

March 14, 1950

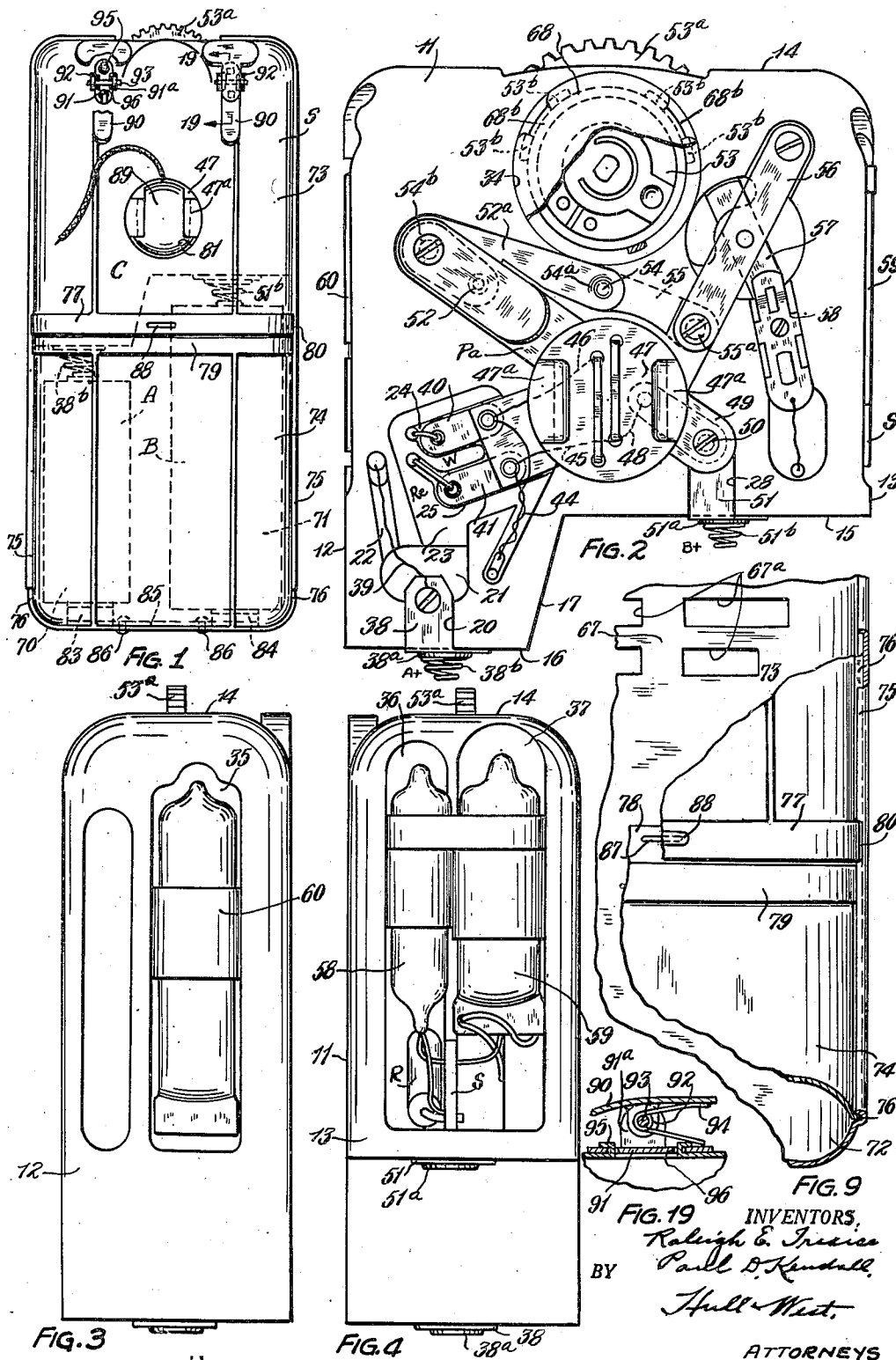
R. E. TRESISE ET AL

2,500,301

MOLDED CHASSIS FOR HEARING AID APPARATUS

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3 Sheets-Sheet 1



97 **FIG. 19** ⁵⁰ **INVENTORS,**
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3 Sheets-Sheet 2

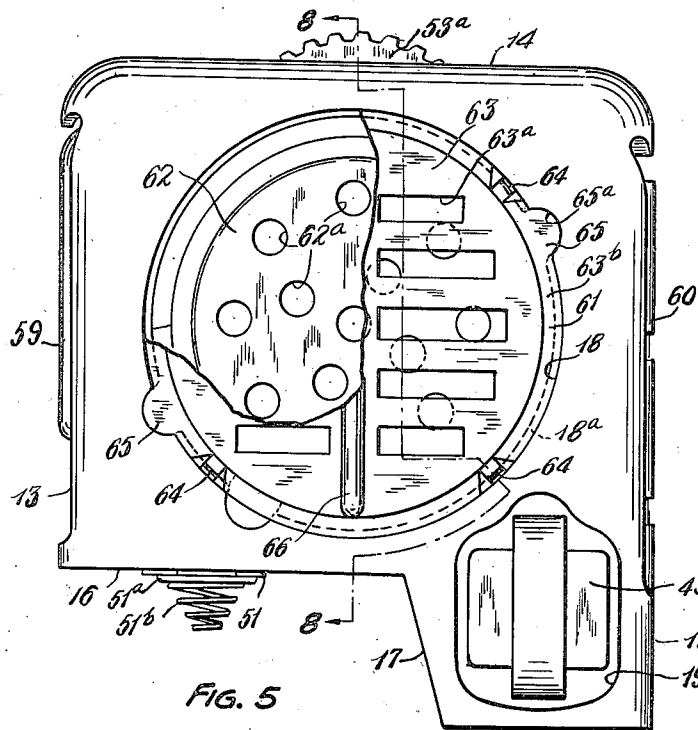


FIG. 5

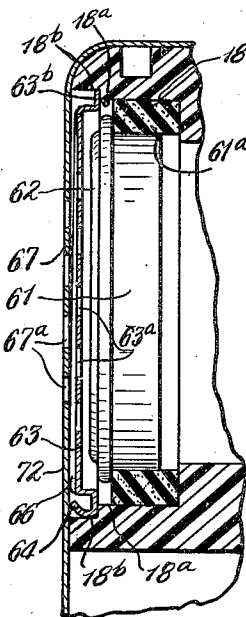


FIG. 8

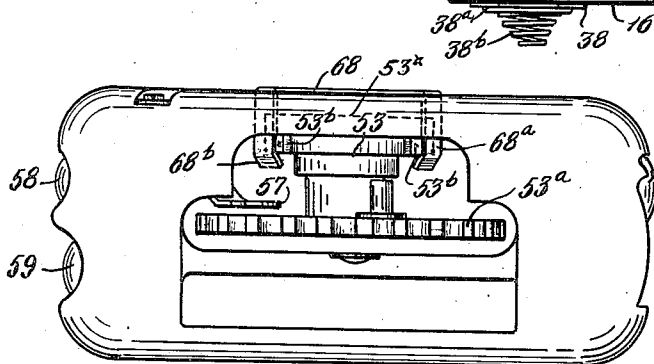


FIG. 6

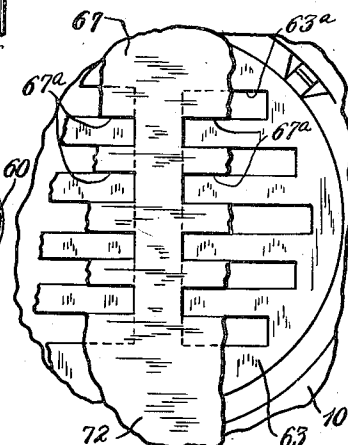


FIG. 18

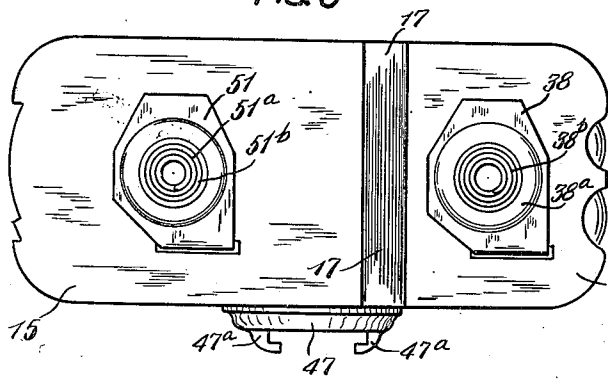


FIG. 7

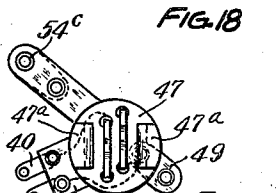


FIG. 17

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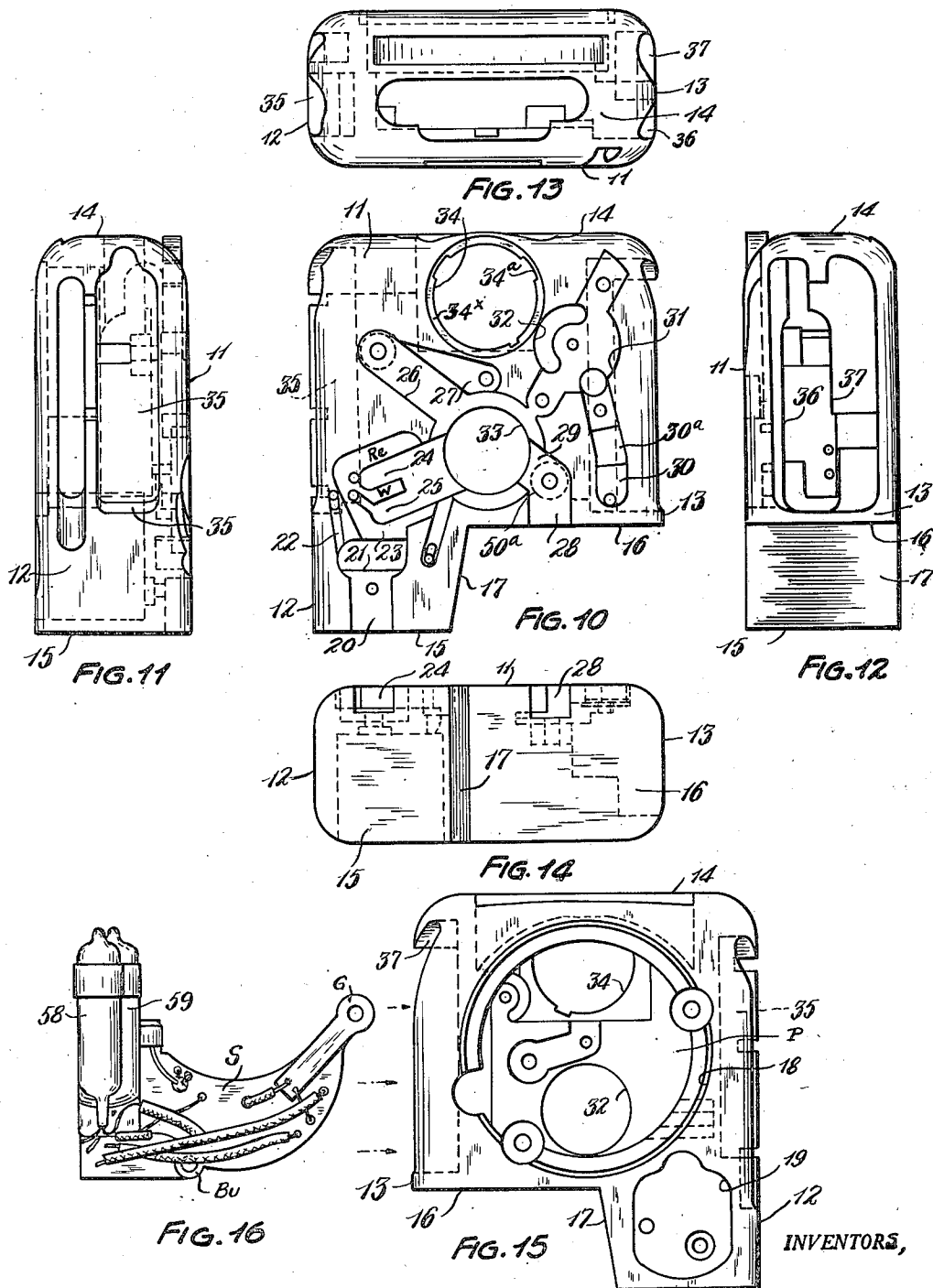
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

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MOLDED CHASSIS FOR HEARING AID
APPARATUS

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Application December 21, 1945, Serial No. 636,459

6 Claims. (Cl. 179-107)

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This invention relates to hearing aid apparatus, and has for one of its objects the production of an apparatus of this kind wherein all of the operating elements will be located within and protected by a chassis made of moldable insulating material, preferably plastic material, and provided with recesses and openings within which the said elements are located and which will eliminate the use of brackets and other parts whereon the said elements have heretofore been mounted on and secured to chassis.

A further object of the invention is to provide a chassis which is so constructed and combined with the hearing aid elements therewithin as to enable the chassis, the elements, and the A and B batteries cooperating with the latter to be assembled in a compact container which can be worn without appreciable discomfort and which can be carried in the vest pocket of the wearer.

A still further object of the invention is to provide a chassis which is extremely light in weight, and which can be produced by a molding operation; also to produce a cooperating construction of chassis and of the arrangement of the hearing aid elements therein which will greatly simplify the assembly and mounting of the elements and the wiring arrangement.

A still further object of the invention is to produce a novel construction of casing which will enable the chassis and the hearing aid elements within and supported by the chassis to be conveniently inserted into and removed therefrom and with a minimum of interference with the wiring.

Still further advantages of our invention will appear in the detailed description of the drawings hereof, wherein Fig. 1 represents a rear elevational view of our casing, the positions of the chassis and the batteries within the casing being shown by broken lines, with the output socket connector and a portion of the volume control disk being shown in full lines and with portions of one of the casing clips broken away; Fig. 2 a rear elevational view of the main chassis showing the positions of the hearing aid elements which are located therewithin; Fig. 3 an elevational view of one side of the chassis shown in Fig. 2 and Fig. 4 a similar view of the opposite side of said chassis; Fig. 5 a front elevational view of the chassis, showing the microphone and its guard and the output impedance; Fig. 6 a top plan view and Fig. 7 a bottom plan view of the chassis shown in the preceding views; Fig. 8 a detail in section taken on the line 8-8 of Fig. 5; Fig. 9 a detail in sectional elevation of our casing; Fig. 10 a rear elevational

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view of the chassis alone, showing the positions of the recesses for the reception of hearing aid elements; Fig. 11 and 12 are elevational views of opposite sides of the chassis shown in Fig. 10, and Figs. 13 and 14 are respectively top and bottom plan views of the chassis shown in Fig. 10; Fig. 15 is a central vertical sectional view through the chassis shown in Fig. 10 and Fig. 16 a side elevational view of the sub-chassis having the input and driver tubes secured to one side thereof and showing its position previously to being inserted within the seat provided therefor within the body of the main chassis shown in Fig. 15; Fig. 17 a plan view of the output connector sub-panel with elements thereon; Fig. 18 a detail in plan showing the relation of the grill in the front of the casing to the grill in front of the microphone; and Fig. 19 a detail in sectional elevation showing the manner in which the supporting clips are secured to the casing.

Describing by reference characters the various parts illustrated herein, 10 denotes the front, 11 the back and 12 and 13 the sides, 14 the top and 15 and 16 the stepped bottom of the chassis, the bottom wall of the stepped portions being connected by the wall 17. The chassis shown herein is molded from plastic material and is provided with recesses and openings in the rear, front and sides thereof for the reception of the various hearing aid elements. The recesses in the front are indicated at 18 and 19 (Fig. 5) while the recesses at the rear are indicated on Fig. 10 at 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30 and 31 and with openings 30^a, 32, 33 and 34, the opening 30^a being for the insertion therein of the end of a switch control (after soldering), the opening 32 being for the passage of a switch arm, the opening 33 providing clearance for the contacts for the output socket connector, and the opening 34 being for the reception of the volume control.

The chassis is also provided with a recess 35 in one side thereof for the reception of the output tube and with two recesses 36 and 37 in the opposite side for the reception of the input and driver tubes; also with a recess P between the front and the rear thereof for the insertion therein and the seating of the sub chassis S.

Referring more particularly to Fig. 2, wherein a number of the hearing aid elements are shown as installed within the recesses provided therefor in the rear of the chassis, 38 denotes the A-battery contact clip which sets in the recess 20 and extends into the recess 21. This clip extends beneath the bottom of the stepped portion 16 of the chassis and is there provided with a

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cupped recess 38^a for the reception of the contact spring 38^b. 39 denotes a wire which connects the filaments of all of the tubes. 40 and 41 are terminal lugs, each of which is connected to the output tube 60 at one end thereof, the other ends of which are connected to the output impedance 42, through wires 44, and to the output socket connector 47 through wires 45 and 46. The wire 43 extends through the terminal 49 which in turn is connected by the screw 50 with the B-battery contact clip 51. The screw 50 is inserted through a terminal bushing 49 in the output connector sub panel, shown in Fig. 17, which comprises generally a panel Pa of insulating material on which is mounted the output connector 47, and the terminal lugs 40, 41, and which supports the arms 52, 52^a. The recess Re within which the terminal lugs 40, 41 are positioned is provided with a chassis wall W providing an insulating space between said lugs. The bushing 49 connects the output connector assembly, which contains terminals for the output impedance and the output tube, with the battery contact clip 51 which is provided with a cupped recess 51^a for the reception of the contact spring 51^b. The screw 50 is threaded into the bushing Bu on the sub chassis S, thus completing all of the B circuits on the sub chassis.

The manner of mounting the battery clips 38 and 51 renders them readily removable and replaceable whenever such operation may be necessary, as, for instance, where either one or both of the springs 38^b or 51^b may be injured in any manner, as by contact of acid therewith.

52 represents one of the integrally formed arms of a spring contact, which arm grounds the chassis to the casing, indicated generally at C in Fig. 1, and 52^a denotes the other arm which grounds the volume control 53 through the screw 54 which extends through the link 55 and the volume control 53 and thence through the chassis, being threaded into a threaded hole in the outer end of the arm 52^a. The screw 55^a extends through the volume control tension spring 56 which holds, and completes the circuit to, the filament switch arm 57 and thence through the chassis where it is connected to the link 55. 53^a denotes the volume control operating disk.

The mounting screw 54^b for the arms 52 and 52^a is threaded into a bushing G at one end of the sub chassis S and grounds the sub chassis and all of the corresponding ground circuits thereon; it also extends through a bushing 54^c in the upper end of the sub panel SP and anchors the same to and within the seat in the chassis.

It will be noted that the input tube 53 and driver tube 59 are carried by one end of the sub chassis and that, when the latter is positioned within the main chassis, these tubes are in turn positioned within the recesses 36 and 37. The output tube 60 is located within the recess 35 provided therefor in the opposite side of the chassis. The sub chassis is provided on one side with connecting wires extending therethrough to the opposite side thereof and there connected with necessary resistors and condensers which complete the amplifier sub chassis circuit, one of the resistors being shown at R in Fig. 4.

The front of the main chassis is provided with a large cylindrical recess 18 extending thereinto and provided with an annular seat 18^a at the bottom of the same, the said seat being provided for the reception of a resilient compressible ring 61^a, such as rubber, surrounding the body 61 of the microphone. The microphone has a perforated

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cover plate 62, the same being shown as provided with circular perforations 62^a, and 63 denotes a chassis grill shown as provided with parallel slots 63^a and having its outer edge deflected downwardly and radially outwardly, as shown at 63^b, whereby it may be pressed into an angular seat 18^b in the front of the recess 18. The grill 63 is yieldingly retained in place above the microphone cover by means of springs 64 struck therefrom and which engage the cylindrical wall of the seat 18^b and with tabs 65 projecting from the peripheral portion thereof and seated in recesses 65^a in the chassis, thereby to position the grill and prevent rotation of the same in its seat. The chassis grill is provided with a central rib 66, which is adapted to engage the central portion of the grill 67 on the casing C when the body of the former grill is maintained in proper spaced relation with respect to the body of the latter grill by the springs 64, the outer ends of which springs are adapted to engage the latter grill. In practice, a slight clearance may exist between the outer surface of the rib and the outer ends of the springs 64 and the inner surface of the casing grill, but this clearance will be so small as to prevent detrimental displacement of the chassis grill. The outer ends of the springs 64 are in the plane of the rib 66 and also in the plane of the exterior of the chassis, whereby they cooperate with the said rib in spacing the chassis grill from the casing grill.

Reference has been made herinbefore to the opening 34 in the back of the chassis as being provided for the reception of a volume control, which is indicated generally at 53 on Figs. 2 and 6 and the outer end of the body 53 of which is shown in dotted lines at 53^x in the latter view. It will be noted that this opening is provided with peripheral notches 34^a (Fig. 10) which are adapted for the reception of tongues 68^a struck from the peripheral portion of a cover 68 seated upon a ledge 34^x provided therefor in the opening 34, the said tongues extending forwardly from the said cover through said notches, one or more of said tongues also extending through slots formed between projections 53^b on the body of the volume control, said tongues having their inner ends bent into engagement with and beneath the said body, as indicated at 68^b. The cover serves, through its tongues 68^b and the notches 34^a and the recesses provided between the projections 53^b to prevent rotation of the volume control body within the opening 32; and, through the engagement of the tongues with the bottom of the volume control body, to clamp or anchor the latter within its seat.

The number, design and arrangement of the recesses and openings in the chassis are such as we have found to be adapted for the accommodation of the number, design and arrangement of hearing aid elements which have enabled us to produce a particularly efficient instrument, but it is evident that the number, design and arrangement of the recesses and openings will vary in accordance with the number, design and arrangement of the elements which may be employed in an amplifier circuit, no claim being asserted herein for patentable novelty in our circuit per se which is a conventional type of vacuum tube amplifier.

In Figs. 1 and 9, we have illustrated a casing in which the chassis and hearing aid parts described hereinbefore and the A battery 70 and B battery 71 are mounted. The casing, indicated generally at C, comprises a unitary front section;

a portion of which is shown at 72 in Fig. 9, and two rear sections, namely; an upper section 73 and a lower section 74. The opposite sides of the front section are provided each with a guide channel 75 while the rear sections are provided each with a guide rail 76 adapted to be received within the said channels. The bottom of the upper back section is provided with a transversely extending outwardly projecting rib 77 while the top of the lower back section is provided with a depressed flange 78 adapted to be received beneath the rib 77 and with a transverse rib 79 adapted to abut against the rib 77 when the back sections are assembled upon the front section. The guide channels on the front section are provided each with a slot 80 which slots are adapted to be engaged by the ends of the rib 77 of the upper rear section when the latter occupies its operative position with reference to the front section. In practice, the upper rear section, together with the chassis, may be first positioned below the top of the front section and the rails of the upper rear section can be interlocked with the side channels of the front section, as by inserting one of said rails into the corresponding side channel of the front section and thereafter pressing downwardly upon the other side of the upper rear section, which will enable its rail to snap into position within the guide channel. This operation must necessarily be performed while the chassis and the upper rear section occupy a position approximately midway between the ends of the front section—the chassis being positioned beneath the upper rear cover section by the fitting of the output socket 47 within the opening 31 provided therefor in the said section.

The manner in which the output connector co-operates with the opening 31 in the upper rear section enables the chassis to be locked in position within the casing without recourse to any other securing means; thereby eliminating the necessity for the use of any tools in effecting such assembly.

The lower contacts 83, 84 for the A and B batteries are formed as a unit comprising a base 85 which is secured to the bottom of the front section in any approved manner, screws 86 being indicated as employed for such purpose. The batteries having been inserted within the lower portion of the front section of the casing, the bottom rear section can then be applied to the front section by inserting the upper end of one of the side rails within the lower portion of the channel guide of the upper section and then by springing the opposite side of the lower rear section downwardly, whereby the corresponding side rail will be snapped into place within the side channel, following which the lower rear section will be slid into place with the flange 78 fitting beneath the rib 77, being removably locked thereto by engagement of a locking projection 87, formed on said flange, with a recessed seat provided therefor in an outwardly extending projection 88 on the rib 77. Obviously, the locking projection may be formed with the rib 77 and the recess for the same with the flange 78.

The parts having been thus assembled within the casing C, the output connector element 89 is applied to the output connector element 47 as by inserting the side rails of the former within the guides 47^a of the latter.

Reference is made hereinbefore to the grill 67 with which the front of the casing is provided. This grill is provided with slots 67^a which are similar to the slots 63^a of the microphone cover

plate, but are staggered with respect to the latter slots; this protects the microphone from damage, as by insertion of sharp instruments through the slots 63^a, and also greatly reduces what is known in the art as "acoustical feedback."

90 denotes clips by which the casing and the hearing air elements therein may be supported in the pocket of the wearer. These clips are mounted within U brackets 91 by means of lugs 92 carried by the clips and embracing upstanding lugs 91^a on the U clips, the clips being journaled on the upstanding lugs by means of shafts 93, springs 94 pressing the gripping ends of the clips toward the casing. The bases of the U clips are secured in place, without recourse to any projection within the interior of the casing which might be engaged by the chassis, by striking tongues 95 therefrom which are received within apertures 96 provided therefor in the bases of the said brackets and by which the bases are locked to the upper rear casing section.

The hearing aid distributor has always experienced much trouble in the past in servicing his product, due to the necessity for removing some five or six screws, by which the chassis have been secured to and within their respective casings, before such removal could be effected; in some cases, the screws required the use of special tools, other than screw drivers, for their removal. In other cases, soldered connections have been employed between the chassis and casings making it necessary for a distributor to be trained by the factory in order that he might service his instruments. Due to the manner in which we have constructed our casing and mounted our chassis within the same, it is possible for a distributor to service our instrument without the necessity for possessing and/or employing any tools or any mechanical skill.

With an apparatus constructed in the manner shown and described herein, we are able to realize all of the general objects set forth in the introductory portion of the specification. In addition, there are no wire connections between the chassis and the casing and there are no screws or other extraneous means for mounting the chassis in the casing nor for securing the sections of the casing together, thus enabling our hearing aid instrument to be efficiently serviced without the necessity for mechanical skill or recourse to any tools whatever. All parts are accurately positioned with reference to one another, making exact duplication of the instrument possible and improving greatly the facility of production of the instrument and also the replacement of the parts within the chassis. All of the parts can be arranged in close proximity to one another in the chassis and without electrical or mechanical interference with one another due to movement or shifting of the parts in the chassis, thereby contributing greatly to the compactness of the entire assembly and insuring uniformity of performance in the production of successive hearing aid instruments.

Having thus described our invention, what we claim is:

1. In a hearing aid apparatus, a main chassis of moldable insulating material having recesses and openings therein for the reception of hearing aid elements included in the amplifier circuit and means for anchoring the said elements within said recesses and the main chassis being also provided with a recess therein for the reception of a sub-chassis carrying hearing aid elements also included in the amplifier circuit, a sub-

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chassis carrying hearing aid elements of the amplifier circuit, and means for anchoring the sub-chassis to the main chassis, the latter anchoring means also effecting electrical connection between the hearing aid elements in the main chassis and the hearing aid elements on the sub-chassis.

2. In the hearing aid apparatus recited in claim 1 the recess for the sub-chassis being located between the front and the back of the main chassis and extending thereinto from one of the sides thereof and the main chassis being provided in the side from which the recess extends with additional recesses for the reception of input and driver tubes carried by said sub-chassis.

3. In a hearing aid apparatus, a main chassis of moldable insulating material having recesses and openings therein for the reception of hearing aid elements included in the amplifier circuit and comprising a microphone, an output impedance, a volume control, a volume control switch, A and B battery contacts and an output tube mounted in some of said recesses and openings, an output connector and a sub-panel supporting the said connector and mounted within others of the recesses in the said chassis, the main chassis also having an additional recess extending thereinto and a sub-chassis within said recess with hearing aid elements carried thereby and included in the transmitter circuit and comprising an input tube, a driver tube, resistors and condensers, and means for anchoring the sub-chassis and the output connector sub-panel to the main chassis, the anchoring means also effecting electrical connection between the hearing aid elements in the main chassis and the hearing aid elements on the sub-chassis and between the sub-panel and the remainder of the electrical circuit of the hearing aid.

4. In the hearing aid apparatus set forth in claim 1, one of the said anchoring means comprising a screw extending through bushings in the output connector sub-panel, the B battery contact, and the sub-chassis, and being threaded into the sub-chassis.

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5. In the hearing aid apparatus set forth in claim 4, one of the anchoring means comprising a screw extending through an end of the output connector sub-panel and through a portion of said chassis and being threaded into a bushing on the inboard end of the sub-chassis.

6. In a hearing aid apparatus, a chassis and hearing aid elements mounted thereon, said elements comprising a volume control having a body and the chassis having an opening for the reception of said body the wall of which opening is provided with notches, a cover mounted in said opening above said body and having tongues extending therefrom through said notches and along the side of said body and bent inwardly into engagement herebeneath, the body being provided, above the bottom thereof, with recesses for the reception of said tongues.

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