

SPEAKER

TECHINICAL FIELD

The present invention relates to a loudspeaker (speaker) for use in television receivers, stereophonic apparatus, sound recording apparatus and the like audio-visual appliances; more specifically to a structure of the speaker.

BACKGROUND ART

Among the speakers developed recently, a terminal for connection with sound signal amplifier is often disposed somewhere in a front part of the speaker for easy connection with an amplifier contained in an apparatus. The above-described arrangement for connection is popular among the speakers used in car-borne sound apparatus.

A conventional speaker is described referring to FIGs. 11 through 13.

As shown in FIGs. 11 through 13, a conventional speaker mainly comprises;

- a. a magnetic circuit 7 formed of a bottom plate 7B having a center pole, a ring shape magnet 7C, an upper plate 7D and a magnetic gap 7A;
- b. a plastic frame 1 connected on the magnetic circuit 7;
- c. a voice coil 3 formed of a coil inserted in the magnetic gap 7A of magnetic circuit 7 and a voice coil bobbin around which the coil is wound;
- d. a damper 4 for supporting the voice coil 3, said damper 4 being connected at an inner circumference with the voice coil 3, and at an outer circumference with the frame 1;
- e. a diaphragm 5 connected at an outer circumference with the frame 1 via an edge portion, and at an inner circumference with the voice coil 3; and
- f. a speaker terminal (hereinafter referred to as ST) 2 mounted on the frame 1.

A conventional speaker further comprises;

a pair of relay terminals 9 for internal connection attached on the frame 1;

a flexible wire (hereinafter referred to as FW) 6, one end being connected with an end of the coil of voice coil, while the other end with the relay terminal 9; and

a relay cord 10, one end being connected with the relay terminal 9, while the other end with a terminal plate 2b.

The above-described ST 2 comprises:

a case 2A for accepting a connector coupled to a sound signal amplifier of an apparatus (not shown);

a terminal plate 2b provided by a press-fitting method or by outsert molding in the case 2A, for coupling with the connector; and

a terminal hole 2c formed in terminal plate 2b into which a relay cord 10 (to be described later) is inserted to be soldered.

In the above-configured conventional speaker, the FW 6 should always be managed not to make a contact with neighboring components (damper, diaphragm), even when the ST 2 is located close to the diaphragm 5. When a FW 6 makes contact with the neighboring components, the speaker generates abnormal sounds, or in some cases it is broken.

During assembly of conventional speakers, operators carefully placed the FW 6 to a location most appropriate for avoiding the above-described collision of the components. The connecting operation around the relay terminal 9 needs special skills and laborious work; therefore, it is one of the costly items in the assembly of speakers. In addition, the conventional speakers have many connection points (soldering points), which means that they have a relatively high possibility of poor connections or broken wires.

DISCLOSURE OF THE INVENTION

The present invention addresses the above problems, and a speaker in accordance with the present invention comprises:

a flexible wire connected at one end with a coil of a voice coil while at another end with a speaker terminal mounted on a frame; and a relay portion

provided on said frame at a place between said voice coil and said speaker terminal, said relay portion comprising a flat section and a wall section, wherein a clamping section for clamping the flexible wire is formed on the flat section and a pair of slanting grooves is formed on the wall section, said grooves being formed to a direction along a pair of flexible wires.

In use, the clamping portion clamps a FW to fix it to a place, while the wall section regulates an position of the FW. Under the above configuration, a relay cord can be eliminated. Thus, number of the component can reduced, and generation of abnormal sounds during operation of a speaker due to collisions of a vibrating FW with other components (damper, diaphragm) can be avoided in accordance with the present invention to provide a excellent speaker.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a perspective view of a speaker in accordance with the present invention.

FIG. 2 is a cross sectional view showing a half portion of a speaker in accordance with an exemplary embodiment of the present invention.

FIG. 3 is a perspective view of a relay portion of the speaker shown in FIG. 2.

FIG. 4A is a side view of the relay portion shown in FIG. 3.

FIG. 4B is a side view of the relay portion with a FW clamped.

FIG. 5 shows the speaker of FIG. 2 attached with a FW, as viewed from an above.

FIG. 6 shows a perspective view of another example of the relay portion.

FIG. 7 shows a perspective view of another example of the ST.

FIG. 8 shows a perspective view of still another example of the ST.

FIG. 9 is a perspective view showing how FWs are connected to the ST of FIG. 8.

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FIG. 10 is a cross sectional view showing how a FW is connected directly to a voice coil in a speaker using the ST of FIG. 8.

FIG. 11 is a perspective view of a conventional speaker.

FIG. 12 is cross sectional view showing a half portion of the speaker of FIG. 11.

FIG. 13 shows a perspective view of the ST of FIG. 11.

BEST MODE FOR CARRYING OUT THE INVENTION

First Embodiment

A speaker in accordance with a first exemplary embodiment of the present invention is described referring to FIGs. 1 through 5. Those constituent parts identical to those in conventional technology are designated using the same numerals, and descriptions on which are omitted.

As shown in FIGs. 1 through 5, a speaker in the first embodiment comprises:

- a. a magnetic circuit 7 comprising a bottom plate 7B having a center pole, a ring shape magnet 7C, an upper plate 7D, and a magnetic gap 7A;
- b. a frame 1A made of a plastic material and fixed on the magnetic circuit 7;
- c. a voice coil 3 inserted in the magnetic gap 7A of the magnetic circuit 7;
- d. a damper 4 fixed at an inner circumference to the voice coil 3 while at an outer circumference to the frame 1A, for supporting voice coil 3;
- e. a diaphragm 5 fixed at an outer circumference to the frame 1A, while at an inner circumference to the voice coil 3;
- f. a ST 2 mounted on the frame 1A; and
- g. a FW 6A connected at one end with a terminal plate 2B of ST 2, while at another end with a coil of the voice coil 3.

The voice coil 3 is formed of the coil and a voice coil bobbin around which the coil is wound.

The plastic frame 1A is attached with a relay portion 8. The relay portion 8 may be formed integrally as a part of the frame 1A, or a relay portion 8

provided separately may be mounted and fixed on the frame 1A.

The FW 6A is connected at one end to a terminal plate 2B, while another end to the coil of voice coil 3. The FW 6A is clamped at a halfway by the relay portion 8.

The relay portion 8 comprises:

a clamping section 8A for clamping the FW6A; and

a wall section 8B provided with a slanting groove 8E.

As shown in FIG. 3, the wall section 8B is provided with two grooves 8E, for preventing the FW 6A with no insulation coating from making mutual contact.

In place of the grooves 8E, a protrusion may be provided in the wall section 8B between the pair of FWs 6A which is placed along the wall.

FIG. 4A is a side view of the relay portion 8 of FIG. 3. FIG. 4B shows a state where a FW 6A is clamped by the relay portion of FIG. 4A. As illustrated in FIG. 4B, a FW 6A is clamped at the halfway by the clamping section 8A, and is disposed along the slanting groove 8E to make an arc shape. While a speaker is in operation, the diaphragm 5 and the damper 4 vibrate. The FW 6A is influenced by the vibration, sometimes it vibrates itself; however, the arc shape prevents the FW 6A from making vibration in the direction to damper 4 and diaphragm 5. An ideal location for FW 6A to avoid making a collision with damper 4 or diaphragm 5 is at an approximate middle part between the diaphragm 5 and the damper 4, as illustrated in FIG. 2.

At an opening for inserting FW 6A to the clamping section 8A, an upper sloped face 8C1 and a lower sloped face 8C2 are provided opposing to each other. At a place inner of the upper sloped face 8C1, for example, a protrusion 8D is provided protruding towards a plane of the sloped face 8C2.

The sloped face 8C1 and sloped face 8C2 facilitate an easier insertion of a FW 6A towards the clamping section 8A. The protrusion 8D prevents the FW 6A from getting out from the clamping section 8A.

The above-described sloped face may be provided in either one of the faces 8C1 and 8C2 (or, such a sloped face is not an indispensable item).

Also provided is a flat porch 8F extended from the lower sloped face 8C2. During an operation for fixing a FW 6A, both ends of which being connected to the respective places, into the clamping section 8A, an operator may provisionally place a FW on the flat porch 8F, in preparation of the succeeding inserting action. This is quite an advantage for such an inserting operation, especially for such a subtle action conducted by the help of delicate tools like tweezers. The flat porch 8F contributes to make the inserting operation easier.

As shown in FIG. 5, the clamping section 8A of relay portion 8 is locating approximately on the line connecting the terminal plate 2B and the tangential line of circumference of voice coil 3. Therefore, a FW 6A is not always under the influence of a pulling force to take the FW 6A away from the opening of clamping section 8A.

Second Embodiment

A second exemplary embodiment of the present invention is described referring to FIG. 6. Description is made only on a difference from the first embodiment, eliminating a description on identical components.

The difference from the first embodiment is that there is a through hole 8G provided underneath a clamping position of FW 6A in the relay portion 8.

The through hole 8G facilitates visual observation from the bottom about the status of a FW 6A being clamped. Depending on needs, a FW 6A may be fixed at the clamping section 8A by applying an adhesive agent via the through hole 8G. Thus the operation of fixing the FW 6A becomes easier, and the status of adhesion can be observed visually via the through hole 8G.

Third Embodiment

A speaker terminal for use in a speaker in a third exemplary embodiment of the present invention is described referring to FIG. 7.

A ST in the conventional technology is for soldering a relay cord 10, which has a relatively high rigidity and a restriction in terms of the length is not

very strict.

In the present invention, what is connecting between the ST and the voice coil 3 is a FW 6A. The FW 6A is made to be soft and flexible so that it can comply with the motion of voice coil 3. The FW 6A, however, is not allowed to make a contact with neighboring components. In order to meet the requirement, the length needs to be controlled within a certain specific length. A ST 11 in the present embodiment provides a structure that secures a certain specific length of a FW 6A.

As shown in FIG. 7, a ST 11 in the present embodiment comprises a casing 11B made of a plastic material having its opening at one end, and a pair of terminal plates 11A1 and 11A2 protruding within the opening of the casing 11B.

The pair of terminal plates 11A1 and 11A2 are disposed in the casing 11B by a press-fitting method or by outsert molding in the casing 11B.

The terminal plate 11A1 comprises:

- a) a terminal 11C1 of terminal plate 11A1 protruding within the casing 11B for leading electrical signals in,
- b) a bent and cut end 11D1 locating at another end of terminal plate 11A1 and extruding out of the casing 11B for catching a FW 6A or the like flexible wire,
- c) an upright wall 11E1 formed by cutting and bending a part of the terminal plate 11A1 straight towards the casing 11B, so that the upright wall stands opposing to the bent and cut ends 11D1.

As seen in FIG. 7, the terminal plate 11A1 and the terminal plate 11A2 are disposed symmetric with respect to the middle plane. So, description on the terminal plate 11A2 is omitted.

The terminals 11C1 and 11C2 are for coupling with a connector which delivers signals from outside (not shown).

A FW 6A is connected to ST 11 in the following manner.

In the first place, a tip end of FW 6A is made to contact with the upright wall 11E1.

Under this state, the bent and cut end 11D1 is somewhat deformed so that it can hold the FW 6A for a provisional fixing.

And then, the bent and cut end 11D1 and the FW 6A are soldered.

Thus, the FW 6A is provisionally fixed with its tip end making contact with the upright wall 11E1, and then it is soldered at the bent and cut end 11D1. As a result, the FW 6A may have least dispersion in the length of a portion for connection to ST 11; accordingly, a portion connecting the voice coil 3 and the ST 11 also has a stable length.

The above-described configuration prevents the FW 6A from making contact with neighboring components during sound reproduction of a speaker, so, no abnormal sounds will be generated by the speaker.

As a result of cutting and bending a part of terminal plate 11A1 for providing the upright wall 11E1, a cut-portion 11F1 is formed. The cut-portion 11F1 creates a narrowed section in the terminal plate 11A1, which limits a conduction of the soldering heat given at the bent and cut ends 11D1 towards the casing 11B. The upright wall 11E1 plays also a role of heat dissipating fin.

The terminal plate 11A2 is symmetrical to the terminal plate 11A1, and connection of a FW 6A to the terminal plate 11A2 is made in the same manner. So, the description is omitted.

In the above-described configuration, the influence of soldering heat given to the casing 11B is restricted, and deformation of the casing 11B at the opening can be avoided. Thus, a connector can be inserted in a smooth and stable manner into a speaker terminal provided in accordance with the present invention.

The cut-portion 11F1 (11F2) may be used as the window for observing the status of soldering from the underneath.

Fourth Embodiment

Another example of a speaker terminal for use in a speaker of the present invention is described referring to FIG. 8 and FIG. 9.

A fourth exemplary embodiment also relates to a ST, like in the third embodiment.

As shown in FIG. 8, a ST 12 in the present embodiment comprises a casing 12B made of a plastic material having its opening at one end, and a pair of terminal plates 12A1 and 12A2 protruding within the opening of casing 12B.

The pair of terminal plates 12A1 and 12A2 are disposed in the casing 12B by a press-fitting method or by outsert molding in the case 12B.

The terminal plate 12A1 comprises:

a bent and cut end 12D1 provided at an end of terminal plate 12A1;

a wall 12G1 provided at a terminal plate 12A2 side in parallel to terminal plate 12A1, formed by bending a part of the terminal plate 12A1, and

a cut-portion 12F1 provided in an area between the casing 12B and the bent and cut ends 12D1.

The bent and cut end 12D1 is identical to the bent and cut ends 11D1 in the third embodiment. The cut-portion 12F1 has an identical function as that of 11F1 in the third embodiment.

As seen in FIG. 8, the terminal plate 12A1 and the terminal plate 12A2 are disposed symmetric with respect to the middle plane. So, description on the terminal plate 12A2 is omitted.

The FW 6A is connected to ST 12 in the following manner;

in the first place, tip end of a FW 6A is made to have a contact with the casing 12B,

at this state, the bent and cut ends 12D1 are somewhat deformed so that they catch and provisionally fix the FW 6A,

and then, the bent and cut ends 12D1 and the FW 6A are soldered together.

Thus, the FW 6A is provisionally fixed with its tip end making contact with the casing 12B, and then it is soldered at the bent and cut ends 12D1. As the result, the FW 6A may have least dispersion in the length of a portion for connection to ST 12; accordingly, a portion connecting the voice coil 3 and the ST

12 also has a stable length.

Thus, the present embodiment provides the FW 6A with a certain specific length required for a trustworthy connection to ST 12 on a stable basis, providing the same advantage obtained in the third embodiment.

The wall 12G1 dissipates the heat, and the cut-portion 12F1 curtails conduction of soldering heat to the casing 12B preventing deformation of the casing 12B due to the heat. Resultant troubles in insertion and pulling out of a connector can also be avoided. A possible trouble to be caused by a bent tip end of the FW 6A making contact with an adjacent terminal plate 12A2 can be prevented by the wall 12G1, as the tip end of FW 6A can sometimes be bent by a heat applied for soldering the FW 6A after it is provisionally fixed by the bent and cut ends 12D1.

The above-configured STs in the third and fourth embodiments can be used as well in such other types of speakers which have no relay portion and no needs of placing a ST at the front part. The ST may be employed in an arrangement as illustrated in FIG. 10. It provides the FW 6A with a certain regulated length on a stable basis, and effectively prevents generation of abnormal sounds caused by contacting with the neighboring components.

INDUSTRIAL APPLICABILITY

A speaker in accordance with the present invention clamps and fixes the FW with a clamping section, and regulates position of the FW with a wall section. Thereby, a relay cord can be eliminated contributing to a decreased number of components, and facilitating an easy assembly operation. Colliding of FWs with neighboring components during operation can be avoided to prevent abnormal sounds.

A slope provided at the clamping section in at least one of the opening faces, and a protrusion provided therein make insertion and fitting of FW into the clamping section easier, and prevent pulling out of FW therefrom.

A flat porch formed by extending the lower face of opening at the

clamping section functions as a guide plate for inserting a FW into the opening, making the inserting operation easier.

A pair of grooves, or a protrusion, formed in the wall of clamping section along the running direction of FW contributes to prevent the FW from leaning to the right/left directions, and facilitates precise placement regulation for the FW. It also contributes for preventing the uncoated FWs from making mutual contact.

A through hole provided underneath the clamping section makes it easier to observe the state of FW clamped.

With the speaker terminals comprising a terminal plate provided with bent and cut ends and an upright wall, the length of FW between ST and voice coil can be regulated to a certain specific length on a stable basis. Thereby, the quality dispersion due to the above-described specific length of FW can be effectively suppressed, and speakers are provided with least quality dispersion.

CLAIMS:

1. A loudspeaker comprising:
a flexible wire connected at one end with a coil of a voice coil while at another end with a speaker terminal mounted on a frame; and
a relay portion provided on said frame at a place between said voice coil and said speaker terminal, said relay portion comprising a flat section and a wall section,
wherein a clamping section for clamping the flexible wire is formed on the flat section and a pair of slanting grooves is formed on the wall section, said grooves being formed to a direction along a pair of flexible wires disposed therein.
2. The loudspeaker of claim 1, wherein said relay portion is further provided with a slope at an opening of the clamping section.
3. The speaker of claim 1, wherein a flat porch is provided by extending a lower plane of the opening of said relay portion.
4. The speaker of claim 1, wherein a protrusion is provided on the wall section of said relay portion for preventing said pair of flexible wires from making mutual contact, in the direction along said pair of flexible wires.
5. The speaker of claim 1, wherein said relay portion is further provided with a through hole beneath the clamping section.
6. The speaker of claim 1, wherein said speaker terminal further comprises;
a casing having an opening; and

a terminal plate integrated in said casing, said terminal plate comprising at one end, a terminal protruding within said casing for receiving electrical signals from an external sound source, at another end, bent and cut ends extruding out of the casing, and an upright wall provided to stand straight ahead of said bent and cut ends towards said casing.

7. The speaker of claim 6, wherein said terminal plate of the speaker terminal is provided with a cut-portion at a place between the upright wall and the bent and cut ends.

8. The speaker of claim 1, wherein said speaker terminal further comprises:
a casing having an opening; and

a pair of terminal plates integrated in said casing, said terminal plate comprising at one end, a terminal protruding within said casing for receiving electrical signals from an external sound source, at another end, bent and cut ends extruding out of the casing, and a wall provided at another terminal plate side formed in a place between said bent and cut ends and said casing.

9. The speaker of claim 8, wherein said terminal plate of the speaker terminal is provided with a cut-portion at a place between the bent and cut ends and the casing.