

The invention relates to a hearing appliance having a housing adapted to be worn behind the ear, according to the precharacterising part of claim 1, i.e. a hearing appliance having a housing adapted to be worn behind the ear, in which units for amplifying and adapting the sound signals to the type and extent of the hearing impediment of someone hard of hearing are accommodated. Generally, these are a microphone, an amplifier, a source of current, a listening coil and an ear phone, as well as control units to adapt the volume and tone and other means of adjusting the operating data of the amplifier such as an automatic volume control (AVC) or peak chopper (PC).

In known appliances (see DE-U-7707594) battery contacts and possibly a listening coil, as well as the adaptation control units are also accommodated on the mounting plate for the amplifier other units so as to be able to determine that the appliance is in working order before the final completion of the appliance with the housing etc. Particularly with regard to mounting the control units for the adaptation and amplification control and the adaptation of the amplification to the frequency distribution, it is difficult to ensure the correct relative positioning of the essential parts in relation to the control units by particularly careful assembly and to ensure electrical insulation by maintaining sufficient tolerances. Hearing appliances that are also additionally provided with a listening coil for receiving induction signals must also be provided with additional mounting means for this component.

The object of the invention is, in a hearing appliance according to the precharacterising part of claim 1, to simplify the assembly of essential control units and the listening coil while maintaining exact positioning as well as mutual electrical insulation. This object is achieved according to the invention by the measures set out in the characterising part of claim 1.

Combining the control units and the listening coil in one unit, which can be connected to the amplifier, enables the uniform relative positioning of these parts to remain constant without the expense of special adjusting means. Apart from this, tolerances that would otherwise be needed and would require space can be reduced, as the arrangement is preset by the combined unit. In addition, the control units and listening coil are electrically insulated from one another.

Further details and advantages of the invention will now be explained with reference to the exemplary embodiment shown in the drawings, in which

Fig. 1 shows a perspective diagram of a hearing appliance adapted to be worn behind the ear, equipped according to the invention,

- Fig. 2 shows the top view of the appliance of which half the housing is removed,
 Fig. 3 shows a view of the appliance with the convex rear wall of the appliance removed,
 5 Fig. 4 shows a cross-section corresponding to IV-IV (Fig. 3) through a unit according to the invention which is mounted on an amplifier plate,
 Fig. 5 shows a side view of a mounting plate of the unit and
 10 Fig. 6 shows a cross-section through a unit corresponding to Fig. 4 with a combined supporting part.

15 In Fig. 1 a hearing appliance adapted to be worn behind the ear and having a housing made up of two shells 2 and 2.1 is indicated by 1. A battery compartment 3 can be seen at the lower end of the housing and a supporting
 20 hook 4 at the upper end with which the appliance 1 is worn behind the ear. The hook 4 is extended at its free end by a tube 5 which opens into an ear plug 6 which can be inserted in the ear canal so that the amplified hearing signals reach the ear directly. On the convexly outward
 25 curved rear side of the appliance 1, there is a volume controlling wheel 8 above a hinged cover 7 and a switch 9 below the cover 7.

The appliance operates in the same manner as the usual appliances of this kind in that a sound signal,
 30 which enters the appliance through an inlet opening 10, is received by the microphone 11 where it is converted into electrical signals which are amplified by an amplifier 12 by means of the electric energy of a battery 13 and then converted back to sound signals in an ear phone 14. These
 35 amplified signals reach the tube 5 and finally the ear plug by way of a sound conducting channel 15, continued in the supporting hook 7 as a channel 16.

The amplifier 12 consists of units 17 which are
 40 mounted on a mounting plate 18. There is a spring contact 20 on the lower end of this plate to receive the current from the battery 13 as well as a second one beneath the battery which cannot be seen in the Figure. On its edge facing the convex side of the housing 1, the plate
 45 supports a unit 21 in which the control units 22 to 25 and a listening coil are combined. The coil 26 can be switched on by the switch 9 in the position T indicated in Fig. 1: in position M the switch connects the amplifier with the microphone. In the switch position 0 the
 50 appliance is switched off. The control units contained in the unit 21 are made accessible by opening the cover 7 into the position 7.1 indicated by a broken line in Fig. 2, so that the control units 22 to 25 can be adjusted by their actuating members 27 to 30.

55 The control unit 22 serves to engage a peak chopper (PC). In Fig. 3 it is switched off, as can be seen from

the direction of the screw slot of its actuating member 27, which can be adjusted by a screwdriver.

5 The control unit 23 serves to engage an automatic volume control (AVC) and is set to a maximum amplification of 90 dB. As can be seen from the further numerals in the lettering, 60 and 75 dB settings could also be chosen.

10 With the control unit 24, the amplifier, in the position L, is regulated so that the transmission of low frequencies is preferred. In the position N, i.e. normal, there is uniform transmission of all frequencies.

15 When the control unit 25, which is switched off in the representation, is set at H the high frequencies could be preferred, whilst at N, as in the case of the control unit 24, there is uniform transmission of all frequencies.

20 The control units 22 to 25 and the listening coil 26 are mounted on a mounting part 35. This part, drawn separately in a side view in Fig. 5, has recesses 50 to 53 on one side into which the control units 22 to 25 fit. In addition it has a further projection 36 on which a
25 suitably formed eye 37, which is arranged on the listening coil 26, can be mounted. The control units 22 to 25 are arranged side by side in the representation shown in Fig. 3. In addition, it can be seen from Fig. 5 that the control units 22 to 25 are on a curved surface which
30 corresponds to the curve of the rear wall of the housing 1.

The winding 38 of the listening coil 26 is injection moulded in a body 39 of plastics material on which, next to the eye 37, there is a projection 40. This projection
35 closes off the openings for the control units 22 to 25 from the assembly space of the amplifier whilst the opposite side is closed by the mounting 35 itself. The upper side 41 of the part 35 closes off the installation of the control units 22 to 25 on the side facing the
40 observer in Fig. 2. The mounting plate 18 of the amplifier 12 closes off the remaining opening at the bottom. Attachment to this part is by means of tongues 42 to 45 of the control units 22 to 25 which, after being
45 inserted in the mounting 35, project therefrom and can be inserted in the plate 18. For the purpose of attachment and connection to the circuit of the amplifier 12 they are soldered on as indicated by 46 in Fig. 4. (See in this respect the claims of application EP-A-238887, divided out
50 of this application).

The curvature of the wall 40 shown in Fig. 5 and indicated by 47 as well as the curvature of the part 35, leads to a mechanical stabilization of the arrangement. The part 35 has another recess 48 on the other side in
55 which the projection 36 is arranged, on which the eye 37 can be mounted. In addition the recess 48 has a form that matches that of the eye 37 and fits tightly therewith and

is held in a close-fitting manner as is the case with the openings for the control units 22 to 25 indicated by broken lines in Fig. 5 and numbered 50 to 53. By this means it is achieved that the unit is already held in position mechanically when being assembled, so that it can be mounted as a unit on the mounting plate 18 of the amplifier 12.

Simplification and further stabilization of the assembly can be achieved if the mounting part 35 is also included in the body 39 of plastics material of the listening coil 38 as well as its own parts 37 and 40, as shown in Fig. 6. In order to insert the control units 22 to 25 only the part, indicated by 55 in Fig. 2, that in the final assembly faces the mounting plate 18 needs to be omitted; the control units 22 to 25 can then be inserted from the lower side, which after assembly is closed by the plate 18, instead of through the openings 50 to 53 from the curved side 47 (Fig. 5). By means of the compact mounting part 56 a further stabilization of the unit can thus be obtained.

Compared with the known solutions the following advantages result according to the invention:

1. The control units 22 to 25 are guided and supported not only on the soldered points 46 but also on the mounting 35, which can also be regarded as a control unit orifice plate.
2. Owing to the all-round enclosure of the unit 21 by an electrical insulating material, the control units 22 to 25 are not exposed to any danger of contacting the listening coil 26 or other surrounding electrically conducting components 17 of the amplifier 12, whether in operation or not.
3. The control units 22 to 25 are automatically correctly positioned relative to one another so that post-adjusting measures are not necessary during the manufacturing process.
4. The listening coil 26 is attached to the control unit orifice plate 35 without additional mounting means which would have been necessary on the shell of the housing 2 or on the amplifier 12. In addition, in the example shown, the necessary mounting elements 36 and 37 are provided on both parts 21 and 26 by their production by plastic injection moulding.
5. The amplifier 12 can, as with known appliances, have its final test before it is built in to the housing comprising the shells 2 and 2.1.
6. The new assembly is easy to manufacture and repair, as all functional elements, apart from the transformers 11 and 14 and battery drawer 3, can be

assembled and disassembled with the amplifier 12.

Claims

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1. A hearing appliance having a housing (2, 2.1) adapted to be worn behind the ear, into which a microphone (11), amplifier (12), source of current (13) and ear-phone (14) can be built in, and having a listening coil (26) arranged behind an opening (7) in the housing on a mounting plate (18) and a group of control units (22 to 25), each of which includes an actuating member (27 to 30) and a connecting and fastening projection (42 to 45), characterised in that the control units (22 to 25) and the listening coil (26) are combined by an electrically insulating mounting (35 or 56) into a unit (21) that can be mounted on the amplifier.

2. A hearing appliance according to claim 1, characterised in that the mounting (35, 56) has openings into which the control units (22 to 25) can be inserted.

3. A hearing appliance according to claim 1 or claim 2, characterised in that the listening coil (26) is clipped or pushed onto the mounting (35).

4. A hearing appliance according to claim 1 or claim 2, characterised in that the listening coil (26) is enclosed in the mounting (56).

5. A hearing appliance according to claim 3, characterised in that the mounting (35) has a projection (36) to push on a counterpart (37) forming a holder, e.g. an eye, which is attached to the listening coil.

6. A hearing appliance according to any one of claims 1 to 5, characterised in that at the positions where the actuating members (27 to 30) of the control units (22 to 25) are inserted, the mounting (35, 56) has lettering which, together with markings on the actuating members, indicates the setting of the control units.

7. A hearing appliance according to any one of claims 1 to 6, characterised in that the mounting (35 or 56), like the arrangement of the control units (22 to 25), forms an arc that matches the curvature of the outer rear wall of the housing of the appliance (2, 2.1).

8. A hearing appliance according to any one of claims 1 to 7, characterised in that the control units (22 to 25) are mounted in the mounting plate with their connecting and fastening projections (42 to 45) projecting from the mounting (35 or 56).

9. A hearing appliance according to claim 8, characterised in that the mounting plate (18) is provided with openings into which the connecting and fastening



assembled and disassembled with the amplifier 12.

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2. A hearing appliance according to claim 1, characterised in that the mounting (35, 56) has openings into which the control units (22 to 25) can be inserted.
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8. A hearing appliance according to any one of claims 1 to 7, characterised in that the control units (22 to 25) are mounted in the mounting plate with their connecting and fastening projections (42 to 45) projecting from the mounting (35 or 56).
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9. A hearing appliance according to claim 8, characterised in that the mounting plate (18) is provided with openings into which the connecting and fastening
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projections (42 to 45) of the control units (22 to 25) are inserted.

5 10 A hearing appliance according to claim 8 or claim 9, characterised in that the connecting and fastening projections (42 to 45) of the control units (22 to 25) are soldered or brazed to the mounting plate (18).

10 11. A hearing appliance according to claim 3, characterised in that the listening coil (26) is enclosed in a body of plastics material (39) which in at least part of its cross-section has the form of an L in the angle of which the mounting (35), fitted with the control units (22 to 25), is inserted, and that the connecting and fastening
15 projections (42 to 25) of the control units, which project from the long side of the arrangement that remains free, are inserted into the mounting plate (18).

