Jan. 17, 1956 E. W. BORN 2,731,586

HEARING AID

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Fig. 1

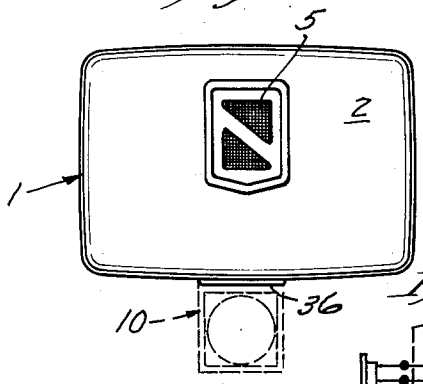


Fig. 2

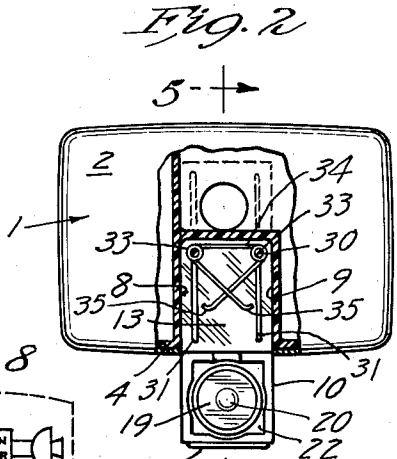


Fig. 8

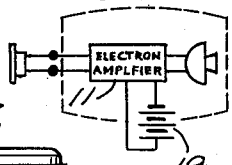


Fig. 3

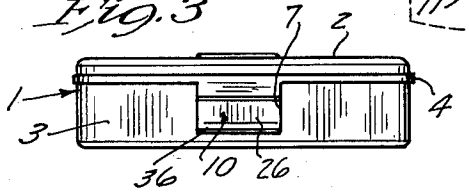
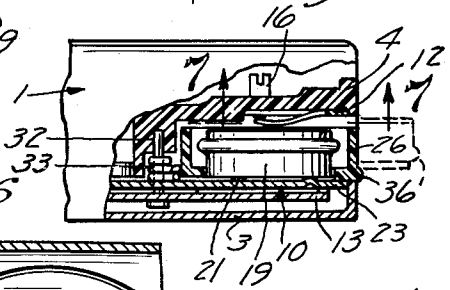


Fig. 4



6 Fig. 5

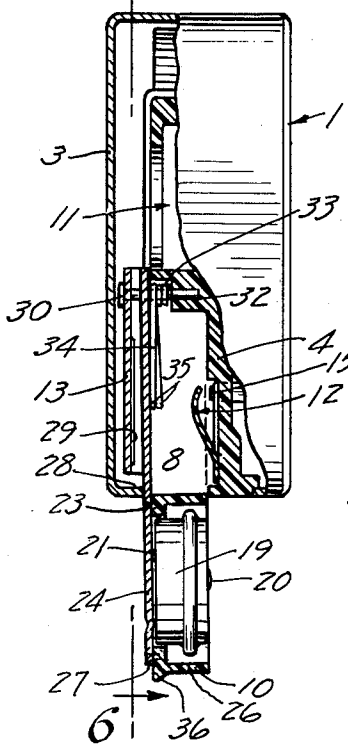


Fig. 6

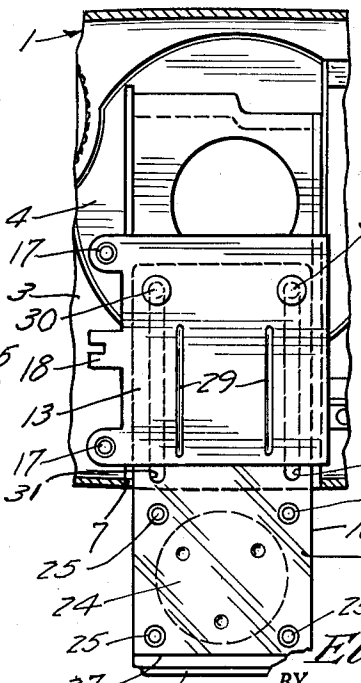
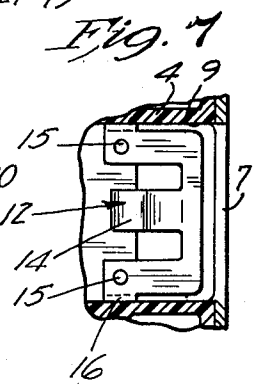


Fig. 7



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Fig. 9

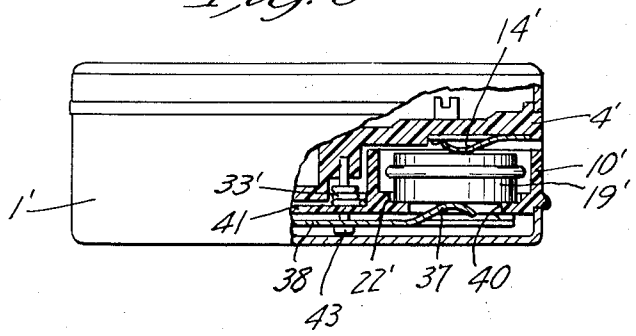


Fig. 10

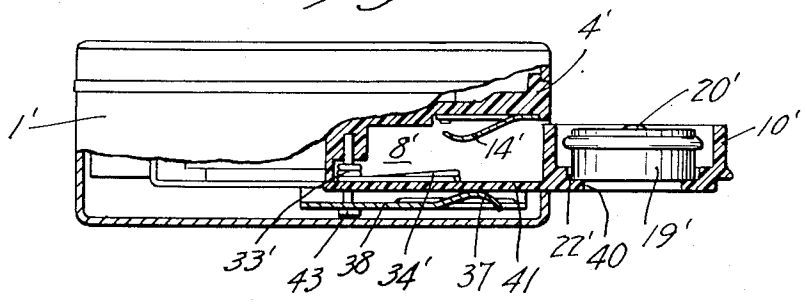
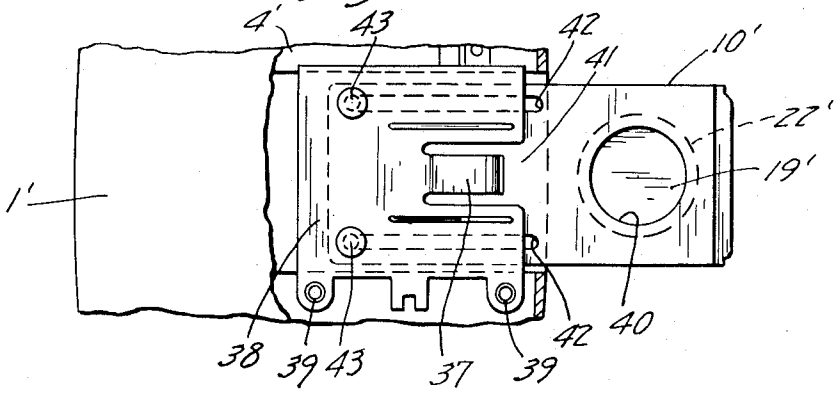


Fig. 11



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2,731,586

HEARING AID

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Application April 20, 1953, Serial No. 349,871

4 Claims. (Cl. 317—99)

My invention relates to electronic devices such as hearing aids wherein an electronic amplifier and a battery providing a source of potential for said amplifier are enclosed within a small casing.

In the latest type hearing aids, the casing and parts contained therein are so small that the batteries which provide the source of potential for the amplifier are so miniature that they must be quite frequently replaced in order to maintain the operating efficiency of the hearing aid at or near its peak. The primary object of my invention is the provision of novel means whereby the tiny batteries in miniature hearing aids may be quickly and easily replaced by the user.

A still further object of my invention is the provision of a device of the class above described having a drawer-receiving recess opening through one wall thereof, an open top drawer normally closing said recess, means mounting and guiding said drawer for endwise sliding movements in said recess from an operative closed position to an inoperative open position, a terminal-equipped battery mounted in said drawer and removable from the open upper end thereof when said drawer is open, said amplifier having relatively fixed terminals orientated for cooperative engagement with the terminals of said battery upon closing movements of the drawer.

A still further object of my invention is the provision of a device of the class described wherein said drawer is likewise mounted in said casing for limited upwardly and downwardly movements when said drawer is formed to provide a latch shoulder adjacent its outer bottom edge portion for engagement with the inner surface of the adjacent wall of the casing when the drawer is closed and moved downwardly.

A still further object of my invention is the provision of a device of the class immediately above described in which the battery is provided with terminals on its upper and lower portions, and in which the bottom of the drawer is in the nature of a metallic conductor which terminates in spaced relation to the front wall of the drawer and provides said shoulder, and in which one of said amplifier terminals engages the terminal on the upper portion of said battery and yieldingly urges said battery toward engagement with metallic bottom of the drawer and urges the drawer toward engagement of said shoulder with the inner wall of said casing and toward engagement with the other of said amplifier terminals.

A still further object of my invention is the provision of a device of the class above described in further combination with yielding means urging said drawer toward its inoperative exended open position when said drawer is elevated against the bias of said first-mentioned yielding means, and in further combination with novel means limiting outward movements of said drawer from said casing.

A still further object of my invention is the provision of a device of the type above described which is relatively inexpensive to produce, which is foolproof in its operation, is sturdy in construction, and durable in use.

The above and still further objects of my invention will become apparent from the following detailed specification, appended claims and attached drawings.

Referring to the drawings, wherein like characters indicate like parts throughout the several views:

Fig. 1 is a top plan view of my novel structure;

Fig. 2 is a view corresponding to Fig. 1, some parts being broken away and some parts being shown in section;

Fig. 3 is a view in front elevation;

Fig. 4 is an enlarged fragmentary view in end elevation, some parts being broken away and some parts being shown in section;

Fig. 5 is a transverse view taken substantially on the line 5—5 of Fig. 2, the non-functional portions thereof being shown in end elevation;

Fig. 6 is a fragmentary view partly in bottom plan and partly in section taken substantially on the line 6—6 of Fig. 5;

Fig. 7 is a fragmentary detail in section taken on the line 7—7 of Fig. 4;

Fig. 8 is a wiring diagram;

Fig. 9 is a view in side elevation of a modified form of my invention, some parts being broken away and some parts being shown in section;

Fig. 10 is a view corresponding generally to Fig. 9 but showing a different position of some of the parts; and

Fig. 11 is an enlarged fragmentary view in bottom plan, some parts being broken away and some parts being shown in section.

Referring with greater particularity to the drawings, the numeral 1 indicates in its entirety a casing of a miniature hearing aid including a relatively shallow top 2 and a relatively deep bottom 3, each of which is adapted to telescopically engage a portion of an intermediate instrument mounting frame 4 formed from nylon or the like. Preferably and as shown, top 2 is provided with a microphone opening 5, whereas the front wall 6 is provided with a notch 7, which, together with the mounting frame 4, defines an opening or recess 8. It will be seen that the mounting frame 4 provides an elongated generally rectangular guide and mounting means 9 for a slide element in the nature of a drawer 10. An electronic amplifier unit 11, suitably mounted in said frame 4 within the casing 1, has a pair of opposed terminals 12 and 13, the former being in the nature of a leaf-spring 14 overlying the drawer 10 when same is moved to its full line closed position of Fig. 4. As shown, the spring 14 is in the nature of a tongue projecting outwardly from the intermediate portion of a flat U-shaped member suitably riveted or otherwise secured to the frame 4, as indicated at 15. Also preferably and as shown, an upturned ear 16 provides a terminal lug for connection with a suitable connector leading directly to the amplifier 11. The other terminal 13 is in the nature of a metallic guide plate suitably secured, as at 17, to the frame 4 and having a laterally projecting connector 18 for cooperative attachment to another lead, not shown, from the amplifier 11.

A single cell battery 19 is provided with a terminal 20, which projects upwardly from the upper portion thereof, and a plurality of downwardly projecting terminals 21. As shown, the battery 19 is receivable within the recess 22 of a slide element in the nature of a drawer 10, the terminals 21 of said battery being in engagement with an elongated metallic conductor plate 23, the forward end portion of which provides the bottom 24 of the drawer 10. Rivets or the like 25 secure the elements 10 and 24 together.

As shown, the bottom forming forward portion 24 of the plate 23 terminates in inwardly spaced relation to the front wall 26 of the drawer 10 to provide a latch shoulder 27 for engagement with the inner surface 28 of the front wall 6 of the casing when the drawer 10 is moved to its closed operative position and moved downwardly, as shown particularly by Fig. 4. As there shown, the

terminal-forming spring 12, in said position, engages the upper terminal 20 of the battery 19 and yieldingly urges said battery 19 toward engagement of the lower terminals 21 with the conductor plate 23 and biases the drawer 10 whereby to cause engagement between the shoulder 27 and the inner surface 28 of the casing 1. It will be noted that the conductor plate 23 overrides and frictionally engages the amplifier terminal 13, the upwardly projecting ribs 29 of the latter causing better contact between said members.

It will also be noted, as shown particularly by Fig. 5, that when the drawer 10 is moved to its inoperative open or extended positon, that the bottom-forming forward portion 24 of the conductor plate 23 rides upon that portion of the wall 6 of the casing 1 forming the bottom of the notch 7. However, when the drawer 10 is moved to its closed operative position of Fig. 4, the terminal-acting spring 14 biases the drawer 10 to the lowermost limits of its movement within the recess 8. In other words, the drawer 10, when in its closed operative position, is mounted in the recess 8 for limited upward and downward movements, as illustrated by the full and dotted line positions of Fig. 4. For the purpose of limiting outward movements of the drawer 10 beyond the position of Figs. 2, 5 and 6, for the removal and insertion of battery 19, I provide a pair of stop pins 30 which project upwardly through the terminal-acting guide plate 13 through closed end slots 31 in the conductor strip 23. The upper ends of the anchoring pins 30 extend into openings 32 in the frame 4. Also, preferably and as shown, the stop pins 30 likewise pass through the laterally spaced coiled portions 33 of a conventional torsion spring 34, the free ends 35 of which extend in the direction of the drawer 10 and impart opening movements to said drawer 10 when the drawer 10 is moved upwardly against the bias of the terminal-acting spring 14. A transversely extended rib 36 of the front wall 26 of the drawer 10 facilitates raising movements of the closed drawer 10 to allow the spring 34 to impart extending or opening movements to the drawer 10.

Referring to the modified forms of the invention disclosed in Figs. 9–11, inclusive, the numeral 1′ indicates the casing; the numeral 4′ the mounting frame; and the numeral 8′ the recess which is adapted to slidably receive the slide element 10′. As shown, the battery 19′ is receivable within a recess 22′ of the slide element 10′. Terminal-acting leaf-spring 14′ is identical to the spring 14, above described, and bears upon terminal 20′ of the battery 19′. The opposed terminal 37 is in the nature of a leaf-spring formed integrally with the mounting plate 38 suitably secured to the frame 4′ by rivets or the like, as indicated at 39. Terminal 37 works through an opening 40 in the bottom of the slide element 10′ and makes frictional engagement with the terminal-acting bottom of the battery 19′ when the slide element 10′ is moved to the closed operative position of Fig. 9. It will be noted that the inwardly projected end 41 of the slide element 10′ is provided with longitudinally extended closed end slots 42 through which the pins 43 project, whereby to limit outward movement of the slide element 10′ beyond that illustrated in Fig. 10. As in the structure of Figs. 1–8, inclusive, the pins project upwardly through the mounting plate 38, through the slots 42, and through laterally spaced coils 33′ of the torsion spring 34′, and have their upper ends received within openings, not numbered, in the frame 4′. In all other respects, the structure of Figs. 9–11, inclusive, in the mode of operation, is identical to the structure of Figs. 1–8, inclusive.

While I have disclosed a preferred embodiment of my invention, it should be obvious that same is capable of modification without departure from the scope and spirit of the appended claims.

What I claim is:

1. In a hearing aid, a casing containing an electronic amplifier, said casing having a slide-receiving recess

opening through the wall thereof, a slide mounted and guided for endwise sliding movements within said opening from a retracted operative position completely within the confine of the recess to an outwardly extended inoperative position, a battery-receiving recess in said slide, a terminal-equipped battery mounted in the recess in said slide and having terminals on its opposite sides, the slide being extendable to allow access to the battery externally of the casing, the amplifier having opposed resilient terminals orientated for cooperative engagement with the battery terminals only upon closing of the slide, and yielding means urging said slide toward said extended inoperative position, the bottom of said slide bearing upon the adjacent wall of the casing during extending movements thereof, said bottom being formed to provide a latch adjacent its outer end portion engageable with the inner surface of the adjacent wall of the casing when the slide is retracted, said slide being yieldingly urged toward engagement of said shoulder with the inner surface of said casing when said slide is moved to its operative retracted position.

2. In a hearing air, a casing containing an electronic amplifier, said casing having a drawer-receiving recess opening through the wall thereof, an open top drawer normally closing said recess, means mounting and guiding said drawer for endwise sliding movements in said recess from an operative closed position to an inoperative open position and for limited upward and downward movements when said drawer is closed, a battery having terminals on its top and bottom portion and providing a source of potential for said amplifier, said battery being seated in said drawer and removable from the open top thereof when said drawer is open, said amplifier having relatively fixed opposed terminals orientated for cooperative engagement with the terminals of said battery upon the closing of said drawer, said drawer having a metallic bottom which bears against the adjacent wall of the casing when the drawer is open, said bottom terminating in spaced relation to the front of said drawer and providing a latch shoulder for engagement with the inner surface of the adjacent wall of said casing when said drawer is closed and moved downwardly, one of said amplifier terminals defining yielding means engageable with the terminal on the top of said battery and biasing said battery toward the bottom of said drawer and said drawer toward engagement of the shoulder thereof with the adjacent wall of the casing when said drawer is closed, a portion of said mounting and guiding means including a guide plate which defines the other of said amplifier terminals, and means yieldingly urging said drawer toward an open inoperative position, said drawer opening under the bias of said last-mentioned means when the front end portion of said drawer is elevated above said shoulder against the bias of said first-mentioned yielding means.

3. The structure defined in claim 2 in which said metallic bottom of said drawer slides upon said terminal-acting guide plate and serves as a conductor therebetween the bottom terminal of said battery.

4. The structure defined in claim 3 in further combination with the stop means positively limiting outwardly movement of said drawer, said stop means comprising a stop pin extending upwardly through said guide plate and engaging a portion of the bottom of said drawer, said stop pin providing mounting means for said last-mentioned yielding means.

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