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A jack plug socket

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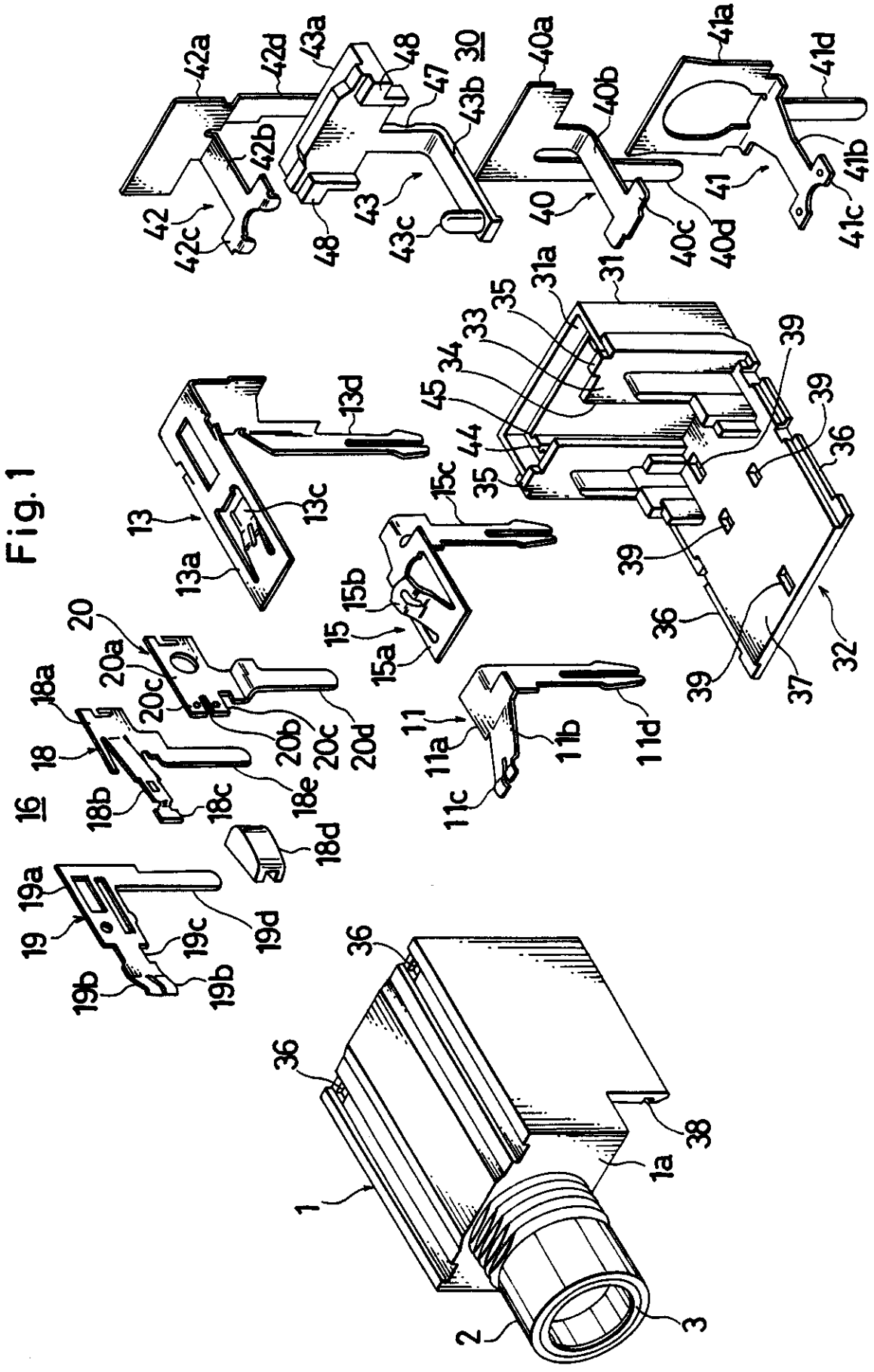
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20b
20c
20d
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16
11
11a
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1a
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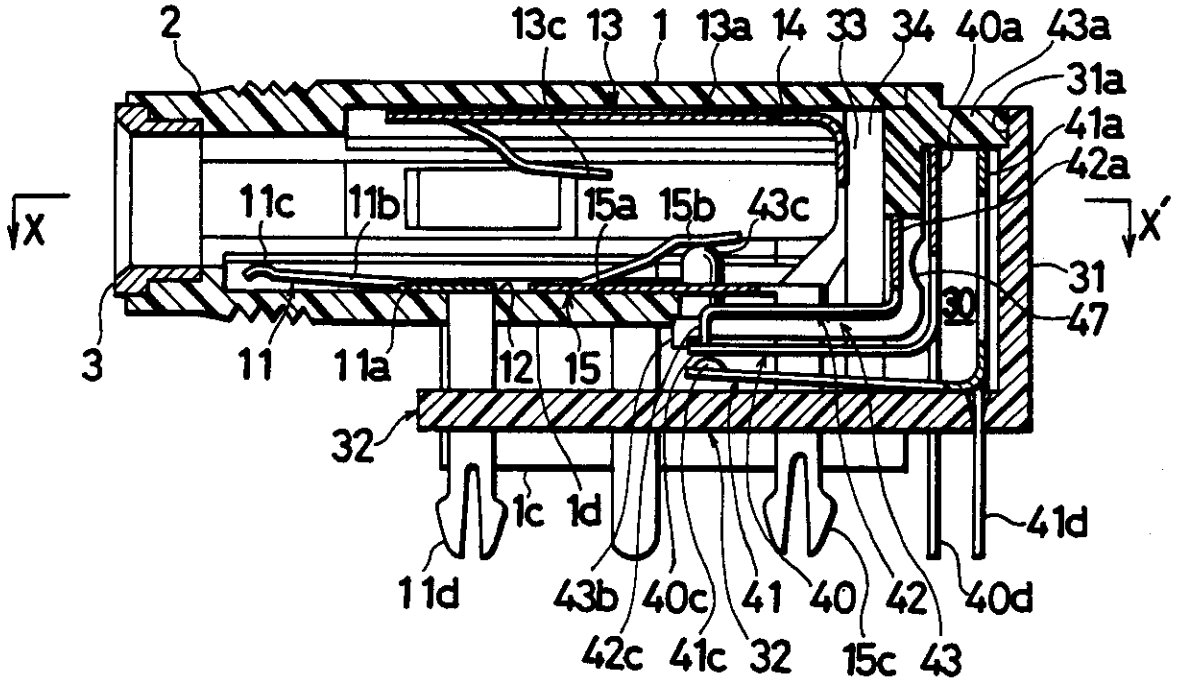
3

Fig. 1

Fig. 2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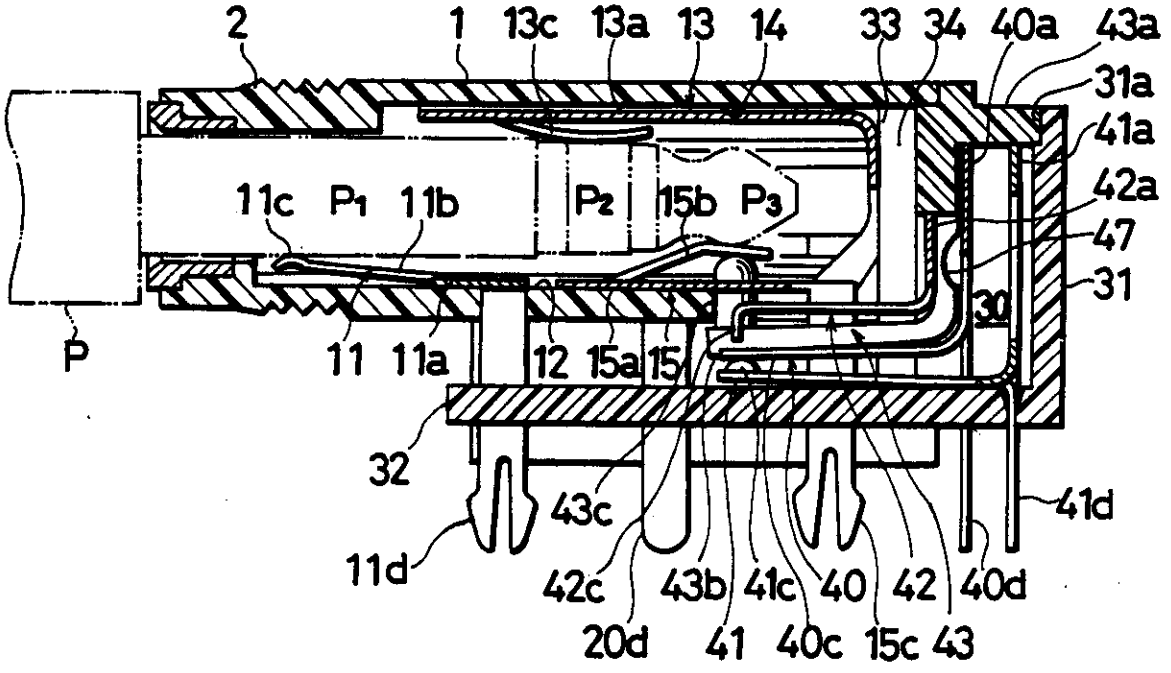
31a
41a
42a
X
X'
11c 11b 15a 15b 43c
31
30
47
3 11 11a 12 15
32
1c 1d
41d
11d 43b 40c 41 40 42 40d
42c 41c 32 15c 43

Fig. 3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31a
41a
42a
47
31
30
11c P1 11b P2 15b P3
P
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32
43c
41d
11d
42c 43b 41c 40 42 40d
20d 41 40c 15c 43

2111770

Fig. 4

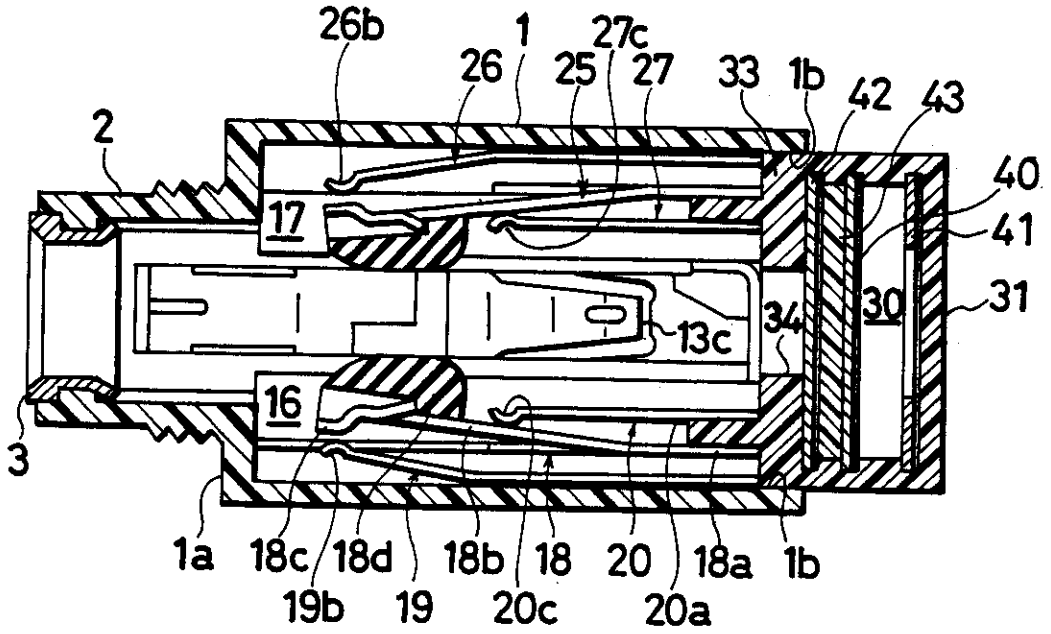
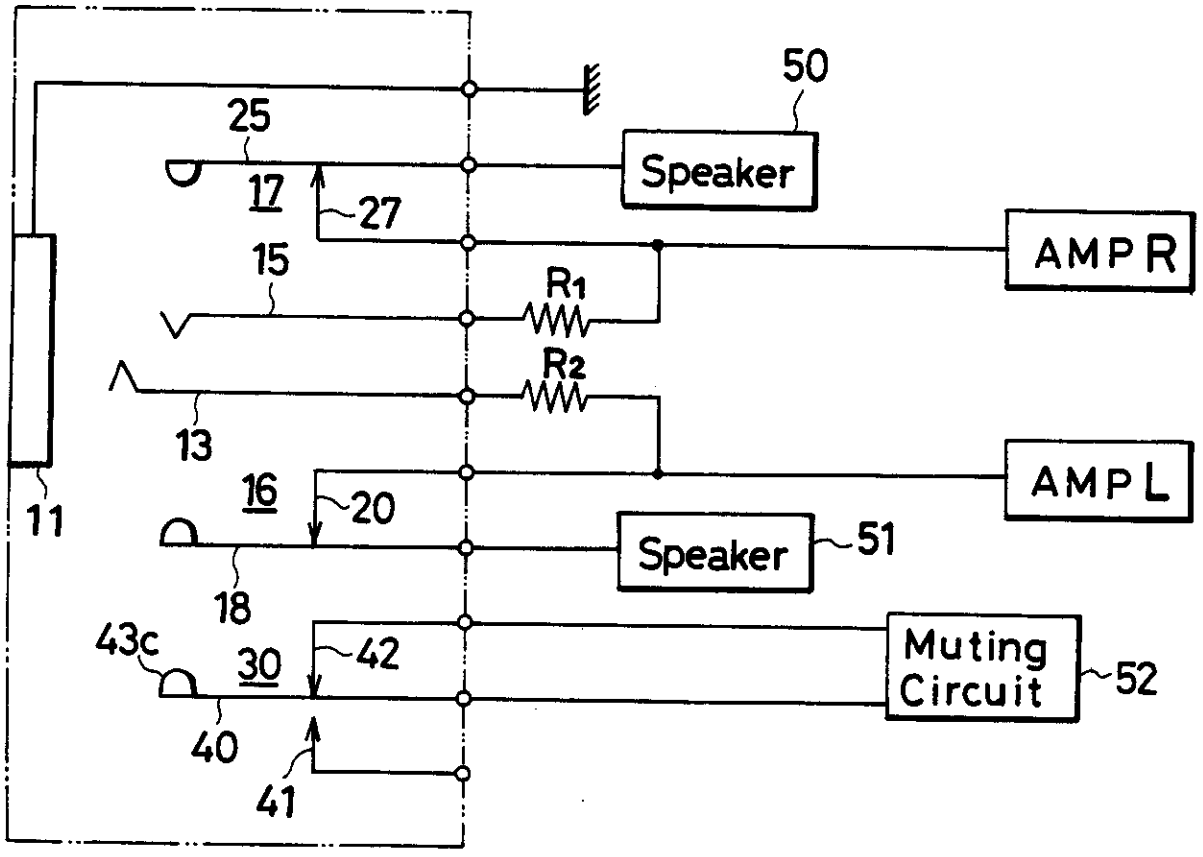


Fig. 5



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A Jack Plug Socket

The present invention relates to a jack plug socket.

Jack plugs and jack plug sockets are extensively used in electronic products such as radios and tape recorders.

A portable apparatus incorporating a transistor radio and a cassette tape recorder is generally provided at the front panel thereof with speakers and microphones. In such a protable radio/recorder, howling takes place when monitoring is made through the speakers while recording is made through the microphones. Provision is therefore often made such that a muting circuit is operated in association with a recording button or the like when it is pressed, whereby no acoustic outputs are supplied from the speakers. There is, however, a strong demand for such provision as to monitor, by the ears, the state of recording which is made though the microphones. Thus, portable radios/recorders having such facility also appear on the market. That is, in view of improvements in manoeuverability, change-over switches adapted to perform a switching operation is association with the insertion of a plug, are incorporated in a jack such that, simultaneously with the insertion of a plug for head-phone, outputs from the amplifiers are automatically switched from the speaker side to the head-phone side. However, since the muting

circuit is operated simultaneously with the pressing operation of the recording button as mentioned earlier, it is then required to dispose in the jack a change-over switch for releasing such muting operation.

In such arrangement, it is necessary to provide a predetermined lag in switching timing between the change-over switch for releasing a muting operation and the changeover switches for switching outputs of the amplifiers from the speaker side to the head-phone side.

If on the insertion of a plug, the change-over switch for releasing a muting operation performs a switching operation before the change-over switches for switching amplifier outputs are operated, it means that the muting operation is released before the speaker circuits are broken. Accordingly, howling takes place, even if temporarily, in the course of plug insertion.

On the other hand, if, on the removal of a plug, the change-over switches for switching amplifier output perform a switching operation before the change-over switch for releasing a muting operation, it also results in the occurence of howling in the course of plug removal.

In a plug-jack structure of the type above-mentioned, a force for preventing a plug from unnecessarily coming out from the jack, is determined by a contact pressure between the plug conductor portion and a contact piece in contact

with this plug conductor portion. In order to enhance such force, a coil spring for example is conventionally disposed at the back side of a tip contact piece in contact with a tip electrode of a plug, thereby to make up the resiliency of the tip contact piece by this coil spring. However, such arrangement disadvantageously increases the manufacturing costs with the number of parts increased and assembly work complicated.

According to the present invention there is provided a jack plug socket comprising a housing having a jack plug insertion port, a first switch means disposed adjacent the insertion port and adapted to be operated by insertion of a jack plug into the jack plug socket, a tip contact means biassed so as to contact the tip of a jack plug fully inserted into the jack plug socket, and a second switch means adapted to be operated by displacement of the tip contact means resulting from full insertion of a jack plug into the jack plug socket and which second switch means resiliently biasses the tip contact means for the said contact with a jack plug.

An embodiment of the present invention provides a jack plug socket incorporating two independent change-over switches adapted to perform switching operations according to the insertion and removal of a plug, in which there is ensured a time lag in switching timing between the change-over switches whereby the above described howling occuring upon insertion and removal of a jack plug can be

avoided, and in which a jack plug need not be unnecessarily removed from the jack plug socket.

Embodiments of the present invention will now be described by way of example only and with reference to the accompanying drawings, in which;

Fig. 1 is a disassembled perspective view of a jack plug socket embodying the present invention;

Fig. 2 is a section view of the jack plug socket of Fig. 1;

Fig. 3 is a section view of the jack plug socket of Fig. 1, with a jack plug inserted therein;

Fig. 4 is a section view taken along the line X-X' in Fig. 2;

Fig. 5 is a connection diagram of an apparatus to which the jack plug socket of the present invention is applied.

A jack case 1 having an open rear end is formed of resin. A cylindrical holder 2 into which a plug is inserted, is projected from the front wall 1a of the jack case 1. A metallic sleeve 3 is fitted into the inner periphery of the opening of the cylindrical holder 2.

A ground contact piece 11 is adapted to come in contact with a ground-side electrode portion P1 of the electrode

of a plug P inserted into the jack case 1. A rectangular shape main portion 11a is pressingly fitted, at the both lateral edges thereof, into housing grooves 12 in the jack case 1. A tongue 11b is extended from the front edge of the main portion 11a and has a tip portion 11c turned in a dogleg shape, which is located in the cylindrical holder 2. A terminal portion 11d is projected from the rear end of the main portion 11a in a direction at right angle thereto.

A ring contact piece 13 is adapted to come in contact with a ring electrode portion P2 constituting one-channel electrode of an electrode unit of the plug P. A rectangular shape main portion 13a of the ring contact piece 13 is pressingly fitted, at the both lateral edges, into housing grooves 14 in the jack case 1. With one side remaining as attached to the main portion 13a, a tongue 13c is punched out and extended from the front end of the main portion 13a in a downward and rearward direction. A terminal portion 13d is formed by turning the rear end of the main portion 13a at a right angle thereto.

A tip contact piece 15 is adapted to come in contact with a tip electrode P3 constituting the other channel electrode of the electrode unit of the plug P. A rectangular-shape main portion 15a is pressingly fitted, at the both lateral edges, into the housing grooves 12 similarly the ground contact piece 11. With one side remaining as attached to the main portion 15a, a tongue 15b is punched

out and extended from the front end of the main portion 15a in an upward and rearward direction. A terminal portion 15c is projected from the rear end of the main portion 15a at a right angle thereto.

While the ground contact piece 11 and the tip contact piece 15 are pressingly fitted into the same housing grooves 12, the ground contact piece 11 is located at the front side of the jack case 1 and the tip contact piece 15 is located at the rear side of the jack case 1, thereby to separate the contact pieces 11 and 15 from each other.

A pair of contact switches 16 and 17 constituting first change-over switches are disposed at the both sides of the jack case 1.

The contact switch 16 has a change-over contact piece 18, a make contact piece 19 and a break contact piece 20.

A rectangular-shape main portion 18a of the change-over piece 18 is pressingly fitted, at the both lateral edges thereof, into housing grooves (not shown). A tongue 18b is forwardly extended from the centre of the main portion 18a with a predetermined angle provided between the tongue 18b and the main portion 18a. The tongue 18b has at the tip thereof a contact 18b. A separator 18d made of insulating material is attached to the back side of the contact 18c. A terminal portion 18e is integrally projected from the lower edge of the main portion.

A rectangular-shape main portion 19a of the make contact piece 19 is pressingly fitted, at the both lateral edges thereof, into housing grooves (not shown). A tongue 19c is extended from the front edge of the main portion 19a and has a tip forked into two branches and turned in a dogleg shape, thus forming contacts 19b.

Where the plug P is not inserted, there are provided predetermined distances between the respective contacts 19b and the contact 18c of the change-over contact piece 18, and where the plug is inserted, these contacts 19b and 18c come in contact with each other.

A terminal portion 19d is integrally projected from the lower edge of the rear end of the main portion 19a.

In the break contact piece 20, a rectangular-shape main portion 20a has in the front centre a notch groove 20b, on and under which contacts 20c are formed. The main portion 20a is pressingly fitted, at the both lateral edges thereof, into housing grooves (not shown). A terminal portion 20d is integrally projected from the lower edge of the front end of the main portion 20a.

The other contact switch 17 also comprises a change-over contact piece 25, a make contact piece 26 and a break contact piece 27 respectively having the shapes symmetrical with respect to those of the change-over contact piece 18, the make contact piece 19 and the break contact piece

20 of the contact switch 16. It is to be noted that the same alphabetical letters used for the parts of the contact switch 16 are put for the parts of the contact switch 17 corresponding to those of the contact switch 16, after the respective numerals. The description of the contact switch is here omitted.

The jack case 1 is closed at the rear-side opening 1b thereof, by a resin cover 32. The cover 32 is provided at the back side thereof with a switch case 31 for housing a second change-over switch 30.

A partition wall 33 for partitioning the jack case 1 from the switch case 31 is integrally formed with the cover 32 and has a slit 34 through which the inside of the jack case 1 communicates with the inside of the switch case 31.

The cover 32 may be secured to the jack case 1 in such a way that engagement projection 35 on the upper end of the partitioning wall 33 are engaged with engagement holes 36 in the top surface of the jack case 1, and projections 36 at the both lateral edges of the cover base portion 37 are engaged with engagement grooves 38 in the both lateral walls of the jack case 1.

The base portion has therein through-holes 39, through which the respective terminal portions of the contact pieces above-mentioned pass, thus ensuring alignment of the terminal portions. That is, the respective terminal

portions are supported by the base portion 37 of the cover 32, so as to be straightly projected from the predetermined positions. Such arrangment facilitates attachment of the jack to a printed circuit board or the like.

The second change-over switch 30 comprises a change-over contact piece 40, a make contact piece 41, a break contact piece 42 and a separator 43 made of insulating material disposed between the change-over contact piece 40 and the break contact piece 42.

In the change-over contact piece 40, a tongue 40b extended from the lower edge of a rectangular-shape main portion 40a is turned so as to have an L-shape section. The tongue 40b has at the tip thereof, a T-shape contact 40c. The main portion 40a is fitted, at the both lateral edges thereof, into housing grooves 44 in the inner lateral walls of the switch case 31, while the tongue 40b is projected into the jack case 1 through the slit 34. A terminal portion 40d is extended from one side of the main portion 40a and projected from the bottom of the switch case 31 to the outside.

In the make contact piece 41, a tongue 41b is extended from the lower side of a rectangular-shape main portion 41a and has at the tip thereof a T-shape contact 41c. The main portion 41a is fitted, at the both lateral edges thereof, into housing grooves 45 in the inner lateral

walls of the switch case 31, while the tongue 41b is projected into the jack case 1 through the slit 34. The contact 41c is thus faced to the contact 40c of the change-over contact piece 40 with a predetermined distance provided therebetween. A terminal portion 41d is extended from the lower side of the main portion 41a and projected from the switch case 31 to the outside.

In the break contact piece 42, a tongue 42b is extended from the lower side of a rectangular-shape main portion 42a in a direction at right angle thereto. The tip of the tongue 42b is forked into two branches and downwardly turned, thus forming contacts 42c. The main portion 41a is fitted, at the both lateral edges thereof, into housing grooves (not shown) in the inner lateral walls of the switch case 31, while the tongue 42b is projected into the jack case 1 through the slit 34 and the contact 42c come in contact with the contact 40c of the change-over contact piece 40. A terminal portion 42d is extended from one side of the main portion 42a and projected from the bottom of the switch case 31 to the outside.

In the separator 43, a base portion 43a simultaneously forms a lid means for closing an upper opening 31a of the switch case 31. An operating portion 43b having an Lshape section is extended from the lower side of the base portion 43a. The operating portion 43b has at the tip or operating end thereof, a columnar projection 43c having a semi-spherical top made of the same insulating material as

that of the separator 43. The operating end 43b is projected into the jack case 1 through the slit 34, while the operating end or projection 43c is located adjacent to the back side of the tongue 15b of the tip contact piece 15. Namely, when the plug P is inserted into the jack case 1 and the tip electrode portion P3 of the plug P presses the tongue 15b, the tongue 15b is downwardly pushed and the operating portion 43b is also downwardly moved. Then, the contact 40c of the change-over contact piece 40 is separated from the contact 42c of the break contact piece 42 and comes in contact with the contact 41c of the make contact piece 41. In the spearator 43, the operating portion 43b has, at its side adjacent the base portion 43a, a notch 47 having a semi-circular section, thereby to increase the resiliency of the operating portion 43b.

A pair of engagement portions 48 are formed on the front wall of the base portion 43a. When the cover 32 is engaged with the jack case 1, these engagement portions 48 are pressed, at the upper ends thereof, by the edge of the rear-side opening of the jack case 1, thus preventing the separator 43 and the contact pieces constituting the change-over switch 30 from coming out from the switch case 31.

With such arrangement, when the plug P is inserted into the jack case 1, the first change-over swithces or contact switches 16 and 17 first perform a switching operation.

The change-over contact pieces 18 and 25 are then separated from the break contact pieces 20 and 27 and come in contact with the make contact pieces 19 and 26.

When the plug P is further inserted, the tip electrode portion P3 comes in contact with the tongue 15b of the tip contact piece 15 to press down the operating portion 43b of the separator 43. This causes the second change-over switch 30 to perform a switching operation, so that the change-over contact piece 40 is separated from the break contact piece 42 and comes in contact with the make contact piece 41.

That is, when the plug P is inserted, the first changeover switches or contact switches 16 and 17 firstly perform a switching operation, after which the second changeover switch 30 performs a switching operation.

On the other hand, when the plug P is removed, the seond change-over switch 30 firstly performs a change-over operation, after which the first change-over switches perform a switching operation. There is thus ensured a time lag in switching timing between the first change-over switches or contact switches 16 and 17 and the second change-over switch 30.

Fig. 5 illustrates a connection diagram of a radio and recorder to which the jack plug socket of the present invention is applied.

Output terminals of amplifiers R and L are respectively connected to the break contact pieces 20 and 27 of the first change-over switches or contact switches 16 and 17. The change-over contact pieces 18 and 25 of the contact switches 16 and 17 are respectively connected to speakers 50 and 51. The break contact pieces 20 and 27 are connected to the tip contact piece 15 and the ring contact piece 13 through attenuator resistors R1 and R2. Lead terminals for releasing a muting operation in a muting circuit 52 are respectively connected to the change-over contact piece 40 and the break contact piece 42 of the second change-over switch 30. These lead terminals may be alternatively connected to the change-over contact piece 40 and the make contact piece 41 of the change-over switch 30, respectively, when the muting operation releasing method in the muting circuit 52 is changed.

The description hereinafter will discuss the operation of this circuit.

When recording is started with the recording buttom pressed, the muting circuit 52 simultaneously starts operating so that amplifier outputs become zero. Then when the plug P for head-phone is inserted into the jack case 1, the first change-over switches or contact switches 16 and 17 firstly perform a switching operation to break the speaker circuits. Then, outputs of the amplifiers R and L are switchingly supplied to the head-phone. Subsequently,

the second change-over switch 30 performs a switching operation to release to muting operation of the muting circuit 52. Then, monitor outputs of the amplifiers R and L are supplied to the head-phone.

During such operations, there is no possibility of howling taking place on the insertion of the plug, since the speaker circuits are broken before release of the muting operation in the muting circuit.

On the removal of the plug P, the speaker circuits are made after the muting operation has been reset, thus producing no howling.

The operating end of the second change-over switch 30 disposed at the back side of the tip contact piece 15, and with the tip electrode portion P3 of the plug being in contact with the tip contact piece 15, the second change-over switch 30 pressingly biases the tip contact piece 15 toward the tip electrode portion P3 by the resiliency inherent in the second change-over switch 30 or the resiliency of the change-over contact piece 40 and the made contact piece 41. Such arrangements enhance contact of the tip contact piece 15 with the tip electrode portion P3 and helps prevent the jack plug from being unintentionally withdrawn from the jack plug socket.

It is not required to dispose a coil spring or the like at the back side of the tip contact piece 15 as done in a

convention jacks, since the resiliency inherent in the second change-over switch 30 is utilized. The jack of the present invention thus requires no special parts and can be economically manufactured.

Regarding the second change-over switch for releasing a muting operation, it is not necessarily required to use such contact switch as shown in the embodiment above-mentioned. Any switch of self-reset type having a strong reset force may be used.

Claims

1. A jack plug socket comprising a housing having a jack plug insertion port, a first switch means disposed adjacent the insertion port and adapted to be operated by insertion of a jack plug into the jack plug socket, a tip contact means biassed so as to contact the tip of a jack plug fully inserted into the jack plug socket, and a second switch means adapted to be operated by displacement of the tip contact means resulting from full insertion of a jack plug into the jack plug socket and which second switch means resiliently biases the tip contact means for the said contact with a jack plug.

2. A jack plug socket as claimed in claim 1, wherein the first and second switch means each comprises a respective change-over contact piece, a respective make contact piece and a respective break contact piece, the change-over contact pieces contacting the respective break contact piece when a jack plug is not inserted in the jack plug socket and contacting the respective make contact piece when a jack plug is fully inserted into the jack plug socket.

3. A jack plug socket as claimed in claim 1 or 2, wherein the housing is provided with a cover which has a casing which houses the second switch means.

4. A jack plug socket as claimed in any preceding claim,

wherein the first switch means comprises a pair of switches.

5. A jack plug socket as claimed in claim 3, wherein the jack plug socket housing and the cover are formed of a resin.

6. A jack plug socket as claimed in any preceding claim in combination with recording apparatus.

7. A combination as claimed in claim 6 in which the recording apparatus comprises a muting circuit and in which the or each loud speaker of the recording apparatus is connected to the first switch means and in which the muting circuit is connected to the second switch means whereby the loudspeaker or loudspeakers are rendered inoperative before the muting circuit is rendered inoperative, upon insertion of a jack plug into the jack plug socket.

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NOTE :

RENEWALS FILED WITHIN THE LAST FEW DAYS MAY NOT APPEAR IN THE RECORDS

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