REPLACED SHEETS SG
☑ Description : paged 1 to paged 13
☑ Claim(s) : paged 14 to paged 17
☐ Drawing(s) : paged ..... to paged .....
☑ Abstract : paged 18 to paged -

9703443-3
IPOS
51172

LOUDSPEAKER INSTALLING DEVICE

BACKGROUND OF THE INVENTION

The present invention relates to a loudspeaker installing device for fixing a loudspeaker around the bottom plate of a TV cabinet, for example, slantingly and downward, and more specifically, relates to a loudspeaker installing device capable of installation and removal easily without using tools.

Fig. 14 is a perspective view schematically showing a conventional loudspeaker installing device for slantingly and downward fixing a loudspeaker 104 around a bottom plate 102 of a cabinet 101 having the bottom plate 102 and a side plate 103.

As shown in Fig. 14, in the conventional loudspeaker installing device, the loudspeaker 104 is positioned on an inclined support 105 within the cabinet 101; one edge of the loudspeaker 104 is held down by means of a rib 106 provided inside the side plate 103 of the cabinet 101, and the other edge of the loudspeaker 104 is fixed to the support 105 by means of a screw 108 with a washer 107.

In the conventional loudspeaker installing device cited above, however, the loudspeaker 104 is fixed to the support 105 within the cabinet by means of the screw 108. Thus, working efficiency during the assembly process is

This Sheet Has Been Replaced

lowered. Further, various tools such as a screwdriver are required in the assembly process. Especially when a loudspeaker is installed under a TV cathode-ray tube, it is difficult to use a screwdriver, thereby causing a burden on a worker. Alternatively, the screwdriver can not be used, so that specialized tools are required.

SUMMARY OF THE INVENTION

The present invention has been made to solve the above-mentioned problems of the prior art. It is therefore an object of the present invention to provide a loudspeaker installing device capable of improving the working efficiency during the assembly process, and installing or removing a loudspeaker without using tools.

According to the present invention, a loudspeaker installing device has: a support member having a first support surface and a second support surface extending differently from the first support surface; fixing means for fixing a loudspeaker to the support member; wherein, the fixing means comprises: an engaging portion provided on the first support surface of the support member to be engaged with the first edge of the loudspeaker; a fitting portion provided on the second support surface of the support member; and a fastening member to be fitted into the fitting portion, for providing a force for pressing down the second

This Sheet Has Been Replaced

edge of the loudspeaker onto the second support surface of the support member.

BRIEF EXPLANATION OF THE DRAWINGS

The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only, and thus are not limitative of the present invention, and wherein:

Fig. 1 is a perspective view schematically showing a loudspeaker installing device according to the first embodiment of the present invention;

Fig. 2 is a schematic sectional view of Fig. 1 through a line S_2-S_2;

Fig. 3 is a perspective view showing a process for fitting a fastening piece into fitting openings;

Fig. 4 is a perspective view showing a process for fitting the fastening piece into the fitting openings;

Fig. 5 is a perspective view showing a process for fitting the fastening piece into the fitting openings;

Fig. 6 is a perspective view showing the bottom plate of a loudspeaker installing device according to the second embodiment of the present invention;

Fig. 7 is a side view (corresponding to a partial sectional view of Fig. 6 through a line S_7-S_7) when the

This Sheet Has Been Replaced

fastening piece is fitted into the bottom plate in Fig. 6;

Fig. 8 is a plan view of Fig. 7;

Fig. 9 is a perspective view showing the bottom plate of a loudspeaker installing device according to the third embodiment of the present invention;

Figs. 10A and 10B are drawings illustrating Fig. 9 through a line S_{10A}-S_{10A} and a line S_{10B}-S_{10B} showing the state in the course of sliding the fastening piece 13 toward the fitting portions;

Figs. 11A and 11B are drawings illustrating Fig. 9 through the line S_{10A}-S_{10A} and the line S_{10B}-S_{10B} showing the state in which the fastening piece 13 is fitted into the fitting portions;

Fig. 12 is a perspective view showing the construction of the fastening piece according to the fourth embodiment of the present invention;

Fig. 13 is a drawing showing Fig. 12 through a line S_{13}-S_{13}; and

Fig. 14 is a perspective view showing a conventional loudspeaker installing device.

DETAILED DESCRIPTION OF THE INVENTION

Further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that

This Sheet Has Been Replaced

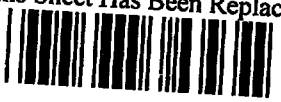
the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications will become apparent to those skilled in the art from the detailed description.

First Embodiment

Fig. 1 is a perspective view schematically showing a loudspeaker installing device according to the first embodiment of the present invention. Fig. 2 is a schematic sectional view of Fig. 1 through a line S_2-S_2. Figs. 3 through 5 are perspective views showing a procedure for fitting a fastening piece into fitting openings.

As shown in the drawings, the loudspeaker installing device according to the first embodiment has a cabinet 1 having a bottom plate 2 and a side plate 3, and an installing structure for fixing a loudspeaker 4 to the inside of the cabinet 1. The cabinet 1 is a TV cabinet, for example. However, it may be the cabinet for other devices. The locations for installing the loudspeaker 4 are around the bottom corner of the cabinet 1, as shown in Figs. 1 and 2. However, if the loudspeaker 4 can be fixed using at least two locations which are different in height, other locations may be used. The cabinet 1 is an integral unit made of, for example, plastic. However, the material for the cabinet 1

This Sheet Has Been Replaced



may be other material such as a metal, and the bottom plate 2 and the side plate 3 may comprise different members.

The above-mentioned installing device includes a positioning structure 5 provided on the side plate 3 for determining the positions for installing the loudspeaker 4 and a fastening structure 6 for fixing to the cabinet 1 the loudspeaker 4 positioned at predetermined installing positions by the positioning structure 5.

The positioning structure 5 is integrated into or bonded to the side plate 3, and has a tubular sound-conducting rib 7 to be brought into contact with a front surface 4a (i.e., a surface on the side of the side plate 3) of the loudspeaker 4. The positioning structure 5 is integrated into or bonded to the side plate 3 and has positioning ribs 8, 9 and 10 to be brought into contact with edges 4b, 4c and 4d of the loudspeaker 4. As shown in Fig. 2, a plurality of perforations 3a are formed within the sound-conducting rib 7 on the side plate 3 of the cabinet 1.

The fastening structure 6 has openings 11 and 12 formed on the bottom plate 2 and a fastening piece 13 for fixing the loudspeaker by being fitted into the openings 11 and 12.

Each of the openings 11 and 12 has an inserting portion 11a or 12a having a size to allow insertion of the fastening piece 13 and a fitting portion 11b or 12b connected to the

This Sheet Has Been Replaced

inserting portion 11a or 12a and into which the fastening piece 13 can be fitted by being slid from the inserting portions 11a and 12a.

The fastening piece 13 has a base 13a to be brought into contact with the top surface (or inner surface) of the bottom plate 2 and two legs 13b and 13c extending from this base 13a toward the openings 11 and 12, bent portions 13d and 13e extending from the ends of the legs 13b and 13c and to be brought into contact with the bottom surface (or outer surface) of the bottom plate 2, and a projection 13f for pressing down the loudspeaker 4. The fastening piece 13 is made of an elastic material such as, for example, plastic or a metal. The distance from the bottom surface of the base 13a of the fastening piece 13 to the top surface of the bent portion 13d or 13e is preferably substantially equal to or slightly smaller than the thickness from the top surface to the bottom surface of the bottom plate.

In the assembly process for fixing the loudspeaker 4 to the cabinet 1, the loudspeaker 4 is first positioned so as to be brought into contact with the sound-conducting rib 7 and the positioning ribs 8, 9 and 10 and thereby fixed temporarily. Next, the legs 13b and 13c of the fastening piece 13 shown in Fig. 3 are inserted into the inserting portions 11a and 12b of the openings 11 and 12, as shown in Fig. 4. Then, the fastening piece 13 shown in Fig. 4 is

This Sheet Has Been Replaced

slid from the inserting portions 11a and 12a to the fitting portions 11b and 12b, as shown in Fig. 5.

As shown in Fig. 5, in the fastening piece 13 slid to the fitting portions 11b and 12b, the bottom surface of the base 13a is brought into contact with the top surface of the bottom plate 2, the top surfaces of the bent portions 13d and 13e are brought into contact with the bottom surface of the bottom plate 2, and the fastening piece 13 is fitted into the fitting portions 11b and 12b by means of the elasticity of the fastening piece 13. In this state, the projection 13f of the fastening piece 13 presses down the edge of the loudspeaker 4 onto the bottom plate 2. Consequently, the loudspeaker 4 is fixed around the bottom corner of the cabinet 1 slantingly and downward by means of the sound-conducting rib 7, positioning ribs 8, 9, 10, and fastening piece 13.

The disassembly process for removing the loudspeaker 4 from the cabinet 1 is performed by the procedures being reverse of the assembly process described above.

As described above, according to the loudspeaker installing device of the first embodiment, working efficiency during the assembly process can be improved, and no tools are required.

The shapes of the fastening piece 13 and the openings 11 and 12 are not limited to the ones illustrated in the

This Sheet Has Been Replaced

drawings. Other shapes can be used if the fastening piece is of such a structure that it can be fitted into the base plate 2 by means of its elasticity and can press down the loudspeaker 4 during that time.

Second Embodiment

Fig. 6 is a perspective view showing the bottom plate of a loudspeaker installing device according to the second embodiment of the present invention. Fig. 7 (corresponding to a partial sectional view of Fig. 6 through a line S_7-S_7) is a side view when the fastening piece is fitted into the bottom plate in Fig. 6, and Fig. 8 is a plan view of Fig. 7.

As shown in Fig. 6, in the loudspeaker installing device according to the second embodiment, the bottom plate 2 has projections 21 and 22 projecting within the fitting portions 11b and 12b of the openings 11 and 12 and to be brought into contact with the fastening piece 13 at the portions on the side of the inserting portions 11a and 12a. As shown in Fig. 6, the projections 21 and 22 are, for example, semicylindrical with their axes perpendicular to the bottom plate 2. However, the shapes of the projections 21 and 22 are not limited to these.

The fitting procedure of the fastening piece 13 is as shown in Figs. 3 through 5. The loudspeaker 4 is

This Sheet Has Been Replaced

positioned so as to be brought into contact with the sound-conducting rib 7 and the positioning ribs 8, 9 and 10. The legs 13b and 13c of the fastening piece 13 are inserted into the inserting portions 11a and 12a of the openings 11 and 12, and the fastening piece 13 is slid from the inserting portions 11a and 12a to the fitting portions 11b and 12b. During this slide, the legs 13b and 13c of the fastening piece 13 hit the projections 21 and 22, thereby subjecting to an elastic deformation. The fastening piece 13 is further slid to cancel the elastic deformation immediately after the legs 13b and 13c have passed through the projections 21 and 22, so that the fastening piece 13 is fitted into the fitting portions 11b and 12b.

As shown in Figs. 7 and 8, the projections 21 and 22 are brought into contact with the edges of the fastening piece 13 on the side of the inserting portions 11a and 12a, so that it is difficult to detach the fastening piece 13 fitted into the fitting portions.

The second embodiment is the same as the first embodiment except for the above-mentioned respect.

Third Embodiment

Fig. 9 is a perspective view showing the bottom plate of a loudspeaker installing device according to the third embodiment. Figs. 10A and 10B are drawings of Fig. 9 through

This Sheet Has Been Replaced

a line S_{10A}-S_{10A} and a line S_{10B}-S_{10B} showing the state in the course of sliding the fastening piece toward the fitting portions. Figs. 11A and 11B are drawings of Fig. 9 through the line S_{10A}-S_{10A} and the line S_{10B}-S_{10B} showing the state in which the fastening piece is fitted into the fitting portions.

As shown in Fig. 9, the loudspeaker installing device according to the third embodiment has inclined parts 31 and 32 on the bottom surface of the bottom plate 2, for reducing the thickness from a top surface 2a to a bottom surface 2b of the bottom plate 2 in the inserting portions 11a and 12a and for progressively increasing the thickness toward the fitting portions 11b and 12b. The distance between the base 13a and the bent portion 13d (or 13e) of the fastening piece 13 is between the minimum and the maximum of the thickness of the bottom plate 2 in the inclined parts 31 or 32, or within the thickness of the bottom plate 2 in the inclined parts 31 or 32.

The fitting procedure of the fastening piece 13 is as shown in Figs. 3 through 5; the loudspeaker 4 is positioned so as to be brought into contact with the sound-conducting rib 7 and the positioning ribs 8, 9 and 10. The legs 13b and 13c of the fastening piece 13 are inserted into the inserting portions 11a and 12a of the openings 11 and 12, and the fastening piece 13 is slid from the inserting portions

This Sheet Has Been Replaced

11a and 12a to the fitting portions 11b and 12b. During this slide, the legs 13b and 13c of the fastening piece 13 first hit the inclined parts 31 and 32 as shown in Fig. 10A and 10B, then the bent portions 13d and 13e and the legs 13b and 13c are subject to an elastic deformation, and then the fastening piece 13 is fitted into the fitting portions, so that the fastening piece 13 is fixed to the bottom plate 2 securely by means of the elasticity of the fastening piece 13 as shown in Figs. 11A and 11B.

According to the loudspeaker installing device of the third embodiment, the process for sliding the fastening piece 13 within the openings 11 and 12 is facilitated, and moreover, the fastening piece 13 can be fixed to the bottom plate 2 securely.

The third embodiment is the same as the first embodiment described above except for the above-mentioned respect. The third embodiment may also be combined with the second embodiment.

Fourth Embodiment

Fig. 12 is a perspective view showing the construction of the fastening piece 13 according to the fourth embodiment of the present invention. Fig. 13 is an enlarged sectional view of Fig. 12 through a line S_{13}-S_{13}. The fourth embodiment is different from the first through third embodiments

This Sheet Has Been Replaced

described above only in that the fastening piece 13 before being fitted into the fitting portions of the bottom plate 2 is integrated into the cabinet 1. The fastening piece 13 and the cabinet 1 are made of, for example, plastic, and they are integrally coupled together through a thin part 41 shown in Fig. 13. Since the fastening piece 13 can be cut off from the cabinet 1 for use in fixing the loudspeaker 4, working efficiency is improved, and the fastening piece 13 is available at low cost.

The fourth embodiment is the same as the first through third embodiments described above except for the above-mentioned respect.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of following claims.

This Sheet Has Been Replaced

WHAT IS CLAIMED IS:

1. A loudspeaker installing device comprising:

a support member having a first support surface and a second support surface extending differently from the first support surface; and

fixing means for fixing a loudspeaker to the support member;

wherein the fixing means comprises:

an engaging portion provided on the first support surface of the supporting member to be engaged with a first edge of the loudspeaker;

a fitting portion provided on the second support surface of the support member; and

a fastening member to be fitted into the fitting portion, for providing a force for pressing down the second edge of the loudspeaker onto the second support surface of the support member.

2. The loudspeaker installing device as set forth in claim 1, wherein the engaging portion comprises:

a contact portion to be brought into contact with a surface of the loudspeaker on a side of the first support surface; and

a positioning portion to be brought into contact with

This Sheet Has Been Replaced

the first edge of the loudspeaker.

3. The loudspeaker installing device as set forth in claim 1 or claim 2, wherein the fitting portion comprises:

a first opening formed on the second support surface of the support member to allow the fastening member to be inserted thereinto; and

a second opening formed on the second support surface of the support member and connected to the first opening to allow the fastening member to be fitted thereinto by sliding the fastening member from the first opening; and wherein,

when the fastening member is fitted into the second opening, the fastening member presses down the second edge of the loudspeaker onto the second surface.

4. The loudspeaker installing device as set forth in any one of claims 1 through 3, wherein the fastening member comprises:

a bent portion to be fitted into the fitting portion;

a projection to be brought into contact with the loudspeaker when the fastening member is fitted into the fitting portion.

5. The loudspeaker installing device as set forth in

This Sheet Has Been Replaced

claim 3, wherein the support member has a projection projecting within the second opening and to be brought into contact with an edge of the fastening member fitted into the second opening on a side of the first opening.

6. The loudspeaker installing device as set forth in any one of claims 1 through 5, wherein

the second support surface of the support member is shaped like a plate;

the fastening member has a first contact portion to be brought into contact with the second support surface and a second contact portion to be brought into contact with an opposite surface of the second support surface;

an inclined part reducing a thickness of the support member in the first opening and progressively increasing the thickness toward the second openings is formed on the opposite surface of the second support surface of the support member; and

a distance between the first contact portion and the second contact portion of the fastening member is between a minimum and a maximum of the thickness of the support member.

7. The loudspeaker installing device as set forth in any one of claims 1 through 6, wherein the fastening member before

This Sheet Has Been Replaced

fitted into the fitting portion is integrated into the support member.

This Sheet Has Been Replaced

ABSTRACT OF THE DISCLOSURE

A loudspeaker installing device has a fixing structure disposed on a side plate for fixing a loudspeaker to a cabinet, ribs to be engaged with the edges of the loudspeaker, openings provided on a bottom plate, and a fastening piece to be fitted into the openings for providing a force for pressing down the other edge of the loudspeaker onto the bottom plate.

This Sheet Has Been Replaced

FIG.1

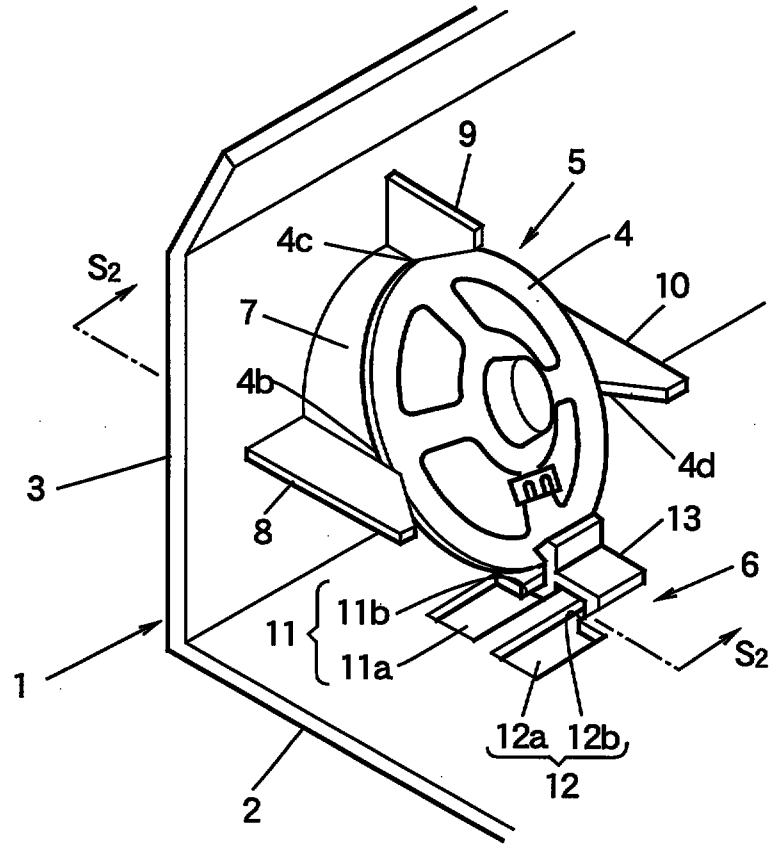

9
5
4c
4
10
S2
7
4b
4d
3
8
13
6
11
11b
11a
S2
1
12a
12b
12
2

FIG.2

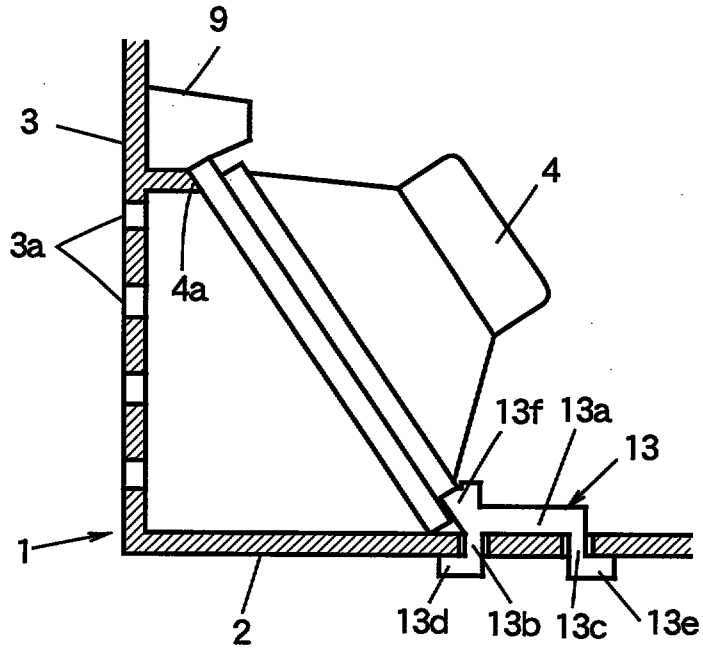

9
3
4
3a
4a
13f
13a
13
1
2
13d
13b
13c
13e

FIG.3

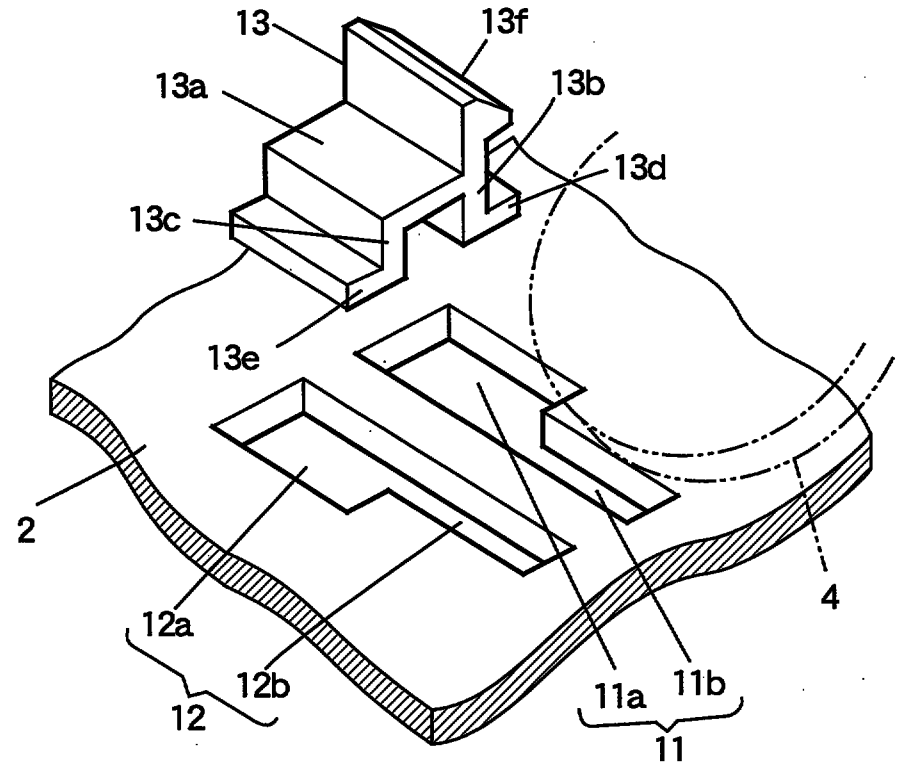

13
13f
13a
13b
13d
13c
13e
2
4
12a
12b
12
11a
11b
11

FIG.4

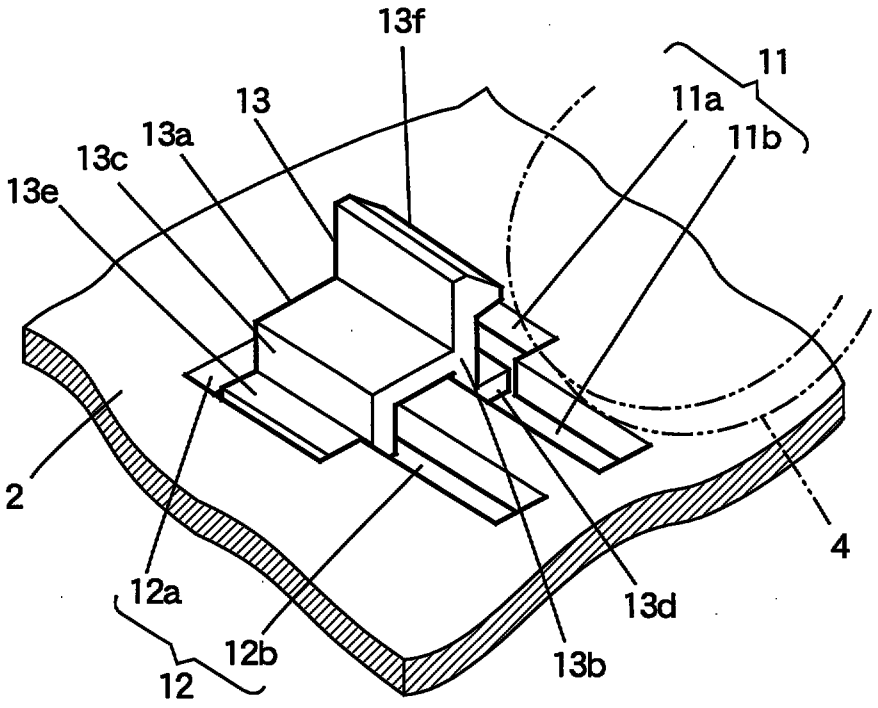

13f
11
13
11a
13a
11b
13c
13e
2
4
12a
13d
12b
13b
12

FIG.5

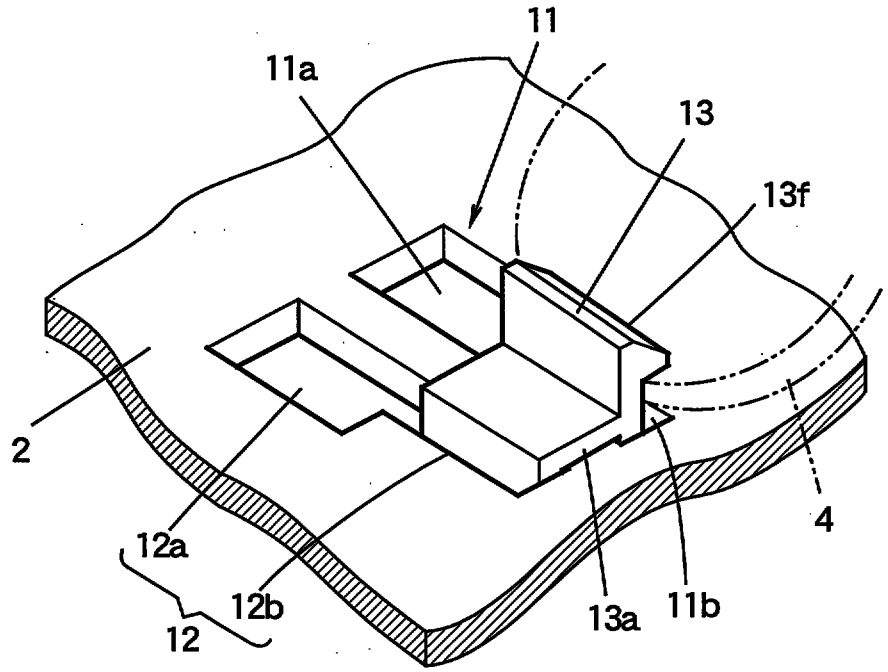

11
11a
13
13f
2
4
12a
12b
12
13a
11b

FIG.6

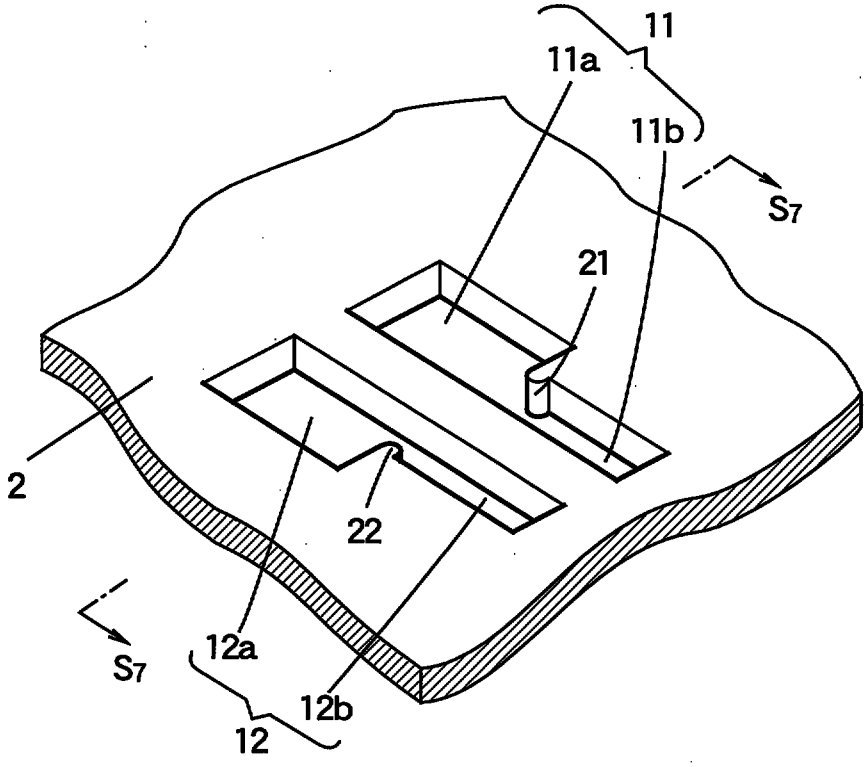

11
11a
11b
S7
21
2
22
S7
12a
12b
12

FIG.7

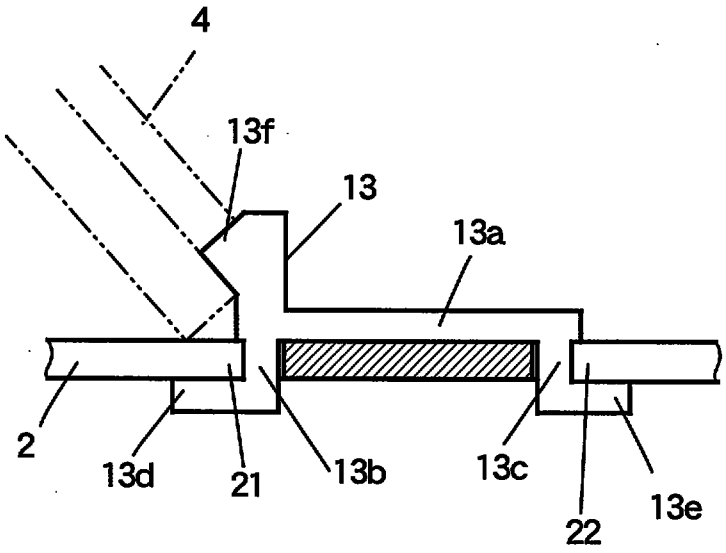


FIG.8

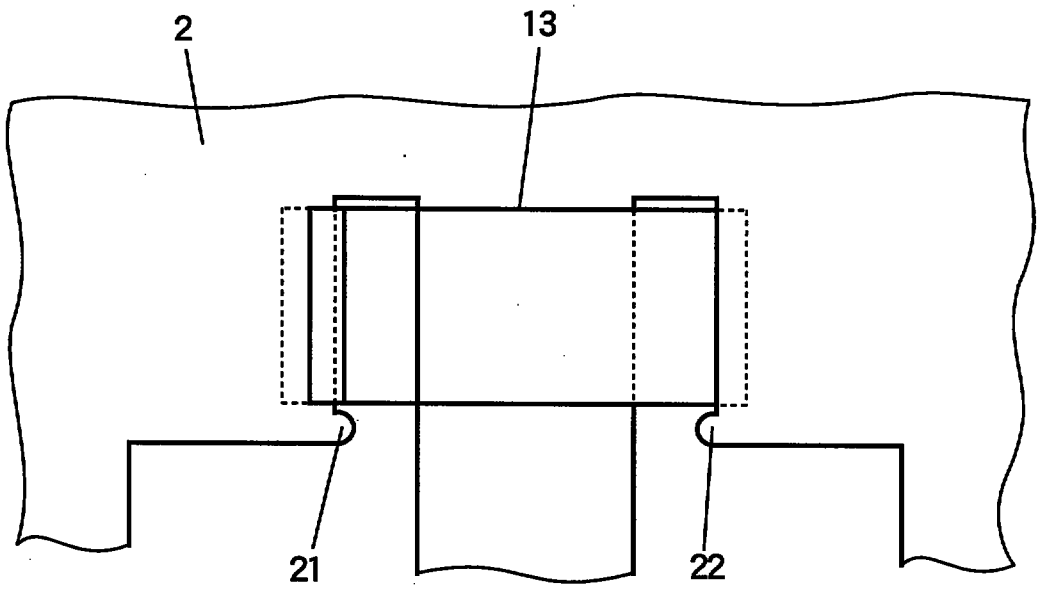


FIG.9

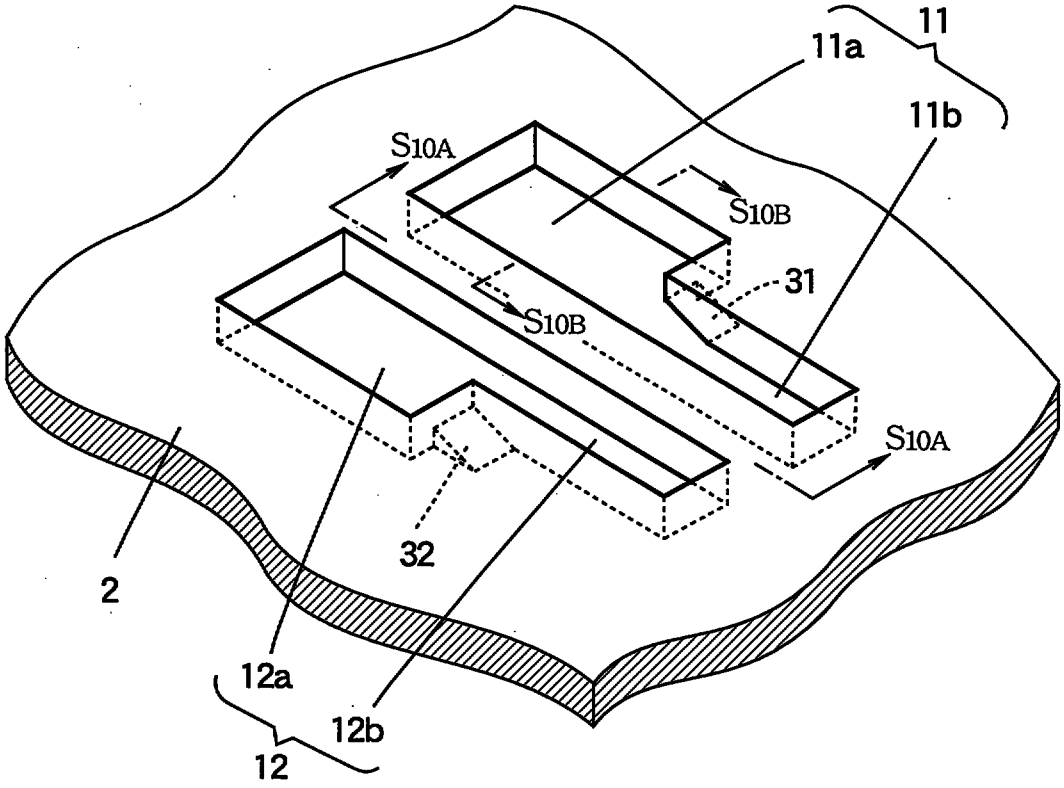


FIG.10A

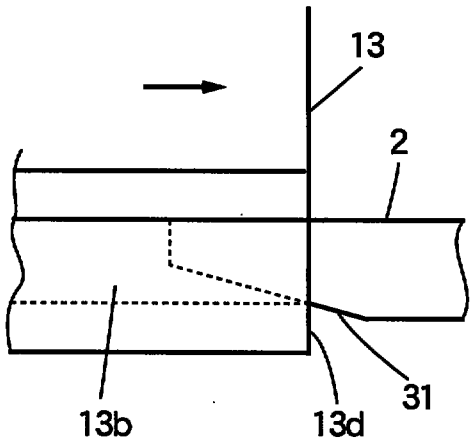


FIG.10B

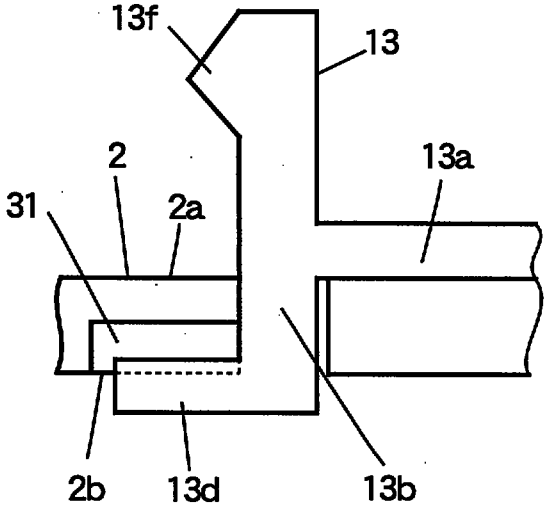


FIG.11A

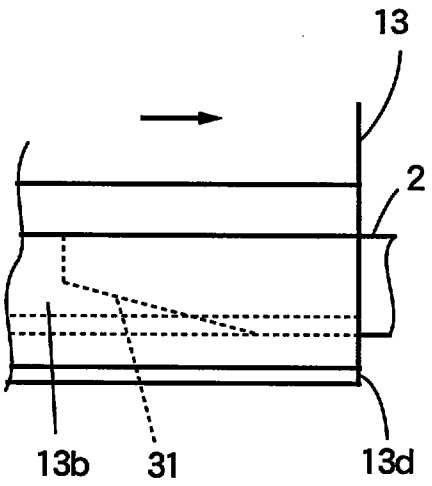


FIG.11B

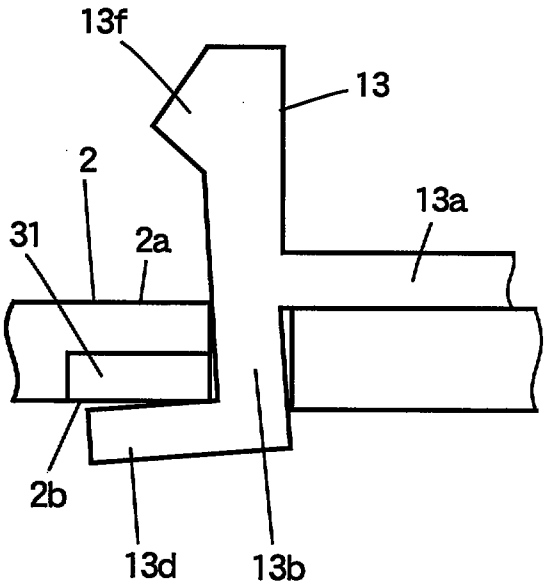


FIG.12

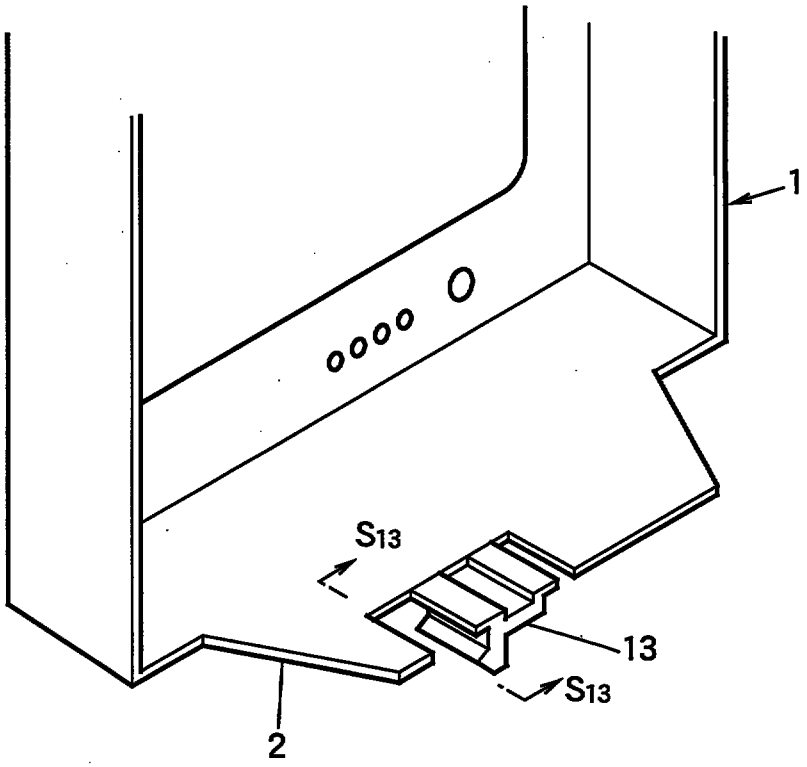


FIG.13

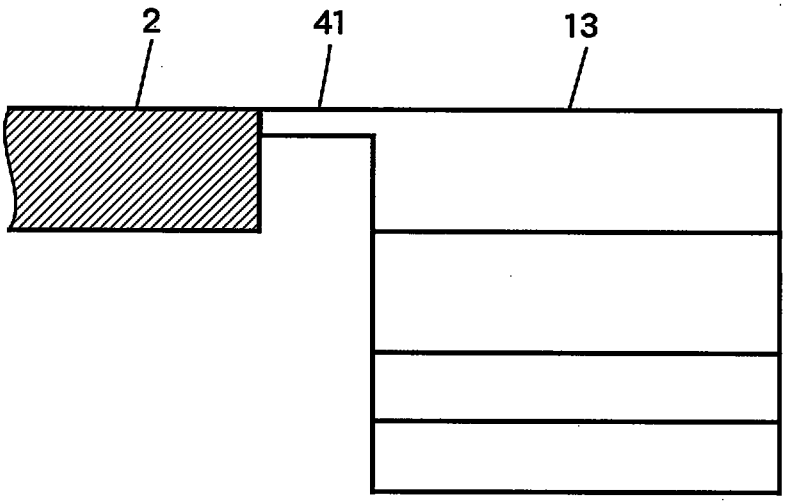
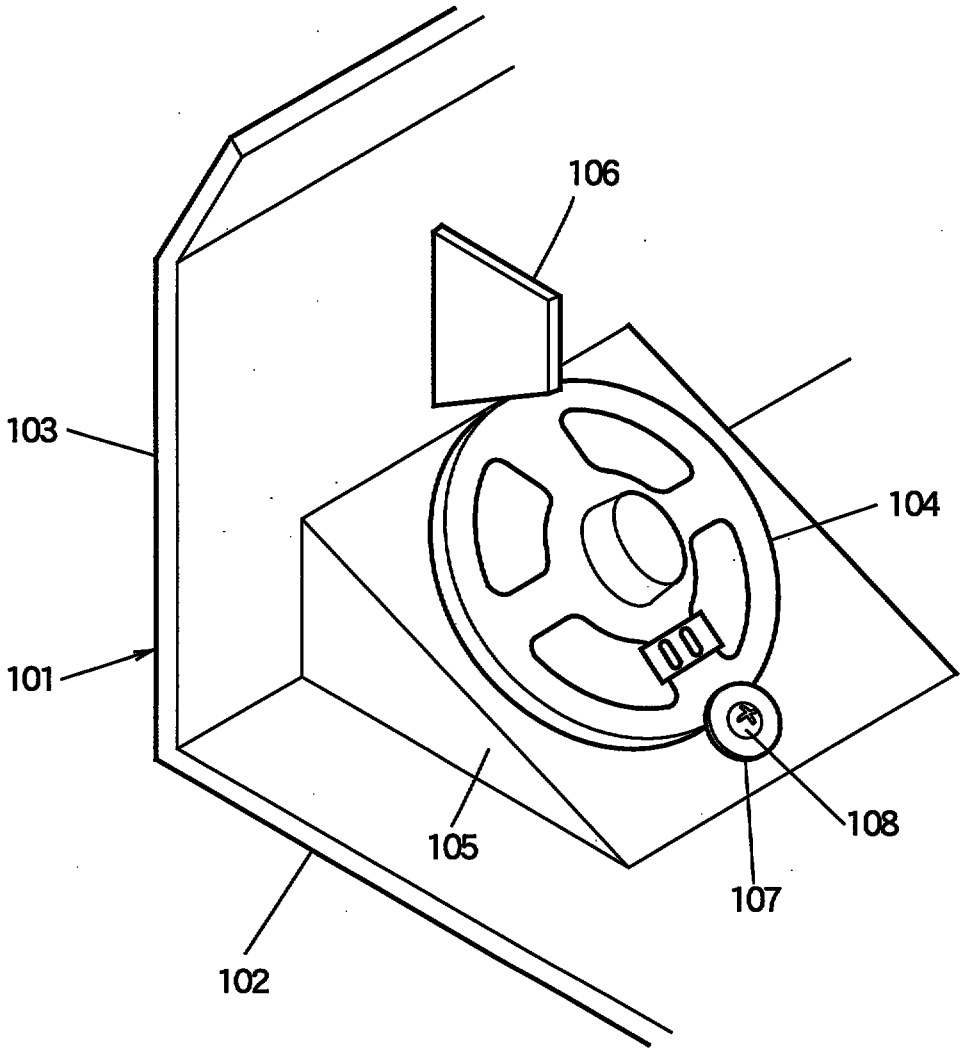


FIG.14



REPLACEMENT SHEETS SG
☑ Description : paged 1 to paged 13
☑ Claim(s) : paged 14 to paged 17
☐ Drawing(s) : paged ..... to paged .....
☑ Abstract : paged 18 to paged —
DATE OF RECEIPT 26/11/97

9703443-3
IPOS

REPLACEMENT SHEET
26 NOV 1997

LOUDSPEAKER INSTALLING DEVICE

BACKGROUND OF THE INVENTION

The present invention relates to a loudspeaker installing device for fixing a loudspeaker around the bottom plate of a TV cabinet, for example, slantingly and downward, and more specifically, relates to a loudspeaker installing device capable of installation and removal easily without using tools.

Fig. 14 is a perspective view schematically showing a conventional loudspeaker installing device for slantingly and downward fixing a loudspeaker 104 around a bottom plate 102 of a cabinet 101 having the bottom plate 102 and a side plate 103.

As shown in Fig. 14, in the conventional loudspeaker installing device, the loudspeaker 104 is positioned on an inclined support 105 within the cabinet 101; one edge of the loudspeaker 104 is held down by means of a rib 106 provided inside the side plate 103 of the cabinet 101, and the other edge of the loudspeaker 104 is fixed to the support 105 by means of a screw 108 with a washer 107.

In the conventional loudspeaker installing device cited above, however, the loudspeaker 104 is fixed to the support 105 within the cabinet by means of the screw 108. Thus, working efficiency during the assembly process is

REPLACEMENT SHEET
26 NOV 1997

lowered. Further, various tools such as a screwdriver are required in the assembly process. Especially when a loudspeaker is installed under a TV cathode-ray tube, it is difficult to use a screwdriver, thereby causing a burden on a worker. Alternatively, the screwdriver can not be used, so that specialized tools are required.

SUMMARY OF THE INVENTION

The present invention has been made to solve the above-mentioned problems of the prior art. It is therefore an object of the present invention to provide a loudspeaker installing device capable of improving the working efficiency during the assembly process, and installing or removing a loudspeaker without using tools.

According to the present invention, a loudspeaker installing device has: a support member having a first support surface and a second support surface extending differently from the first support surface; fixing means for fixing a loudspeaker to the support member; wherein, the fixing means comprises: an engaging portion provided on the first support surface of the support member to be engaged with the first edge of the loudspeaker; a fitting portion provided on the second support surface of the support member; and a fastening member to be fitted into the fitting portion, for providing a force for pressing down the second

REPLACEMENT SHEET
26 NOV 1997

edge of the loudspeaker onto the second support surface of the support member.

BRIEF EXPLANATION OF THE DRAWINGS

The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only, and thus are not limitative of the present invention, and wherein:

Fig. 1 is a perspective view schematically showing a loudspeaker installing device according to the first embodiment of the present invention;

Fig. 2 is a schematic sectional view of Fig. 1 through a line S_2-S_2;

Fig. 3 is a perspective view showing a process for fitting a fastening piece into fitting openings;

Fig. 4 is a perspective view showing a process for fitting the fastening piece into the fitting openings;

Fig. 5 is a perspective view showing a process for fitting the fastening piece into the fitting openings;

Fig. 6 is a perspective view showing the bottom plate of a loudspeaker installing device according to the second embodiment of the present invention;

Fig. 7 is a side view (corresponding to a partial sectional view of Fig. 6 through a line S_7-S_7) when the

fastening piece is fitted into the bottom plate in Fig. 6;

Fig. 8 is a plan view of Fig. 7;

Fig. 9 is a perspective view showing the bottom plate of a loudspeaker installing device according to the third embodiment of the present invention;

Figs. 10A and 10B are drawings illustrating Fig. 9 through a line S_{10A}-S_{10A} and a line S_{10B}-S_{10B} showing the state in the course of sliding the fastening piece 13 toward the fitting portions;

Figs. 11A and 11B are drawings illustrating Fig. 9 through the line S_{10A}-S_{10A} and the line S_{10B}-S_{10B} showing the state in which the fastening piece 13 is fitted into the fitting portions;

Fig. 12 is a perspective view showing the construction of the fastening piece according to the fourth embodiment of the present invention;

Fig. 13 is a drawing showing Fig. 12 through a line S_{13}-S_{13}; and

Fig. 14 is a perspective view showing a conventional loudspeaker installing device.

REPLACEMENT SHEET
26 NOV 1997

DETAILED DESCRIPTION OF THE INVENTION

Further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that

REPLACEMENT SHEET
26 NOV 1997

the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications will become apparent to those skilled in the art from the detailed description.

First Embodiment

Fig. 1 is a perspective view schematically showing a loudspeaker installing device according to the first embodiment of the present invention. Fig. 2 is a schematic sectional view of Fig. 1 through a line S_2-S_2. Figs. 3 through 5 are perspective views showing a procedure for fitting a fastening piece into fitting openings.

As shown in the drawings, the loudspeaker installing device according to the first embodiment has a cabinet 1 having a bottom plate 2 and a side plate 3, and an installing structure for fixing a loudspeaker 4 to the inside of the cabinet 1. The cabinet 1 is a TV cabinet, for example. However, it may be the cabinet for other devices. The locations for installing the loudspeaker 4 are around the bottom corner of the cabinet 1, as shown in Figs. 1 and 2. However, if the loudspeaker 4 can be fixed using at least two locations which are different in height, other locations may be used. The cabinet 1 is an integral unit made of, for example, plastic. However, the material for the cabinet 1

REPLACEMENT SHEET
26 NOV 1997

may be other material such as a metal, and the bottom plate 2 and the side plate 3 may comprise different members.

The above-mentioned installing device includes a positioning structure 5 provided on the side plate 3 for determining the positions for installing the loudspeaker 4 and a fastening structure 6 for fixing to the cabinet 1 the loudspeaker 4 positioned at predetermined installing positions by the positioning structure 5.

The positioning structure 5 is integrated into or bonded to the side plate 3, and has a tubular sound-conducting rib 7 to be brought into contact with a front surface 4a (i.e., a surface on the side of the side plate 3) of the loudspeaker 4. The positioning structure 5 is integrated into or bonded to the side plate 3 and has positioning ribs 8, 9 and 10 to be brought into contact with edges 4b, 4c and 4d of the loudspeaker 4. As shown in Fig. 2, a plurality of perforations 3a are formed within the sound-conducting rib 7 on the side plate 3 of the cabinet 1.

The fastening structure 6 has openings 11 and 12 formed on the bottom plate 2 and a fastening piece 13 for fixing the loudspeaker by being fitted into the openings 11 and 12.

Each of the openings 11 and 12 has an inserting portion 11a or 12a having a size to allow insertion of the fastening piece 13 and a fitting portion 11b or 12b connected to the

REPLACEMENT SHEET
26 NOV 1997

inserting portion 11a or 12a and into which the fastening piece 13 can be fitted by being slid from the inserting portions 11a and 12a.

The fastening piece 13 has a base 13a to be brought into contact with the top surface (or inner surface) of the bottom plate 2 and two legs 13b and 13c extending from this base 13a toward the openings 11 and 12, bent portions 13d and 13e extending from the ends of the legs 13b and 13c and to be brought into contact with the bottom surface (or outer surface) of the bottom plate 2, and a projection 13f for pressing down the loudspeaker 4. The fastening piece 13 is made of an elastic material such as, for example, plastic or a metal. The distance from the bottom surface of the base 13a of the fastening piece 13 to the top surface of the bent portion 13d or 13e is preferably substantially equal to or slightly smaller than the thickness from the top surface to the bottom surface of the bottom plate.

In the assembly process for fixing the loudspeaker 4 to the cabinet 1, the loudspeaker 4 is first positioned so as to be brought into contact with the sound-conducting rib 7 and the positioning ribs 8, 9 and 10 and thereby fixed temporarily. Next, the legs 13b and 13c of the fastening piece 13 shown in Fig. 3 are inserted into the inserting portions 11a and 12b of the openings 11 and 12, as shown in Fig. 4. Then, the fastening piece 13 shown in Fig. 4 is

REPLACEMENT SHEET
26 NOV 1997

slid from the inserting portions 11a and 12a to the fitting portions 11b and 12b, as shown in Fig. 5.

As shown in Fig. 5, in the fastening piece 13 slid to the fitting portions 11b and 12b, the bottom surface of the base 13a is brought into contact with the top surface of the bottom plate 2, the top surfaces of the bent portions 13d and 13e are brought into contact with the bottom surface of the bottom plate 2, and the fastening piece 13 is fitted into the fitting portions 11b and 12b by means of the elasticity of the fastening piece 13. In this state, the projection 13f of the fastening piece 13 presses down the edge of the loudspeaker 4 onto the bottom plate 2. Consequently, the loudspeaker 4 is fixed around the bottom corner of the cabinet 1 slantingly and downward by means of the sound-conducting rib 7, positioning ribs 8, 9, 10, and fastening piece 13.

The disassembly process for removing the loudspeaker 4 from the cabinet 1 is performed by the procedures being reverse of the assembly process described above.

As described above, according to the loudspeaker installing device of the first embodiment, working efficiency during the assembly process can be improved, and no tools are required.

The shapes of the fastening piece 13 and the openings 11 and 12 are not limited to the ones illustrated in the

REPLACEMENT SHEET
26 NOV 1997

drawings. Other shapes can be used if the fastening piece is of such a structure that it can be fitted into the base plate 2 by means of its elasticity and can press down the loudspeaker 4 during that time.

Second Embodiment

Fig. 6 is a perspective view showing the bottom plate of a loudspeaker installing device according to the second embodiment of the present invention. Fig. 7 (corresponding to a partial sectional view of Fig. 6 through a line S_7-S_7) is a side view when the fastening piece is fitted into the bottom plate in Fig. 6, and Fig. 8 is a plan view of Fig. 7.

As shown in Fig. 6, in the loudspeaker installing device according to the second embodiment, the bottom plate 2 has projections 21 and 22 projecting within the fitting portions 11b and 12b of the openings 11 and 12 and to be brought into contact with the fastening piece 13 at the portions on the side of the inserting portions 11a and 12a. As shown in Fig. 6, the projections 21 and 22 are, for example, semicylindrical with their axes perpendicular to the bottom plate 2. However, the shapes of the projections 21 and 22 are not limited to these.

The fitting procedure of the fastening piece 13 is as shown in Figs. 3 through 5. The loudspeaker 4 is

REPLACEMENT SHEET
26 NOV 1997

positioned so as to be brought into contact with the sound-conducting rib 7 and the positioning ribs 8, 9 and 10. The legs 13b and 13c of the fastening piece 13 are inserted into the inserting portions 11a and 12a of the openings 11 and 12, and the fastening piece 13 is slid from the inserting portions 11a and 12a to the fitting portions 11b and 12b. During this slide, the legs 13b and 13c of the fastening piece 13 hit the projections 21 and 22, thereby subjecting to an elastic deformation. The fastening piece 13 is further slid to cancel the elastic deformation immediately after the legs 13b and 13c have passed through the projections 21 and 22, so that the fastening piece 13 is fitted into the fitting portions 11b and 12b.

As shown in Figs. 7 and 8, the projections 21 and 22 are brought into contact with the edges of the fastening piece 13 on the side of the inserting portions 11a and 12a, so that it is difficult to detach the fastening piece 13 fitted into the fitting portions.

The second embodiment is the same as the first embodiment except for the above-mentioned respect.

Third Embodiment

Fig. 9 is a perspective view showing the bottom plate of a loudspeaker installing device according to the third embodiment. Figs. 10A and 10B are drawings of Fig. 9 through

PLACE IT SHEET
26 NOV 1997

a line S_{10A}-S_{10A} and a line S_{10B}-S_{10B} showing the state in the course of sliding the fastening piece toward the fitting portions. Figs. 11A and 11B are drawings of Fig. 9 through the line S_{10A}-S_{10A} and the line S_{10B}-S_{10B} showing the state in which the fastening piece is fitted into the fitting portions.

As shown in Fig. 9, the loudspeaker installing device according to the third embodiment has inclined parts 31 and 32 on the bottom surface of the bottom plate 2, for reducing the thickness from a top surface 2a to a bottom surface 2b of the bottom plate 2 in the inserting portions 11a and 12a and for progressively increasing the thickness toward the fitting portions 11b and 12b. The distance between the base 13a and the bent portion 13d (or 13e) of the fastening piece 13 is between the minimum and the maximum of the thickness of the bottom plate 2 in the inclined parts 31 or 32, or within the thickness of the bottom plate 2 in the inclined parts 31 or 32.

The fitting procedure of the fastening piece 13 is as shown in Figs. 3 through 5; the loudspeaker 4 is positioned so as to be brought into contact with the sound-conducting rib 7 and the positioning ribs 8, 9 and 10. The legs 13b and 13c of the fastening piece 13 are inserted into the inserting portions 11a and 12a of the openings 11 and 12, and the fastening piece 13 is slid from the inserting portions

REPLACEMENT SHEET
26 NOV 1997

11a and 12a to the fitting portions 11b and 12b. During this slide, the legs 13b and 13c of the fastening piece 13 first hit the inclined parts 31 and 32 as shown in Fig. 10A and 10B, then the bent portions 13d and 13e and the legs 13b and 13c are subject to an elastic deformation, and then the fastening piece 13 is fitted into the fitting portions, so that the fastening piece 13 is fixed to the bottom plate 2 securely by means of the elasticity of the fastening piece 13 as shown in Figs. 11A and 11B.

According to the loudspeaker installing device of the third embodiment, the process for sliding the fastening piece 13 within the openings 11 and 12 is facilitated, and moreover, the fastening piece 13 can be fixed to the bottom plate 2 securely.

The third embodiment is the same as the first embodiment described above except for the above-mentioned respect. The third embodiment may also be combined with the second embodiment.

Fourth Embodiment

Fig. 12 is a perspective view showing the construction of the fastening piece 13 according to the fourth embodiment of the present invention. Fig. 13 is an enlarged sectional view of Fig. 12 through a line S_{13}-S_{13}. The fourth embodiment is different from the first through third embodiments

described above only in that the fastening piece 13 before being fitted into the fitting portions of the bottom plate 2 is integrated into the cabinet 1. The fastening piece 13 and the cabinet 1 are made of, for example, plastic, and they are integrally coupled together through a thin part 41 shown in Fig. 13. Since the fastening piece 13 can be cut off from the cabinet 1 for use in fixing the loudspeaker 4, working efficiency is improved, and the fastening piece 13 is available at low cost.

The fourth embodiment is the same as the first through third embodiments described above except for the above-mentioned respect.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of following claims.

REPLACEMENT SHEET
26 NOV 1997

REPLACEMENT SHEET
26 NOV 1997

* C L M S *

WHAT IS CLAIMED IS:

1. A loudspeaker installing device comprising:

a support member having a first support surface and a second support surface extending differently from the first support surface; and

fixing means for fixing a loudspeaker to the support member;

wherein the fixing means comprises:

an engaging portion provided on the first support surface of the supporting member to be engaged with a first edge of the loudspeaker;

a fitting portion provided on the second support surface of the support member; and

a fastening member to be fitted into the fitting portion, for providing a force for pressing down the second edge of the loudspeaker onto the second support surface of the support member.

2. The loudspeaker installing device as set forth in claim 1, wherein the engaging portion comprises:

a contact portion to be brought into contact with a surface of the loudspeaker on a side of the first support surface; and

a positioning portion to be brought into contact with

REPLACEMENT SHEET
26 NOV 1997

* C L M S *

the first edge of the loudspeaker.

3. The loudspeaker installing device as set forth in claim 1 or claim 2, wherein the fitting portion comprises:

a first opening formed on the second support surface of the support member to allow the fastening member to be inserted thereinto; and

a second opening formed on the second support surface of the support member and connected to the first opening to allow the fastening member to be fitted thereinto by sliding the fastening member from the first opening; and wherein,

when the fastening member is fitted into the second opening, the fastening member presses down the second edge of the loudspeaker onto the second surface.

4. The loudspeaker installing device as set forth in any one of claims 1 through 3, wherein the fastening member comprises:

a bent portion to be fitted into the fitting portion;

a projection to be brought into contact with the loudspeaker when the fastening member is fitted into the fitting portion.

5. The loudspeaker installing device as set forth in

REPLACEMENT SHEET
26 NOV 1997

* C L M S *

claim 3, wherein the support member has a projection projecting within the second opening and to be brought into contact with an edge of the fastening member fitted into the second opening on a side of the first opening.

6. The loudspeaker installing device as set forth in any one of claims 1 through 5, wherein

the second support surface of the support member is shaped like a plate;

the fastening member has a first contact portion to be brought into contact with the second support surface and a second contact portion to be brought into contact with an opposite surface of the second support surface;

an inclined part reducing a thickness of the support member in the first opening and progressively increasing the thickness toward the second openings is formed on the opposite surface of the second support surface of the support member; and

a distance between the first contact portion and the second contact portion of the fastening member is between a minimum and a maximum of the thickness of the support member.

7. The loudspeaker installing device as set forth in any one of claims 1 through 6, wherein the fastening member before

* C L M S *

fitted into the fitting portion is integrated into the support member.

REPLACEMENT SHEET
26 NOV 1997

LOUDSPEAKER INSTALLING DEVICE

ABSTRACT OF THE DISCLOSURE

A loudspeaker installing device has a fixing structure disposed on a side plate for fixing a loudspeaker to a cabinet, ribs to be engaged with the edges of the loudspeaker, openings provided on a bottom plate, and a fastening piece to be fitted into the openings for providing a force for pressing down the other edge of the loudspeaker onto the bottom plate.

FIG. 1

REPLACEMENT SHEET
26 NOV 1997