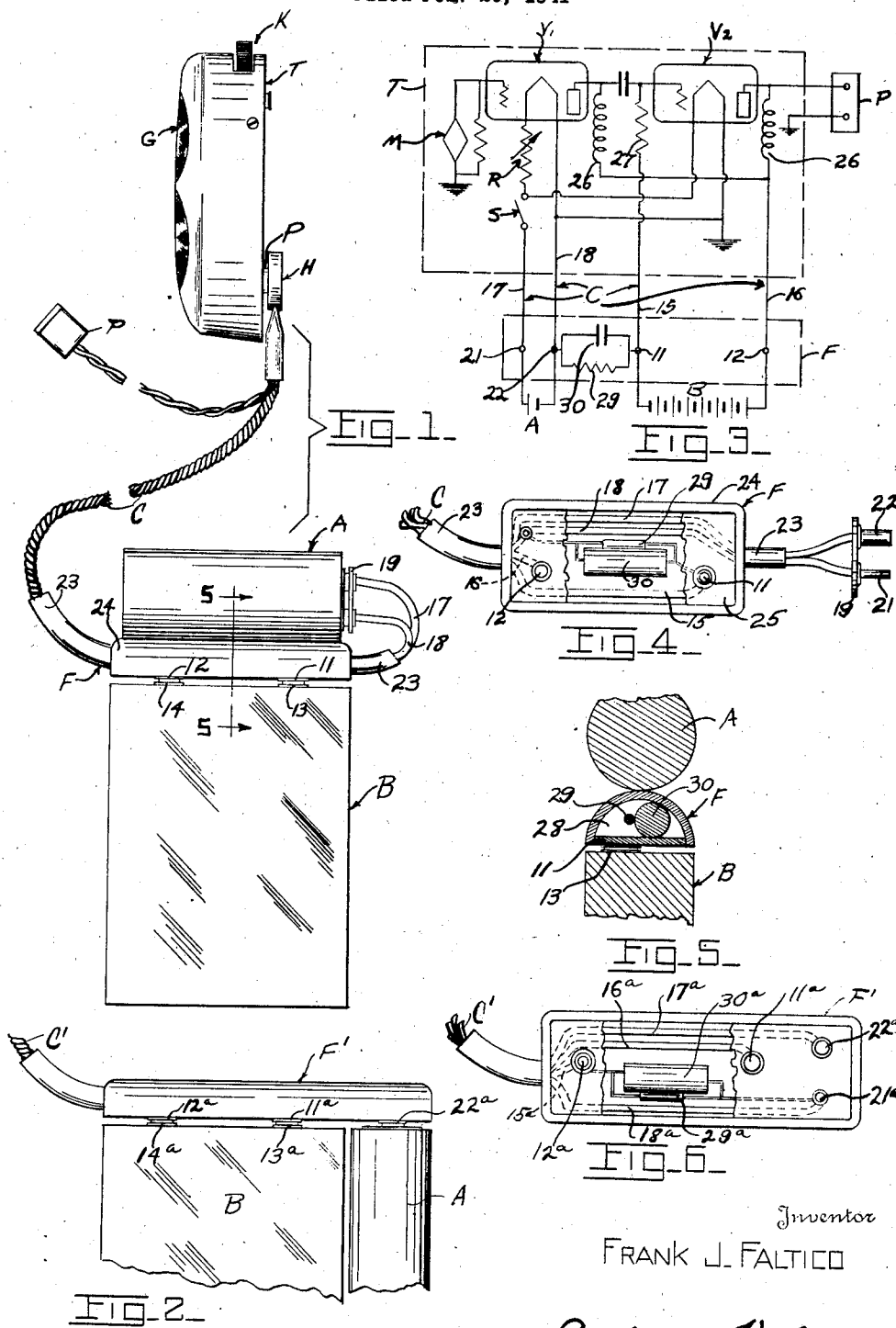
Nov. 17, 1942.

F. J. FALTICO

2,302,113

BATTERY CONNECTOR FOR HEARING AIDS

Filed Feb. 20, 1941



Inventor
FRANK J. FALTICO

By

Carlson & Hayle

Attorneys

UNITED STATES PATENT OFFICE

2,302,113

BATTERY CONNECTOR FOR HEARING AIDS

Frank J. Faltico, Minneapolis, Minn.

Application February 20, 1941, Serial No. 379,819

10 Claims. (Cl. 179-197)

This invention relates generally to improvements in battery connectors or frames for hearing aid instruments.

The wearable hearing aid instrument in its most-desirable form includes a vacuum tube amplifier unit, or "transmitter" as it is called, arranged in a compact housing or case with the pickup microphone so that this part of the equipment may be concealed about the dress or in the wearer's pocket. For energizing the vacuum tubes there is then required small A and B batteries which are connected through a cable to the encased unit or transmitter. It is with a device for making these battery connections that my invention concerns itself.

Heretofore it has been the practice to provide the necessary operating bias for the output or last tube of the transmitter unit by a section of the B battery since the relatively large resistor and by-pass condenser required for the far more desirable automatic or cathode bias are much too large to be accommodated in the transmitter unit. The primary object of my invention therefore is to provide a battery connector or frame for making the necessary battery connections to the transmitter unit and with means for receiving and enclosing the resistor and by-pass condenser for providing automatic bias to the unit.

Another object is to provide a battery connector for this purpose in compact, neat and light form and adapted for the convenient disconnection and replacement of the batteries by a user not skilled in this art. Still another object is to provide connectors adapted for use with batteries of different types for so connecting the batteries that they may be compactly related and enclosed in a carrying bag or case.

These and other more detailed and specific objects will be disclosed in the course of the following specification, reference being had to the accompanying drawing, in which—

Fig. 1 is an elevation showing the transmitter unit, battery connector or frame, batteries and various connecting cables of a wearable hearing aid assembly incorporating my invention.

Fig. 2 is an elevation of a modified form of connector with the same connected to A and B batteries which are only fragmentally shown.

Fig. 3 is a diagrammatical showing of a representative circuit for the transmitter unit and showing the manner in which my connector is employed for connecting the batteries and for providing bias for the output tube.

Fig. 4 is an inverted plan view of the con-

necter of Fig. 1 with a portion broken away to show the bias resistor and its by-pass condenser.

Fig. 5 is a cross section along the line 5-6 in Fig. 1.

Fig. 6 is a view similar to Fig. 4 but showing the connector of Fig. 2.

A wearable hearing aid mechanism in one well known form comprises the transmitter unit T in the case or housing of which are enclosed not only the microphone M but a multi-stage voltage amplifier connected to amplify a signal picked up by the microphone and deliver the amplified signal to the wearer's ears through an ear piece or head phone (not shown) connected to the plug P. The microphone M is arranged behind the grill G and the entire unit T is of such shape, size and weight that it may be easily and conveniently concealed about the dress, or in a pocket, of the wearer.

As here shown, for example only, the transmitter unit includes two vacuum tubes V_1 — V_2 connected as a more or less conventional impedance coupled amplifier and for supplying the filaments and plates of these tubes small filament and plate batteries A and B are required. The tubes, as well as all other circuit components, are necessarily of the smallest physical size since the space within the unit T for their accommodation is very restricted. For this reason it has been the practice heretofore in units for this purpose to provide the necessary bias voltage for the output tube V_2 by using a separate battery or a section of the B battery. This type of bias supply, however, has several disadvantages well known in the art and which may be overcome by the use of so-called "automatic" or cathode bias in which a resistor is arranged to provide a voltage drop in accordance with variations in plate current flow and which voltage drop is employed as grid bias for the amplifier.

It has, however, been impossible up to the present time to use this far more desirable type of automatic bias in wearable hearing aids since the bias resistor, while itself very small physically, must be by-passed for audio frequencies by a condenser of considerable capacity. Although the voltage rating on this condenser may be very low the capacity required to prevent spilling the tone or frequency response of the unit is so great that it is physically impossible to construct a condenser small enough to fit into the extremely restricted space available in the transmitter unit.

In accordance with my invention I provide a means for both making the necessary connec-

tions between the transmitter unit T and the A and B batteries and means for connecting and accommodating the bias resistor and its associated by-pass condenser. For this purpose I provide the frame or connector designated generally at F and which in the form shown in Figs. 1, 4, and 5 comprises a hollow member in one side of which is fastened male and female snaps 11-12 for connection to the corresponding snap terminals 13-14 on the B battery. A cable C makes connection between the units T and F and two of the wires 15-16 making up this cable are of course connected to the snaps 11-12. The remaining two wires 17-18 carrying the filament voltage are run through the frame and terminate in a plug 19 having prongs 21-22 to fit the small A battery as clearly shown. The cable C enters the frame F at one end and the filament wires 17-18, running to the plug 19, leave the frame at the opposite end. Protective sleeves 23 enclose the cable and wires where they leave the frame.

In its preferred form the frame F is molded from an insulating plastic material and includes the main body portion 24 rounded on one outer or upper side and open toward the other or lower side to receive the flat strip 25 upon which the snaps 11-12 are mounted. The strip 25 may, of course, be secured in the lower side of the body portion by cement or by screws as may be desired.

In making the cable connections the wire 16 making connection to the positive terminal 14 of the B battery is connected to the plates of the tubes V¹-V² through the impedance loads 26 (and to screen grids of the tube if they are of the multi-grid type) while the wire 15 making connection to the negative terminal 13 of the B battery is connected through the grid resistor 27 to the control grid of the output tube V². The filament wires 17-18 are, of course, connected to the filament of both tubes V¹-V² with a filament rheostat R for controlling gain, operated by the knurled knob K, and a switch S built into the rheostat for turning off the filaments when not in use. Connections to the transmitter unit T are made by the connector head 14 detachably engaging prongs P at the back of the unit.

Within the cavity or recess 28 in the frame F I then mount a bias resistor 29 and its associated by-pass condenser 30 which are connected together in shunt and connected between the negative terminal or snap 11 and one wire 13 going to the A battery. An eyelet 31 may be used for making the latter connection and for anchoring the resistor and condenser. With these connections made the voltage drop across the bias resistor 29, caused by the plate current flow therethrough, is applied as a negative bias voltage to the control grid of the output tube V² in the transmitter unit T to thus provide the required bias and automatically vary the bias according to the plate current flow, and condition of the batteries. The by-pass condenser 30 prevents loss of any useful audio frequencies and due to the fact that the space within the frame F is considerable a condenser of large size may be used to best fulfill this purpose.

It may be thought that running the grid lead of the tube V² the considerable length to the frame F through the cable C would give rise to difficulties from feed back, oscillation and the like. However, the cable C is closely twisted as shown and the combination of this frequent

transpositioning of the wires, with an appropriate choice of the capacity of the condenser 30, is found to completely and effectively buck out any oscillatory tendencies in the circuit.

The connected A and B batteries and the frame F are usually enclosed in a case or bag of flexible material (not shown) which may be strapped to the leg or body of the wearer or placed in the pocket. To make the package compact the A battery may be conveniently laid atop the frame F as shown, due to the flexible connection to the plug 19, and it will be noted that the length and breadth of the frame F are such that they correspond nicely with the width and thickness of both batteries to facilitate the making of a neat package.

As shown in Figs. 2 and 6 I may elongate the frame F' at one end so that in addition to the snaps 11a-12a for connection to the B battery terminals 13a-14a the frame may directly carry the prongs 21a-22a for connection to the A battery which then stands upright alongside one edge of the larger B battery. Corresponding connections are made to the wires 15a, 16a, 17a and 18a of the cable C to the snaps and prongs and to the bias resistor 29a and by-pass condenser 30a which are located within the frame as clearly shown. This type of frame may be used where a slightly larger, or multi-cell A battery, is desired.

It is understood that suitable modifications may be made in the structure as disclosed, provided such modifications come within the spirit and scope of the appended claims. Having now therefore fully illustrated and described my invention, what I claim to be new and desire to protect by Letters Patent is:

1. The combination with a hearing aid device including a vacuum tube amplifier and batteries for supplying filament and plate voltages for the amplifier, of a battery connector for connecting the batteries to the amplifier, and means located in said connector for supplying grid bias to the amplifier in response to total cathode current flow through said means.

2. The combination with a hearing aid device including a vacuum tube amplifier and batteries for supplying filament and plate voltages for the amplifier, of a battery connector having means for connection to the batteries and for connecting the same to the amplifier, a by-passed resistor disposed on and in operative connection with said connector for supplying grid bias to the amplifier.

3. The combination with a wearable hearing aid device including a vacuum tube amplifier and A and B batteries for supplying filament and plate voltages thereto, of a connector member having means for detachable connection to the batteries and a cable connecting said means to the amplifier, and a by-passed resistor arranged in connection between the batteries to provide automatic grid bias to the amplifier, the said resistor being located on the connector member.

4. The combination with a wearable hearing aid device including a vacuum tube amplifier and A and B batteries for supplying filament and plate voltages thereto, of a connector member having means for detachable connection to the batteries and a cable connecting said means to the amplifier, and a by-passed resistor arranged in connection between the batteries to provide automatic grid bias to the amplifier, and the said

connector member being hollow to provide space for the reception of said by-passed resistor.

5. The combination with a wearable hearing aid device including a vacuum tube amplifier and A and B batteries for supplying filament and plate voltages thereto, of a connector member having means for detachable connection to the batteries and a cable connecting said means to the amplifier, a resistor connected between the batteries and to a control grid of the vacuum tube amplifier to provide automatic bias for said grid, a high capacity by-pass condenser connected across the said resistor, and both the resistor and condenser being located at the said connector remote from the amplifier.

6. The combination with a wearable hearing aid device including a vacuum tube amplifier and A and B batteries for supplying filament and plate voltages thereto, of a connector member having means for detachable connection to the batteries and a cable connecting said means to the amplifier, a by-passed resistor arranged on the connector member connected between the batteries and to a control grid of the amplifier in such manner as to provide automatic bias to that grid, and the lead to the said control grid being twisted into the said cable in such manner as to buck out oscillatory tendencies in the amplifier.

7. In a wearable hearing aid device, a transmitter unit including a microphone and a vacuum tube amplifier, batteries for supplying filament and plate potentials to said amplifier, at least one of said batteries having snap fastener terminals, a connector member having connection means for releasably engaging the terminals of the batteries, a cable for connecting the batteries through said member to the amplifier, and an automatic bias resistor and by-pass condenser arranged in said connector member and connected through the cable with the amplifier for supplying bias thereto.

8. A wearable hearing aid unit, comprising a vacuum tube amplifier, portable A and B batteries for supplying filament and plate voltages to the amplifier, the said B battery having snap terminals, a battery connector member having snap connections for releasably engaging the terminals of the battery and having connections for the A battery, a cable for connecting said connector to the amplifier, and an automatic bias resistor and condenser in the connector member for supplying grid bias to the amplifier.

9. A wearable hearing aid unit, comprising a vacuum tube amplifier, portable A and B batteries for supplying filament and plate voltages to the amplifier, said B battery having snap terminals, a battery connector member having snap connections for releasably engaging the terminals of the B battery and having connections for the A battery, a cable for connecting said connector to the amplifier, and an automatic bias resistor and condenser in the connector member for supplying grid bias to the amplifier, the said A battery connections being flexible whereby the A battery may be laid atop the connector member, and said connector member being of length and width corresponding generally to the width and thickness of the batteries.

10. A wearable hearing aid unit, comprising a vacuum tube amplifier, portable A and B batteries for supplying filament and plate voltages to the amplifier, the said B battery having snap terminals a battery connector member having snap connection for releasably engaging the terminals of the B battery and having connections for the A battery, a cable for connecting said connector to the amplifier, and an automatic bias resistor and condenser in the connector member for supplying grid bias to the amplifier, both the A and B battery connections being located on one side of the connector member to dispose the A and B batteries in side by side positions.

FRANK J. FAITICO.