United States Patent

[11] 3,629,789

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[73] Assignee **General Electric Company**

[54] **TELEVISION RECEIVER SAFETY INTERLOCK SYSTEM FOR POWER CONNECTIONS**
8 Claims, 9 Drawing Figs.

[52] U.S. Cl. ..... **339/33,** 339/126 R, 339/156 R, 339/170
[51] Int. Cl. **H01r 27/00,** H01r 13/50
[50] Field of Search ..... 339/32, 33, 36, 37, 39, 59, 119, 125 R, 126 R, 126 RS, 127, 128, 129, 132, 133, 134, 147 R, 147 C, 155, 156, 170, 192 R; 174/52 R; 178/7.8, 7.9; 179/1 PL, 1 SW; 317/9 AI, 9 R, 99; 248/27

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Assistant Examiner—Lawrence J. Staab
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ABSTRACT: A simplified power interconnection is provided in a television receiver adapted for both battery and AC power operation and having a normally closed cabinet with a removable wall in the cabinet for access to the chassis by skilled service personnel. The power interconnection is fixed in the removable wall and has one connector pattern on the exterior of the wall which mates with disconnectable alternative battery and AC power source plugs outside the cabinet, and has a different connector pattern on the inside of the wall which mates with a single set of power connectors on the chassis inside the cabinet. Because the outside and inside mating patterns are different, unskilled personnel may alternatively energize the chassis through either of the power source plugs only when the removable wall is in position, and may not mate the loose power plugs to the chassis when the wall is removed.

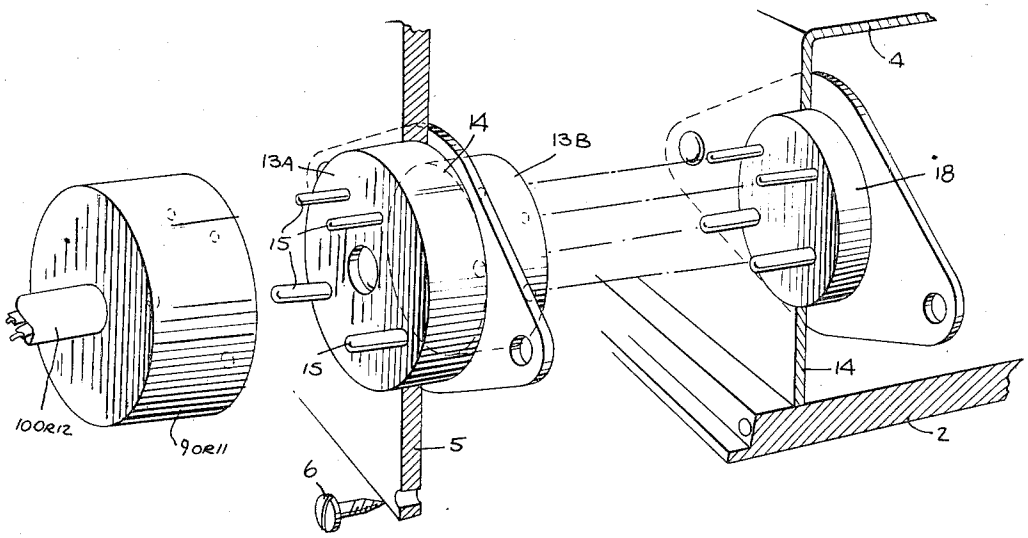


Fig. 1.

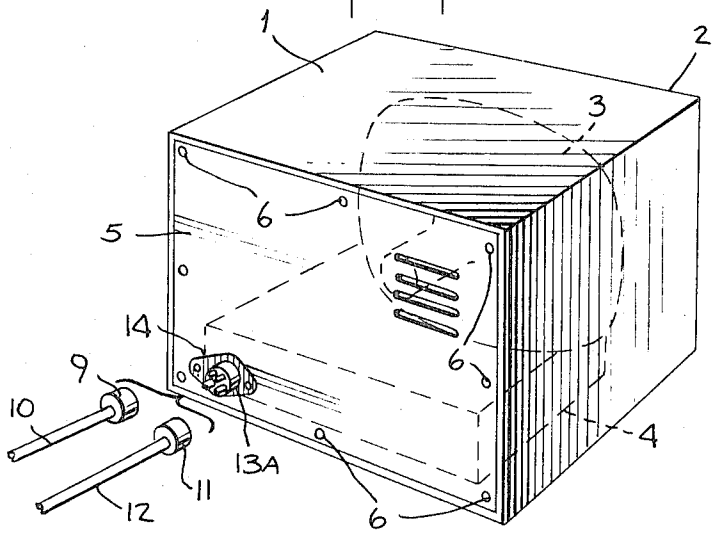


Fig. 5.

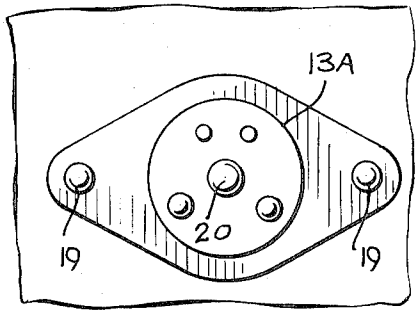
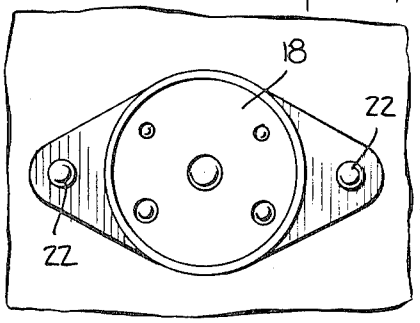


Fig. 6.



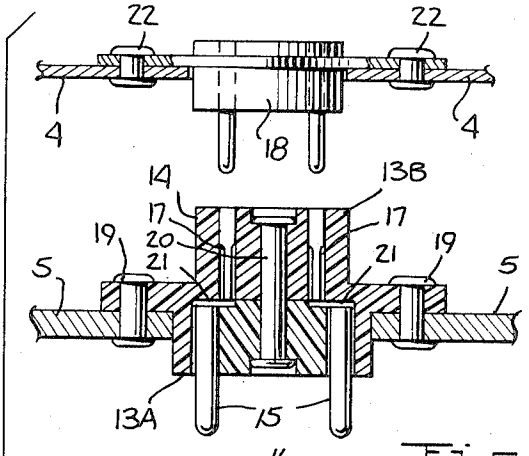


Fig. 2.

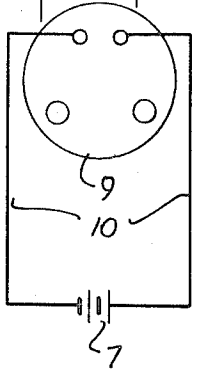


Fig. 3.

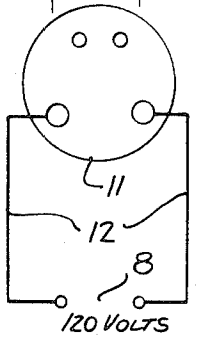
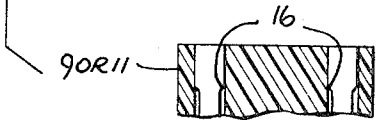


Fig. 7.



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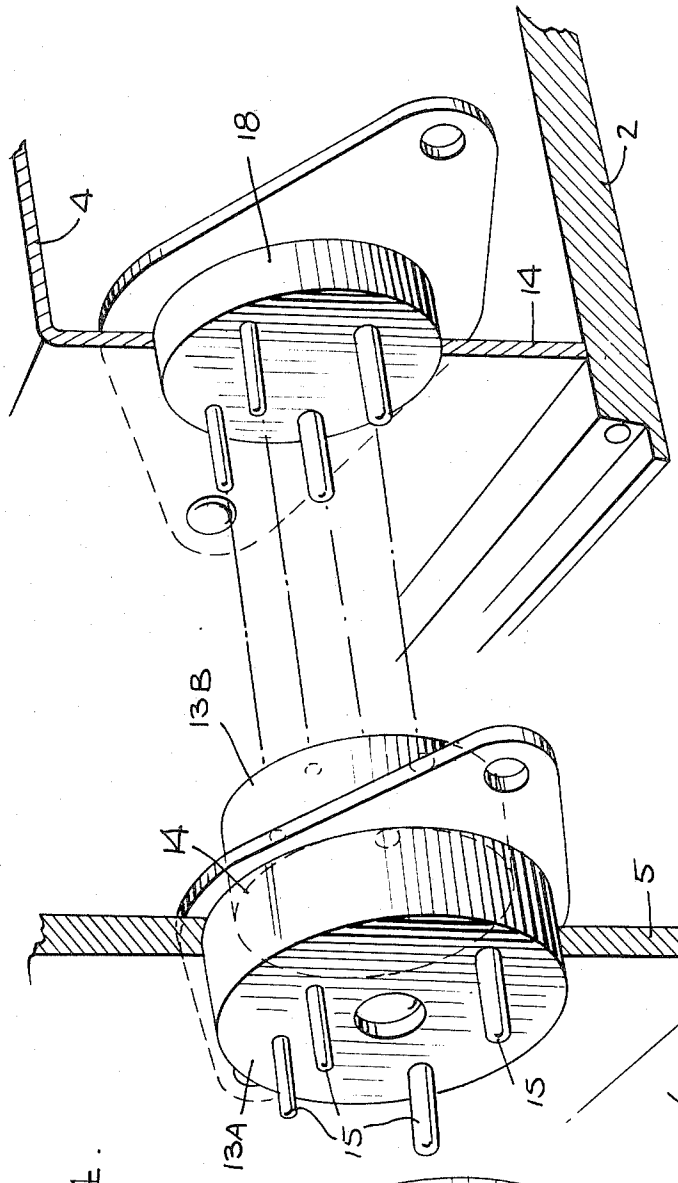
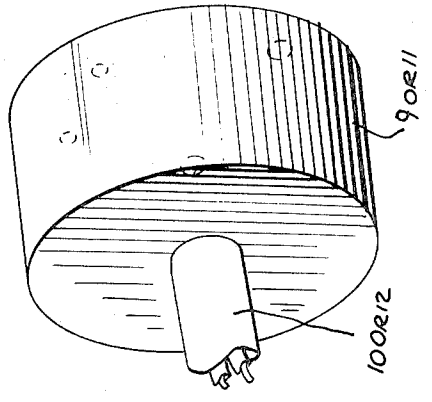


Fig. 4.



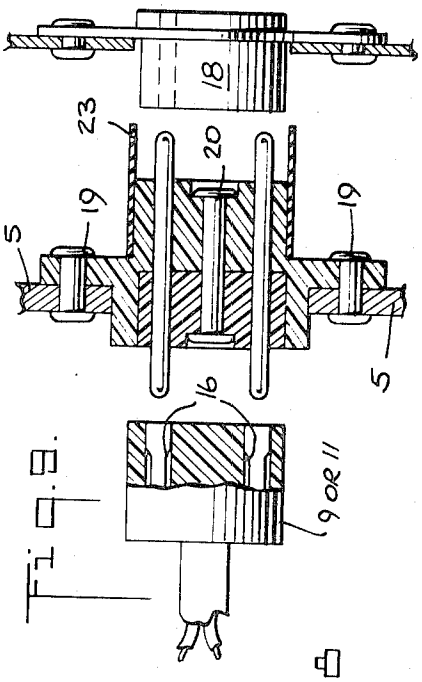
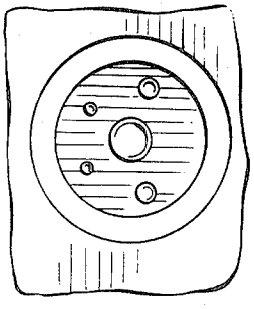


Fig. 3.

Fig. 5



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TELEVISION RECEIVER SAFETY INTERLOCK SYSTEM FOR POWER CONNECTIONS

BACKGROUND OF THE INVENTION

It is generally well known that, for reasons of safety, an interlock arrangement is provided in the power connections to a television receiver so that the power is automatically disconnected when the backwall of the receiver is removed. To discourage unskilled individuals from bypassing this interlock, the power cord connection at the receiver end is customarily permanently attached to the backwall so that the only way to connect power to the receiver chassis is to replace the backwall thus preventing the unskilled from obtaining access to the interior of the cabinet while the receiver is in operation.

With the advent of portable AC/DC transistorized TV sets operated from either external battery or normal AC power sources, consideration must now be given to how the dual power sources can be safely and economically connected to the set. For the purchaser's safety removal of the back must automatically disconnect the power from the chassis and it must be impossible without special equipment to bypass this interlock feature. At the same time, for protection of the set against accidental damage, it should not be possible to apply power to the chassis from both power sources at the same time. Unfortunately, the relatively high cost of internal sensing and switching devices required to meet the latter requirement mitigates against the permanent attachment of the AC and battery power cable to the backwall.

This invention is particularly directed to the foregoing problems in connection with transistorized television receivers which are powered alternatively by a battery plug connected to the cabinet, as in outdoor usage, or by a conventional 120-volt powerline plug connected to the cabinet as in indoor usage.

One arrangement hitherto used in this situation has been to use a four-terminal power receptacle on the outside of the cabinet. Into this receptacle either the battery plug using one set of two contacts of the four, or the powerline plug using the other set of two contacts of the four, is plugged in. With this arrangement, therefore, it is impossible to use more than one kind of power at a time, i.e., one cannot use both the battery plug and the 120-volt powerline plug at the same time.

The difficulty with the latter arrangement is that since the chassis uses only one power receptacle which has to mate with the two power plugs, these power plugs can be connected to the chassis even with the cabinet back removed. This is obviously unsafe since the unskilled user can power the chassis with the cabinet back removed.

STATEMENT OF THE INVENTION

By fixing in the removable cabinet wall a double plug-receptacle which mates with the chassis inside the cabinet in one mating pattern, and which mates with the battery or powerline plugs outside the cabinet in a different mating pattern, this invention makes it impossible to mate the battery or powerline plugs directly to the chassis. In other words, power may be applied to the chassis only when the removable wall is in position closing the cabinet.

DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates a television receiver embodying the invention and powered alternatively through one or the other of two four-prong plugs, one plug being attached to a battery source of power as illustrated by FIG. 2, and the other plug being attached to a commonly available 120-volt power source as illustrated by FIG. 3.

FIGS. 4, 5, 6 and 7 illustrate the manner in which a different plug mating pattern is used as between the inside and outside of the receiver.

FIGS. 8 and 9 show a mating pattern difference alternative to that of FIGS. 4 to 7.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, there is shown a television receiver 1 having the conventional cabinet 2 enclosing picture tube 3 as part of a chassis 4. The rear of the cabinet is normally closed by a backwall 5 which is fixed to the cabinet by screws 6 or removable from the cabinet by removal of screws 6 to permit access to the chassis and picture tube by skilled service personnel.

Power may be applied to the receiver 1 either from a battery 7 (FIG. 2) or 120-volt source 8 (FIG. 3) by way of four-contact female plug 9 connected to the battery 7 (FIG. 2) through cable 10, or by way of four-contact female plug 11 connected to source 8 (FIG. 3) through cable 12. Plugs 9 and 11 mate, one at a time, with four-contact male plug 13A fixed in wall 5. Note that in the four-contact pattern of plugs 9 and 11 and plug 13A, the battery connects to the pair of small diameter contacts, while the 120-volt power source connects to the pair of larger diameter contacts. Since the plugs 9 and 11 can be mated with plug 13A only in the pattern shown, the battery can only be connected to battery circuits in the receiver, and the 120-volt source only to 120-volt circuits in the receiver. Only one of plugs 9 and 11 may be mated to plug 13A at a time and so only one kind of power may be applied to the receiver at a time.

Plug 13A is the outer part of a conductive interconnection 14 for interconnecting chassis 4 with either of plugs 9 and 11. This interconnection is affixed in removable wall 5 so that the unskilled user cannot remove it, or at least the user will be discouraged from doing so. The interconnection 14, which is shown better in the FIGS. 4 and 7, is designed so that the mating pattern between the interconnection 14 and the chassis 4 inside the cabinet is different from the mating pattern between the interconnection 14 and the plugs 9 and 11 outside the cabinet. Due to this difference it will be impossible for the unskilled user to mate the plugs 9 and 11 directly with the chassis 4 when the removable wall 5 is removed from the cabinet 2. In other words, the plugs 9 and 11 will not fit the chassis and it will be impossible for the user to apply power to the chassis so long as the removable wall 5 is not in position closing the receiver.

The foregoing purpose of different mating patterns inside and outside the receiver 1 is accomplished in two ways in the FIGS. 4 to 9. In the FIGS. 4 to 7, it will be seen that the chassis 4 to interconnection 14 mating pattern is generally that of the four corners of a square, while the interconnection 14 to plugs 9 and 11 mating pattern is that of the four corners of a trapezoid.

Thus, referring to FIGS. 4 and 7, it will be seen that the interconnection 14 comprises the male member 13A having four male prongs 15 which mate with the four female receptacles 16 of either of power plugs 9 and 11; and a four-prong female member 13B having four female receptacles 17 which mate with a four-prong male member 18 on the chassis 4. As seen better in FIG. 5, the four-contact pattern between plugs 9 or 11 and member 13A outside the cabinet 2 is that of the four corners of a trapezoid; while as better seen in FIG. 6, the four-contact pattern between the female receptacles 17 and the male prongs of member 18 on the chassis 4 is that of the four corners of a square. Thus, the female contacts of plugs 9 and 11 will not mate with male member 18 on the chassis because the trapezoidal and square patterns do not mate.

Corresponding female contacts 17 and male prongs 15 of the interconnection 14 may be permanently interconnected within interconnection 14 by any suitable means and interconnection 14 may be permanently secured to wall 5 by any suitable means as rivets 19. Interconnection 14 is shown as constructed of two members secured together by rivets 20 with suitable contacts 21 between corresponding prongs 15 and contacts 17. Member 18 is permanently secured to chassis 4 by rivets 22.

The male prongs of member **18** are of course connected by suitable means (not shown) to various elements of the chassis **4** requiring power from either battery **7** or 120-volt source **8**.

In the embodiment of FIGS. **1** through **7**, the plugs **9** and **11**, and member **13B** are female because their contacts **16** will have voltage upon them when cables **10** and **11** are connected to a power source and so will contacts **17** if contacts **16** and prongs **15** are connected together. The fact that plugs **9** and **11** and member **13B** are female will minimize the possibility that the fingers of a user will touch the female contacts when so energized with voltage and when plugs **9** and **11** are disconnected from interconnection **14** or when plugs **9** and **11** are connected to interconnection **14** but backwall **5** is removed from cabinet **2**. To further minimize the possibility that the fingers of the user will touch the female contacts **16** and **17**, those contacts are, as shown in FIG. **7**, positioned well within the interior of plugs **9** and **11**, and member **13B**.

While the plugs **9** and **11** and member **13B** are shown as female, and members **13A** and **18** as male, plugs **9** and **11** and member **13B** may be replaced by male members and members **13A** and **18** by female members. But in that case, it will be necessary to provide suitable protective shields around the male prongs of plugs **9** and **11** and member **13B** in order to minimize the possibility that the fingers of the user may touch the male prongs of plugs **9** and **11** and member **13B** when energized with voltage and separated from the cabinet under the conditions previously described. Such a shield is illustrated in FIG. **8**.

Alternatively, as in FIGS. **8** and **9**, the different mating patterns may be brought about by arranging the male-female relationship in reverse order as between the inside and outside of the cabinet. Thus, as illustrated in FIG. **9**, both inner and outer terminals of interconnection **14** are male; while the chassis member **18** and plugs **9** and **11** are both female and thus cannot be directly interconnected. In this arrangement, both inside and outside contact patterns may be the trapezoidal patterns illustrated in FIG. **8**, or the square pattern previously mentioned, or any other pattern.

In FIG. **9**, a cylindrical shield **23** is provided surrounding the inner male members of interconnection **14** for the purpose of minimizing the possibility that the fingers of the user may touch the male prongs within the shield **23** when voltage is on those prongs as when one of the plugs **9** or **11** is connected both to the power source through cables **10** or **12** and to the male prongs outside wall **5** when wall **5** is removed from cabinet **2**. Shield **23** will, of course, slide over member **18** so that the male prongs may engage the female contacts on the chassis.

The FIG. **9** construction may be altered so that both sides of interconnection **14** are female and member **18** and plugs **9** and **11** are male. In that case, shield **23** would be placed around the male prongs of plugs **9** and **11** for the same purpose as before.

It will thus be seen that the invention provides a means whereby the unskilled user may not apply power to the receiver unless he has the removable wall in safe position closing the cabinet. It should discourage him from making the attempt to do his own servicing while power is on the receiver. Moreover, the arrangement is very inexpensive.

It will be understood that the invention is useful in other than television receivers—for example, radio sound receivers, or any electrical or electronic devices which are alternately powered by either battery or powerline source.

I claim:

1. In an electrical device having a normally closed cabinet enclosing electrical equipment to isolate it from unskilled personnel, the cabinet having a wall removable for access to the equipment by skilled service personnel, the equipment being adapted to be energized through a mateable power plug connection externally of the cabinet to a conductive interconnection extending through the removable wall, and the interconnection being mateable to the electrical equipment internally of the cabinet;

such a conductive interconnection adapted to supply two different modes of electrical power to different portions of the electrical equipment, said conductive interconnection adapted to extend through and be fixed to the removable wall, said conductive interconnection comprising:

a first set of at least three contact means disposed in a first pattern at a first side of said conductive interconnection and adapted to engage a first or a second pair of power plug contact means;

a second set of at least three contact means disposed in a second pattern at a second side of said conductive interconnection and adapted to engage a corresponding set of mating contact means for supplying power to the two different portions of the electrical equipment;

whereby the power plug contacts cannot be mated to said mating contact means within the cabinet and cannot energize the electrical equipment except through the conductive interconnection.

2. An interconnection as in claim **1** in which the contact means are male and female contacts and the difference in mating patterns comprises a difference in cross-sectional positioning of the male and female contacts.

3. An interconnection as in claim **2** in which:

the power plug is female;

the conductive interconnection is male externally of the cabinet and female internally of the cabinet;

and the electrical equipment is male.

4. An interconnection as in claim **1** in which the contact means are male and female contacts, said power plug contacts being of the same sex as said contact means within the cabinet.

5. In an electrical device having a normally closed cabinet enclosing electrical equipment to isolate it from unskilled personnel, the cabinet having a wall removable for access to the equipment by skilled services personnel, the equipment having a portion adapted to be energized through a plug connected to a source of direct current electrical power and another portion adapted to be energized through a plug connected to a source of alternating current electrical power, the plugs being mateable externally of the cabinet to a conductive interconnection through the removable wall, and the interconnection being mateable to the electrical equipment internally of the cabinet, such a conductive interconnection adapted to extend through and be fixed in the removable wall, comprising:

a first plurality of contacts for mating the plugs to the conductive interconnection externally of the cabinet in a given mating pattern;

a second plurality of contacts each electrically connected to ones of the first plurality of contacts for mating the conductive interconnection to the electrical equipment within the cabinet adapted to be energized by direct current electrical power;

a third plurality of contacts each electrically connected to others of the first plurality of contacts for mating the conductive interconnection to the electrical equipment within the cabinet adapted to be energized by alternating current electrical power;

said second and third pluralities of contacts being disposed in a mating pattern different from that of said first plurality of contacts.

6. An interconnection as in claim **5** in which the contacts are male and female and the difference in mating patterns comprises a difference in cross-sectional positioning of the male and female contacts.

7. An interconnection as in claim **6** in which:

the plugs are female;

the conductive interconnection is male externally of the cabinet and female internally of the cabinet;

and the electrical equipment is male.

8. An interconnection as in claim **5** in which the contact means are male and female contacts, said power plug contacts being of the same sex as said contact means within the cabinet.