

Nov. 5, 1935.

W. J. O'BRIEN

2,019,625

ELECTRICAL APPARATUS

Filed March 30, 1934

3 Sheets-Sheet 1

*Fig. 1*

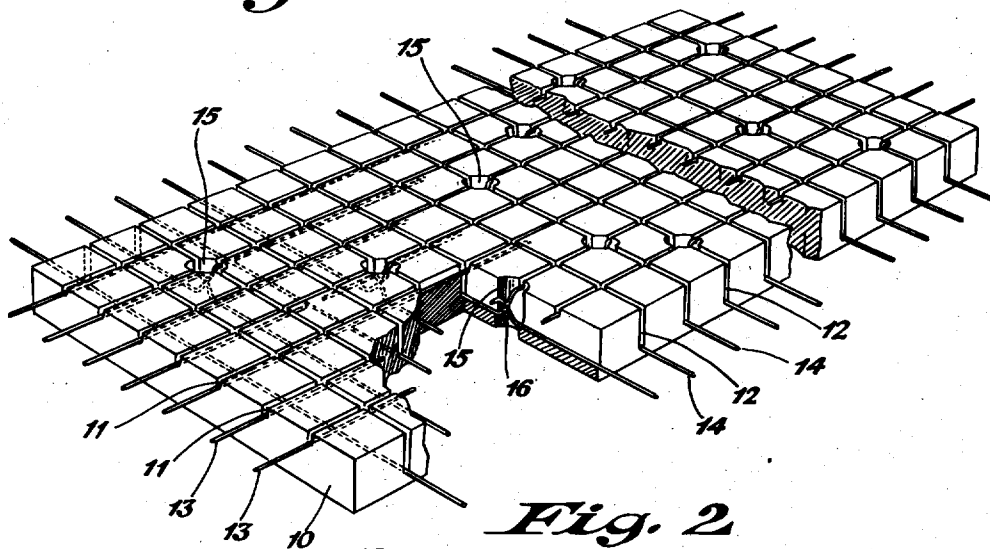


*Fig. 2*

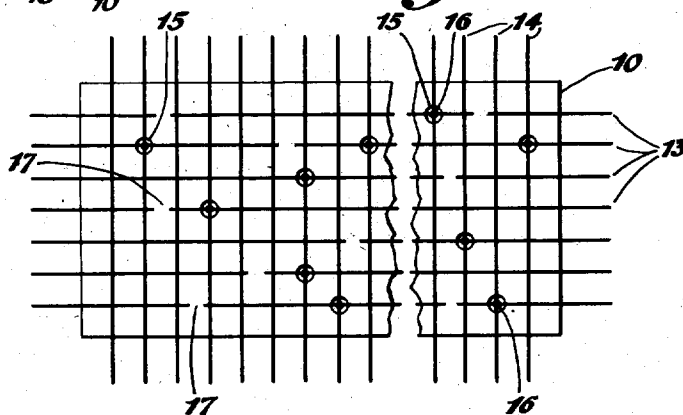
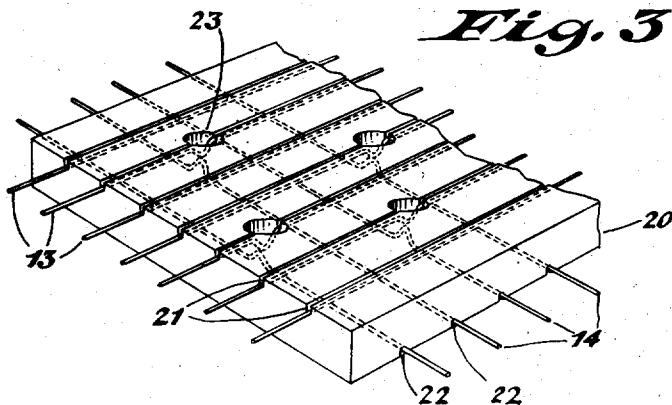


*Fig. 3*



INVENTOR  
WILLIAM J. O'BRIEN

BY *Charles McClure*  
ATTORNEY

Nov. 5, 1935.

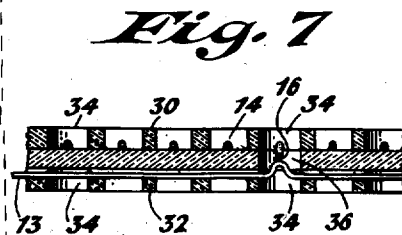
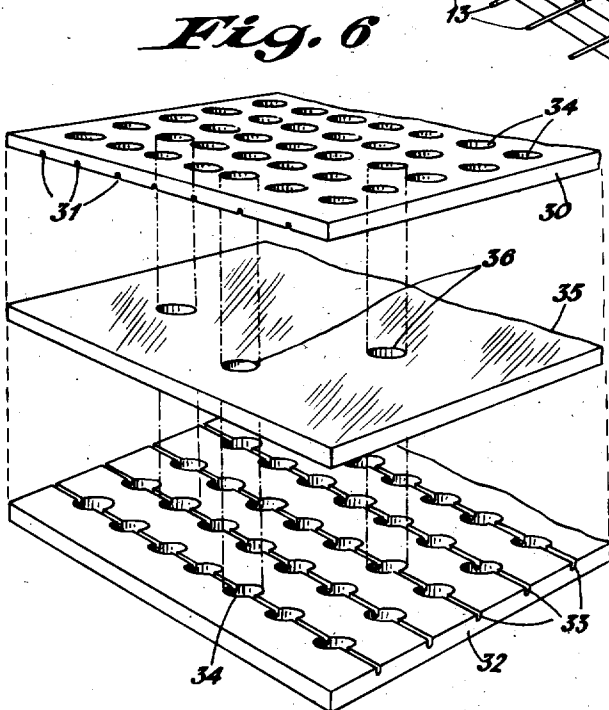
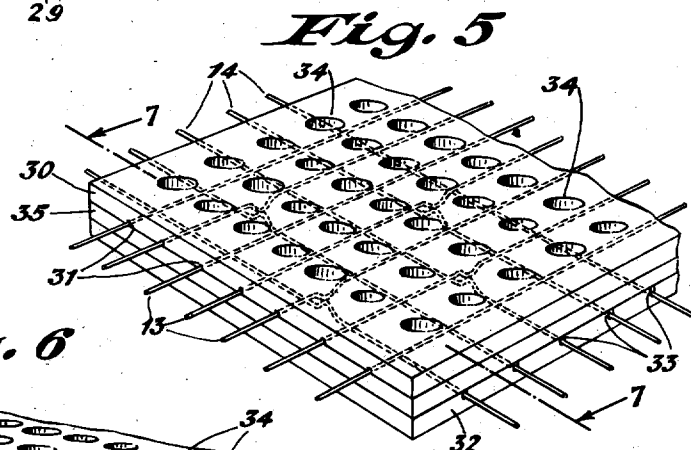
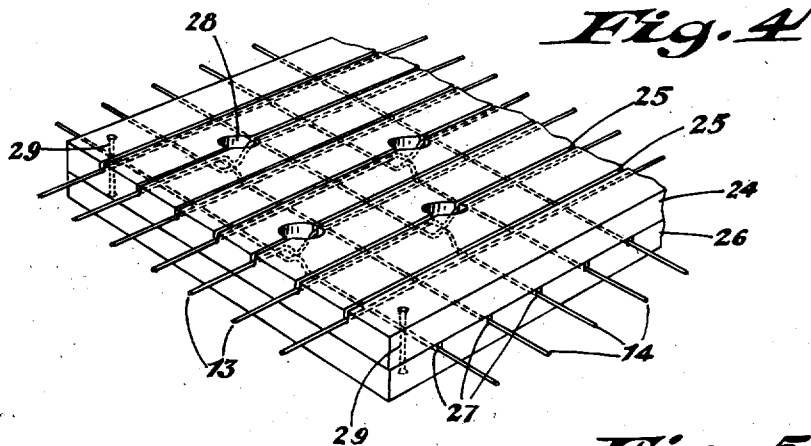
W. J. O'BRIEN

2,019,625

ELECTRICAL APPARATUS

Filed March 30, 1934

3 Sheets-Sheet 2



INVENTOR  
WILLIAM J. O'BRIEN

BY *Charles McClure*  
ATTORNEY

Nov. 5, 1935.

W. J. O'BRIEN

2,019,625

ELECTRICAL APPARATUS

Filed March 30, 1934

3 Sheets-Sheet 3

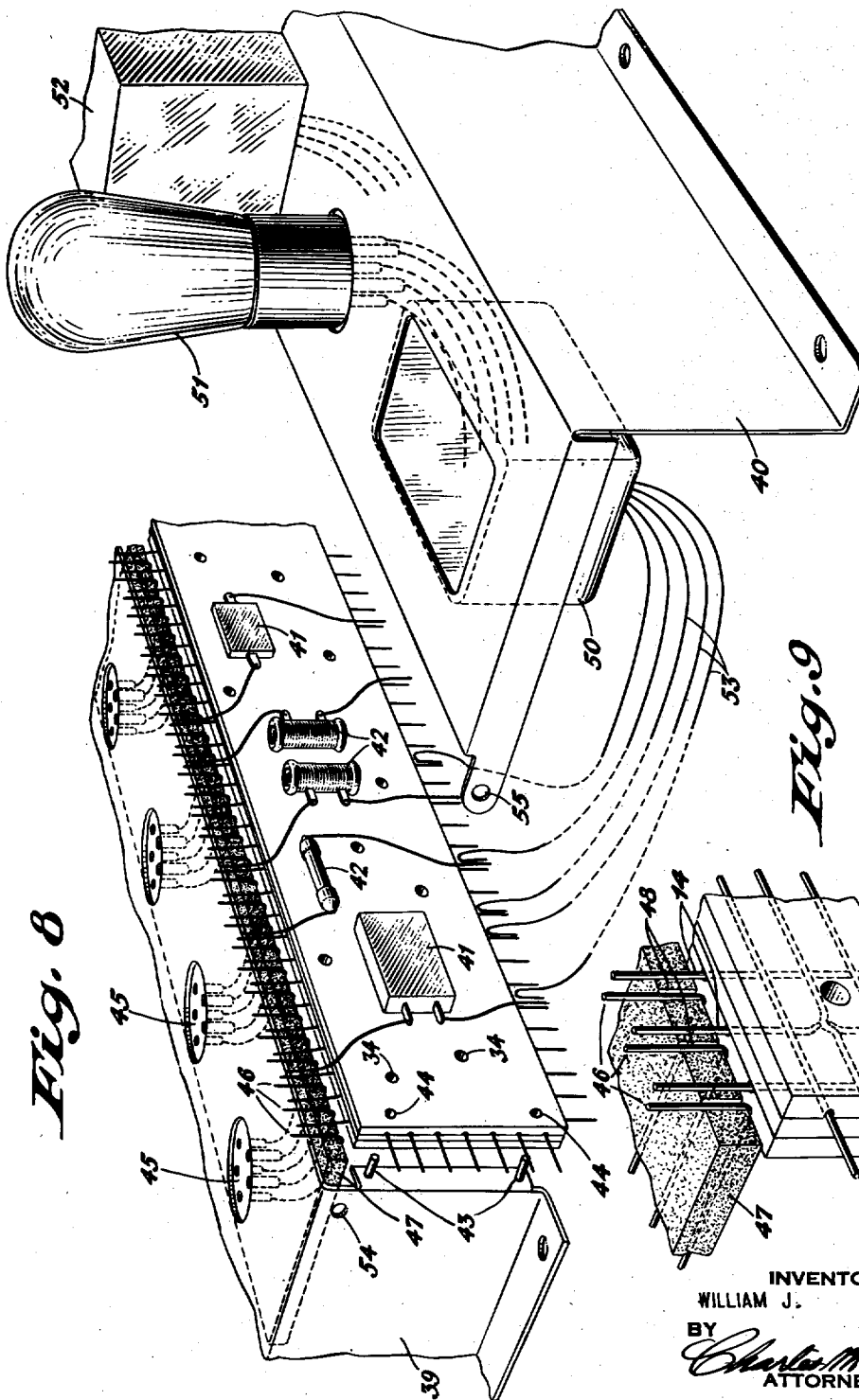


Fig. 8

Fig. 9

INVENTOR  
WILLIAM J. O'BRIEN

BY *Charles McClain*  
ATTORNEY

## UNITED STATES PATENT OFFICE

2,019,625

## ELECTRICAL APPARATUS

William J. O'Brien, New York, N. Y., assignor to  
Radio Corporation of America, a corporation of  
Delaware

Application March 30, 1934, Serial No. 718,100

7 Claims. (Cl. 175—298)

My invention relates to the manufacture of electrical apparatus and more particularly to an improved radio set and an improved method of assembling and wiring a radio set.

Difficulty is encountered in the hand assembly and wiring of modern radio sets due to the numerous wires, the many soldered joints and connections, and the limited space in which the elements of the set are placed. Only the experienced operators avoid errors in connection and the cramped space in which the operator must work makes it difficult to provide good soldered joints between the various conductors. Welding the joints is not feasible in sets constructed in the usual way because of the difficulty of getting the welding jaws to the joints.

Introduction of new sets having new circuit connections slows up production because time is required for the operators to become familiar with the new connections to be made.

Inspection and testing of the assembled set is also difficult because of the tangle of wires in the finished set.

Repairing is difficult in the modern type of set not only because of the space limitations but because of the fact that numerous flexible leads may connect to a single unit, so that unless great care is exercised by the repairman when a new unit is substituted for a damaged one, wrong connections will result.

One object of my invention is to facilitate the assembly and wiring of a radio set and to insure proper connections electrically satisfactory as well as to facilitate testing and inspection of the assembled set. A more specific object of my invention is to provide a novel wiring device which permits connections to be made only in accordance with a predetermined plan, thus insuring proper electrical connections under all conditions. A further object of my invention is to provide a set assembly and system of wiring which facilitates welding of the connections and which makes the repair of a damaged set easier.

In the preferred embodiment of my invention I provide a novel conductor carrying panelboard on which the major portion of the wiring is done according to a predetermined plan. This panelboard carries many of the small parts, such as resistors and condensers, and has the terminal portions of the connecting conductors extending beyond the edges of the panel. The chassis is so designed that the panelboard with the small parts on it can be placed in such a position on the chassis that the leads of the elements mounted on the chassis can be readily connected to the terminal portions of the conductors on the panelboard by welding the terminal portions of the connecting conductors to these leads, which are preferably preformed so that they will register

with the terminal portions of the conductors on the panel when the panelboard is put in place on the chassis.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claims, but the invention itself will best be understood by reference to the following description taken in connection with the accompanying drawings in which:

Figure 1 is a perspective view of one form of conductor carrying panelboard embodying my invention with parts broken away to show the details of construction.

Figure 2 is a diagrammatic representation of the electrical connections of the conductors shown in Figure 1.

Figures 3 and 4 show modifications of the panel shown in Figure 1 and embodying my invention.

Figures 5, 6 and 7 show a still further modification of a conductor carrying panel made in accordance with my invention.

Figure 8 is an exploded perspective view of a radio set made in accordance with my invention, and

Figure 9 is an enlarged perspective view of details of the radio set shown in Figure 8.

Referring to Figure 1 of the drawings the panelboard which consists of an elongated panel 10 of insulating material in accordance with my invention is provided with longitudinal slots 11, and transverse slots 12 of greater depth than the longitudinal slots, set of conductors 13 being laid in the slots 11 and the set of conductors 14 in the slots 12. The conductors of each set thus lie in different planes and are positioned to cross each other out of contact with each other except in the apertures 15, where the conductors are electrically connected as at 16, preferably by welding, the welding electrodes displacing portions of the conductors with respect to each other to form the weld. The apertures are so arranged that connections between the two sets of conductors can be made only according to the prearranged plan.

As shown in Figure 2, which is a diagrammatic representation of the conductors and the electrical connections, some of the conductors are broken as at 17. By means of this arrangement various circuits can be laid out. The apertures in the panel permit only the correct connections to be made between the conductors, thus preventing errors in the electrical connections. Welding electrodes can be easily inserted into the apertures to make the necessary electrical connections. It is not necessary to handle a maze of wires or to work in cramped quarters in order to wire up a set with which a panel made in accordance with my invention is used.

In the modification shown in Figure 3 the panelboard comprises an insulating panel 20

with longitudinal slots 21 on one face, and transverse slots 22 on its other face, apertures 23 being provided to permit conductors of the different sets to be electrically connected thru the apertures. The conductors could be insulated on the outside; for example, by insulating panels secured to each side of the conductor carrying panel over the conductors.

Another modification of a conductor carrying panelboard made in accordance with my invention is shown in Figure 4, and consists of an insulating panel 24 having on one face the longitudinal grooves 25 in which the longitudinal wires are laid, and a panel 26 having on one face transverse grooves 27 in which the conductors 14 are laid. The panels 24 and 26 are placed one on top of the other as shown and have registering apertures 28 thru which the electrical connections between the two sets of conductors can be made. Any desirable method can be employed to fasten the two panels together although I prefer to use rivets 29.

The modification shown in Figures 5, 6 and 7 is a three layer panelboard comprising a panel 30 of insulating material having grooves 31, in which the longitudinal conductors 13 are laid, a similar panel 32 having grooves 33 in which the transverse conductors 14 are laid, and an intermediate insulating panel 35 which serves to electrically insulate the two sets of conductors from each other and also acts as a templet which determines where connections can be made. The outside panels 30 and 32 may have similar sets of apertures 34, which register with all the junctions of the crossed wires. The intermediate or templet panel 35 has a set of apertures 36 arranged to register with only those selected junctions which are to be welded or soldered, and with only the corresponding apertures in the panels 30 and 32. The apertures in the outside panels 30 and 32 can be arranged in a standard pattern which will provide for all desired connections and by making the arrangement of the apertures in the panels 35 correspond to different circuits, a panelboard for any desired circuit can be made with two standard outside panels and a special templet panel for that circuit since the circuit connections are determined solely by the templet panel 35, as appears from Figure 6 and the cross section of this three layer panelboard shown in Figure 7. The operator can therefore make only the connections permitted. It is, therefore, not necessary for the operator to learn new circuit connections and no time is lost when new circuits are introduced. The panels 30 and 32 may thus be made standard for all types of circuits, the intermediate panel 35 being used to determine the circuits which are to be made. In this way it is only necessary to change the templet or intermediate panel 35 to change the circuit connections for different circuits. The panels may be riveted together into a unitary panelboard as shown in Figure 4, or may be molded or joined together by the application of heat.

The application of my invention to radio set construction is shown in one embodiment in Figure 8. Briefly, the set is provided with a chassis preferably in two parts, one of which carries the tube sockets and the other of which carries the power equipment and control elements such as condensers and volume controls. A panelboard made in accordance with my invention and carrying a large number of the small parts, such as condensers and resistors, is

mounted vertically between the two parts of the chassis. Preferably the ends of the conductors extending above the upper edge of the panelboard are connected to preformed conductors extending from the tube sockets on one part of the chassis and the conductors extending below the lower edge of the panel are connected to the equipment carried by the other part of the chassis. The radio frequency coils are preferably carried on the side of the panelboard facing the socket carrying part of the chassis. The conductors from the devices on the parts of the chassis line up with the conductors on the conductor panelboard when the conductor panelboard is in position on the chassis and extends away from the chassis sufficiently to permit welding rollers to be passed over the ends of the aligned conductors to weld the conductors together and thus interconnect the devices on the two parts of the chassis into associated circuits.

As best shown in Figure 8, the chassis comprises two parts 39 and 40, between which is mounted a panelboard similar to that shown in Figures 5, 6 and 7, except that the holes 34 are provided only in certain places to provide for the particular circuit used. The panelboard carries such parts as condensers 41 and resistors 42, and is vertically mounted and held in position by means of screws 43 on the chassis part 39, the screws 43 passing thru holes 44 provided for them in the conductor carrying panel.

The chassis member 40 carries sockets 45 provided with preformed connecting conductors 46 held in alignment by insulating plate 47 having slots 48 along its edge into which the conductors 45 extend.

As best shown in Figure 9, which shows the conductor carrying panel in the process of being placed in position, the preformed conductors 46 connected to the tube sockets 45 register with the transverse conductors 14 on the conductor carrying panel, the conductors 14 and 46 contacting with each other when the panel is fastened in position on the chassis part 40. The conductors then can easily be welded together by passing energized welding rollers over the ends of the conductors.

Part 41 of the chassis carries other parts of the radio set, such as the power transformer 50, rectifier tube 51, condensers 52 and other devices not shown. These devices are connected to the lower end of the transverse conductors when the part 41 is assembled and held in position by means of bolts (not shown) passing thru apertures 54 and 55, which register when parts 40 and 41 are assembled in position. It is then possible to roll the welding rollers along the lower conductors, which are in registry, to electrically connect them together.

It can thus be seen that I have provided by means of my invention a method of assembling and wiring which not only reduces errors in connection, facilitates the assembly of the set and welding of the connections as well as inspection and testing but one in which repairs are easily made since the damaged unit can be easily cut out and replaced without the necessity of working in cramped quarters and of hunting thru a maze of wires to find the proper conductors.

While I have indicated the preferred embodiments of my invention of which I am now aware and have also indicated only one specific application for which my invention may be employed, it will be apparent that my invention is by no

means limited to the exact forms illustrated or the use indicated, but that many variations may be made in the particular structure used and the purpose for which it is employed without departing from the scope of my invention as set forth in the appended claims.

What I claim as new is:—

1. Means for interconnecting electrical devices into associated circuits and comprising an insulating panel having a set of spaced conductors thereon positioned to lie in one direction and a second insulating panel in registry with said first panel and having a set of spaced conductors thereon positioned to lie in another direction so that the conductors of one set lie in crossed relationship with the conductors of the other set, said panels having apertures in registry with the junctions of said crossed conductors, and a third insulating panel between said first two panels and having apertures registering with only certain apertures in said first two panels, conductors of different sets being electrically connected thru the apertures in said third panel.

2. Means for interconnecting electrical devices into associated circuits and comprising a panel of insulating material, a set of spaced substantially parallel connectors positioned on one side of said panel, a second panel of insulating material disposed over said set of conductors, a second set of spaced substantially parallel conductors disposed on the other side of the second panel from the first set and positioned to cross the conductors of said first set, and a third panel of insulating material disposed over said second set of conductors, the insulating panels being secured together to form a unitary structure with the conductors enclosed therein, (said first and third panels being provided with apertures registering with the junctions of the conductors) said second panel being provided with apertures registering with only certain of said junctions, and conductors of the different sets being electrically connected thru the apertures in said second panel.

3. Means for interconnecting electrical devices into associated circuits and comprising a panel of insulating material, a set of spaced substantially parallel connectors positioned on one side of said panel, a second panel of insulating material disposed over said set of conductors, a second set of spaced substantially parallel conductors disposed on the other side of the first panel from the first set of conductors and positioned to cross the conductors of said first set, and a third panel of insulating material disposed over said second set of conductors, the insulating panels being secured together to form a unitary panelboard with the conductors enclosed therein, said first panel being provided with apertures registering with only certain of said junctions, and conductors of the different sets being electrically connected thru the apertures in said second panel.

4. In a radio set, a chassis, electrical devices supported on said chassis, preformed conductors connected to and extending from said electrical devices and positioned in aligned relationship, means for interconnecting the electrical devices into associated circuits and comprising an insulating panel having a set of spaced conductors positioned thereon in one direction, a second insulating panel in registry with said first panel and having a set of spaced conductors thereon positioned in another direction so that the conductors of one set lie in cross relationship with conductors of the other set, said panels having apertures in registry with junctions in said con-

ductors and a third insulating panel between said first two panels and having apertures registering with only certain apertures in said first two panels, conductors of different sets being electrically connected thru the apertures in said third panel, the ends of said conductors extending beyond the edges of said panel and in alignment with and electrically connected to the preformed conductors of said electrical devices.

5. In a radio set, a two part chassis, electrical devices on each of the parts of said chassis, conductors extending from said devices and means positioned between the two parts of the chassis for interconnecting said electrical devices into associated circuits and comprising a panel of insulating material, a set of conductors on one face of said panel, a second panel of insulating material disposed over said set of conductors, a second set of conductors disposed on the other side of said second panel from said first set of conductors, the conductors of said second set being positioned to cross the conductors of said first set and a third panel of insulating material disposed over said second set of conductors, the panels of insulating material being joined to form a unitary structure having a pair of relatively insulated sets of conductors enclosed therein, said panels having apertures in registry with certain junctions of the crossed conductors in different sets, the conductors being electrically connected thru said apertures, said conductors having portions extending outwardly from the edges of the panels to facilitate connection of said conductors to the conductors of said electrical devices.

6. In a radio set, a two part chassis, electrical devices mounted on each of the parts of said chassis, conductors electrically connected to and extending from said devices, and means for interconnecting said electrical devices into associated circuits and comprising an insulated panel having apertures and mounted vertically between the two parts of the chassis, a set of laterally spaced substantially parallel conductors positioned on each side of said panel and extending beyond the edges of said panel, the conductors of one set being vertically positioned and the conductors of the other set being horizontally positioned so that the conductors of one set overlap the conductors of the other set at said apertures, the overlapping conductors of the different sets being electrically connected thru the apertures, the electrical devices on one part of the chassis being connected to the conductors extending above the top edge of the vertically mounted panel and the electrical devices on the other part of the chassis being connected to the portion of the conductors extending below the lower edge of said vertically mounted panel.

7. Means for interconnecting electrical devices into associated circuits and including an insulating panel, a set of spaced substantially parallel conductors positioned on each side of said panel so that the conductors in one set cross the conductors of the other and are spaced apart at the junction of the conductors, a second panel of insulating material disposed over one set of said conductors and a third panel of insulating material disposed over the other set of said conductors, the panels of insulating material being joined to form a unitary structure having a pair of relatively insulated sets of conductors enclosed therein, said panels having apertures in registry with certain junctions of the crossed conductors in different sets, the conductors being electrically connected thru said apertures.

WILLIAM J. O'BRIEN.