Feb. 3, 1931. R. C. DA COSTA 1,791,123

TERMINAL CONNECTING SYSTEM

Filed Nov. 28, 1928 3 Sheets-Sheet 1

Fig. 1.

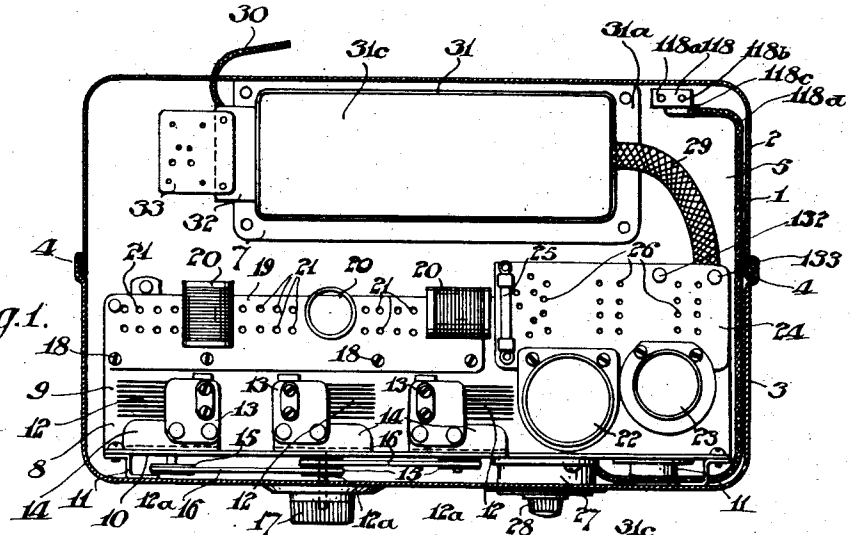


Fig. 2.

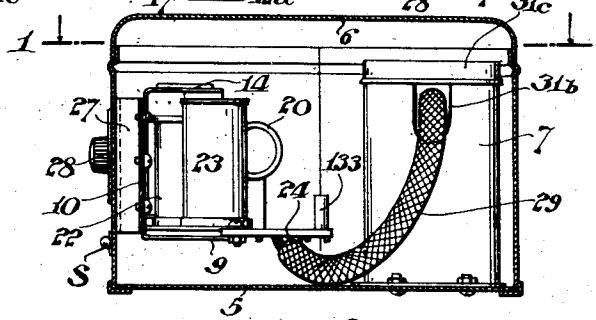


Fig. 3.

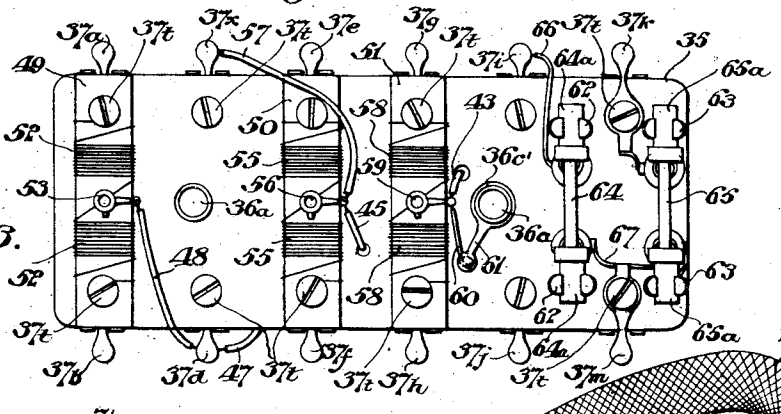
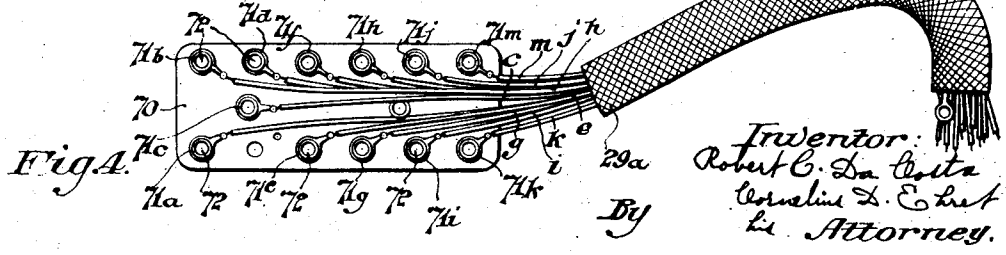


Fig. 4.



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TERMINAL CONNECTING SYSTEM

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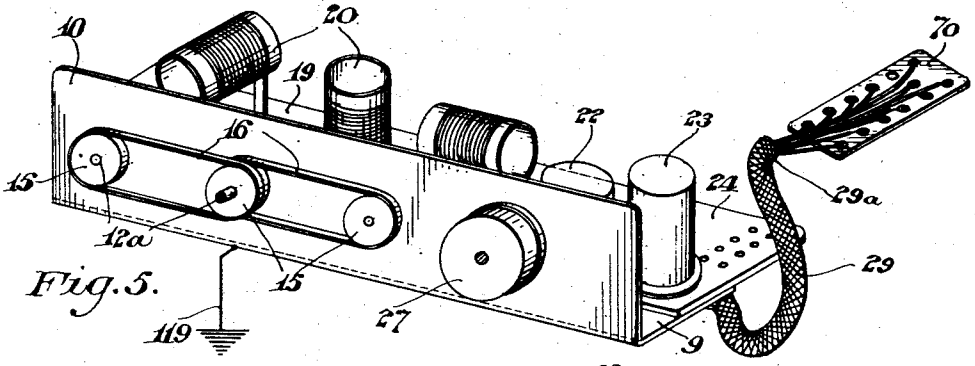


Fig. 5.

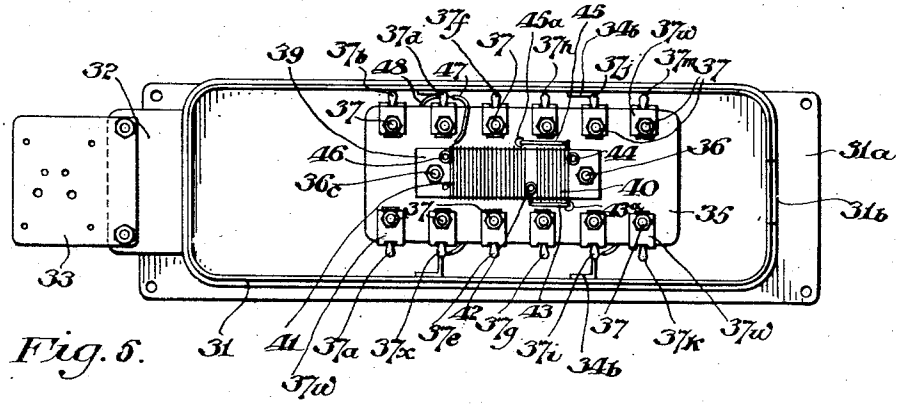


Fig. 6.

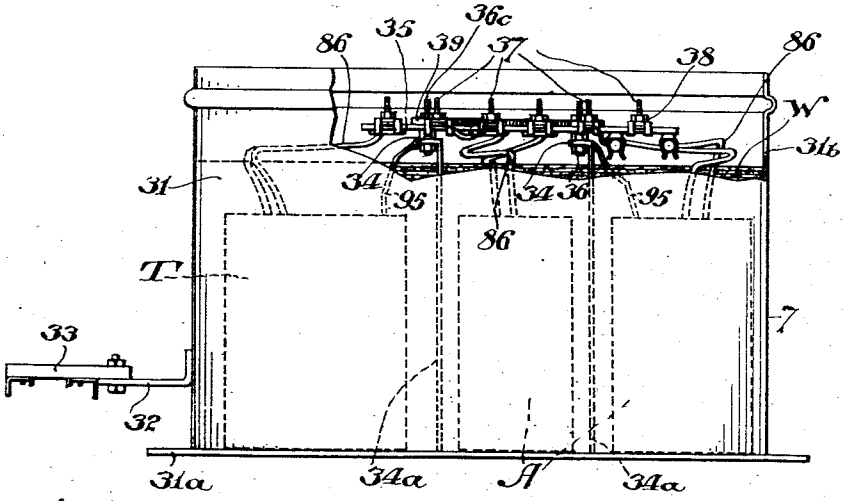


Fig. 7.

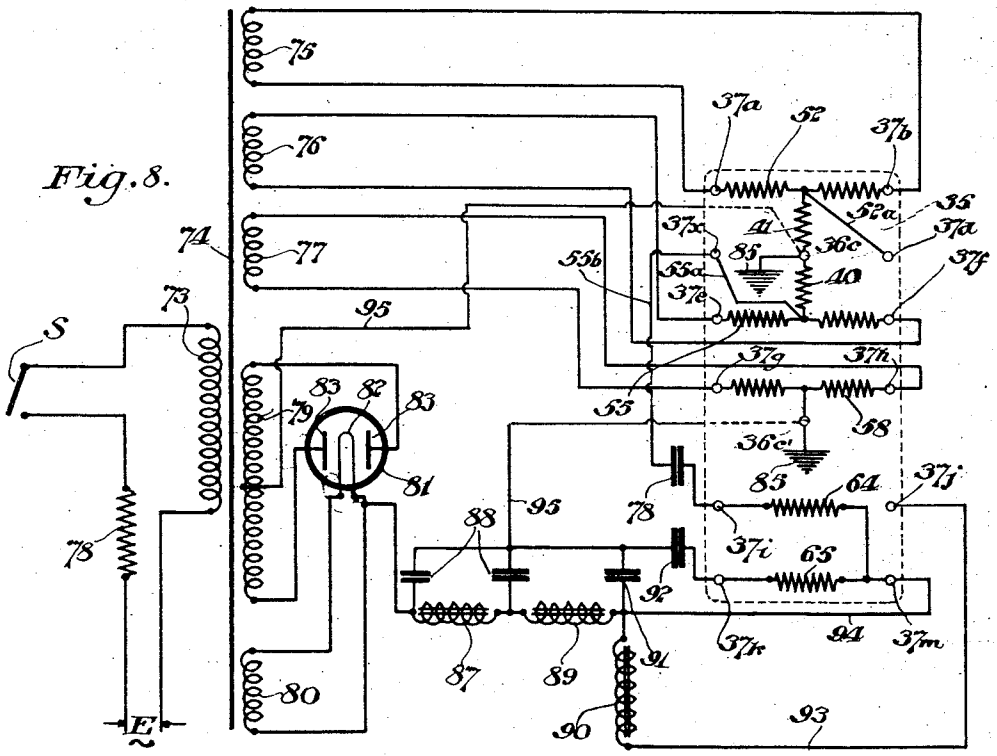
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TERMINAL CONNECTING SYSTEM

Filed Nov. 28, 1928 3 Sheets-Sheet 3

Fig. 8.



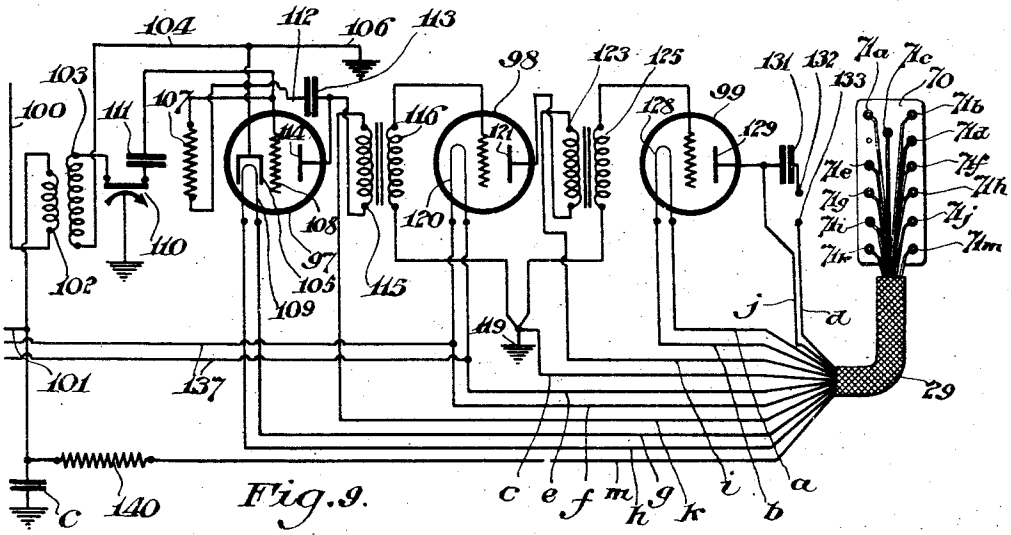


Fig. 9.

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Patented Feb. 3, 1931 1,791,123

UNITED STATES PATENT OFFICE

ROBERT C. DA COSTA, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO ATWATER KENT MANUFACTURING COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA

TERMINAL CONNECTING SYSTEM

Application filed November 28, 1928. Serial No. 322,314.

My invention relates to radio receiving apparatus, and more particularly to means for interconnecting the power supply and receiving set thereof

In accordance with my invention, a power unit has within its housing a supply terminal panel, to whose several terminals conductors leading from said unit are connected, and a distributing terminal panel detachably mounted upon said supply panel, said distributing panel having conductors connected to its several terminals and leading to the receiving set.

Further in accordance with my invention, the distributing panel is detachably mounted as a unit upon the supply terminal panel, and more particularly, the supply terminal panel has mounted thereon elements of or for the radio receiving set as, specifically, one or more impedance elements.

Further in accordance with my invention, the supply terminal panel is fixedly mounted upon or comprised in a power unit, either detached from or incorporated in the housing or cabinet of the radio receiving set, and comprises connecting elements in registry with corresponding elements mounted on the distributing terminal panel, said elements affording means for both mechanically and electrically interconnecting said panels; and more particularly, the supply terminal panel has mounted thereon impedances included in anode, cathode-heating or other circuits of the radio receiving set.

Further in accordance with my invention, the power unit has on the supply panel a terminal, preferably grounded, as to the metal housing for the power unit, and with that terminal detachably contacts a terminal on the distributing panel connected to a separate ground. in or of the receiving set, such as a grounded point or metal frame, panel or chassis, of the receiving set.

My invention further resides in a system and apparatus of the character hereinafter described and claimed.

For an illustration of one of the various forms my invention may take, reference is had to the accompanying drawings, in which:

Fig. 1 is a plan view of radio receiving apparatus, taken along the line 1—1 of Fig. 2.

Fig. 2 is an end elevational view of apparatus shown in Fig. 1.

Fig. 3 is a view of the lower surface of a terminal panel.

Fig. 4 is a view of a conductor cable and terminal panel, adapted to be associated with the panel shown in Fig. 3.

Fig. 5 is a perspective view of a chassis and elements of radio receiving apparatus mounted thereon associated with the conductor cable and panel of Fig. 4.

Fig. 6 is an interior plan view of a power unit in which the terminal panel shown in Fig. 3 is incorporated.

Fig. 7 is an elevational view, partly in section, of the power unit and terminal panel shown in Fig. 6.

Fig. 8 is a diagrammatic illustration of circuit connections and apparatus for the power unit and its associated terminal panel.

Fig. 9 is a diagrammatic illustration of the circuit connections and elements of detector and audio frequency stages of radio receiving apparatus with which the conductor cable and its panel are associated.

Referring to Fig. 1, a housing or cabinet 1, which may be of any suitable material, as sheet metal, comprises a pair of sections 2 and 3 joined at 4, a bottom portion 5 and a top or cover portion 6. Mounted within the housing are a power unit 7, hereinafter described, and radio receiving apparatus carried by a chassis or equivalent mounting structure 8. The chassis 8 comprises in general, two panel-like members 9 and 10 spaced from and substantially parallel to the bottom and front portions of the housing respectively. The front panel 10 of the chassis is secured in any suitable manner with respect to the front side of the housing, as by lugs 11. Condensers 12, of the rotating disc type, having interleaving rotor and stator plates, have their rotors mounted upon panel 10 by shafts 12*a* extending therethrough. The stator plates are carried by the sheets or blocks of insulating material 13, in turn secured to the metal brackets 14 which are secured to the panel 10.

Upon the rotor shafts 12*a* of the condensers are secured drums 15 which co-operate

with driving bands 16 actuated by a single operating dial 17 effecting simultaneous and equal extents of movement of the condenser rotors.

Mounted upon panel 9, as by screws 18, is a sub-panel 19 on which are mounted radio frequency transformers 20. Apertures 21 extending through panel 19 serve as mounting means for the thermionic tubes, the prong terminals thereof extending through the apertures into engagement with contacts not shown, for connecting the tubes in circuit.

Also mounted upon panel 9, are the first and second stage audio frequency transformers 22 and 23. A sub-panel 24 having a grid leak 25 mounted thereon is furthermore provided with apertures 26 for receiving the prong terminals of the detector and audio frequency amplifier tubes. A volume control 27 is mounted upon panel 10 within the space between said panel and the front of housing 1, and is operated exteriorly thereof and by rotatable dial 28.

Connected to the volume control 27 and to a wall of the metal housing 1, in a manner illustrated and described in a co-pending application by Dreyer, Serial No. 299,933, filed August 16, 1928, is a braided conductor 118*d* extending along the sides of and within housing 1 to an insulating block 118 mounted within housing 1 on the rear wall thereof by a metallic bracket (not shown), and on which are secured terminals 118*a* and 118*b* for receiving conductors connected to the antenna and earth respectively. Terminal 118*b* is electrically connected to a member 118*c* of conducting material mounted on the metallic bracket above referred to, which is in turn connected to the braided conductor 118*d*, which is accordingly electrically connected to the metal housing 1 and the metal panel or chassis structure 9, 10.

A power unit 7 is mounted by bottom flanges 31*a* to the lower portion 5 of the housing 1. A conductor cable 29, extending through the notch or dot 37*b* in the upper edge of wall 31 and maintained in position by cover 31*c*, interconnects corresponding elements of power unit 7 and the radio receiving apparatus above described.

The power unit is supplied from a source of alternating current by cable or lamp cord 30 communicating with an alternating current circuit plug through a lamp socket or attachment. The unit comprises a metallic housing 31 having mounted exteriorly thereof bracket 32 and panel 33 upon which is mounted a rectifying tube, not shown.

Referring now more particularly to Figs. 6 and 7, housing 31 of the power unit 7 has mounted therein, as upon posts or brackets 34 forming a part of transversely extending partitions 34*a*, a supply terminal panel 35 for the purpose hereinafter described. Metal housing 31 comprises three separate compartments defined by metal partitions 34*a*, having at their upper edges flange or bracket members 34 for a purpose hereinafter described. Partitions 34*a* are mounted within housing 31 in any suitable manner, as by welding in inwardly turned flanges 34*b* (Fig. 6) to the sides of the housing 31. Filter circuit apparatus A, such as filter condensers and choke coils, and transformer structure T, are mounted within the several compartments of housing 31. Conductors 86 leading therefrom are connected to a terminal panel 35, hereinafter described, said conductors having slack between the above described apparatus and terminal board. After the transformer and filter apparatus have been placed in the several compartments of housing 31 the compartments are filled with wax W, or equivalent insulating material, which solidifies on cooling to approximately the level indicated in Fig. 7. Leads, 95, are grounded to casing 31 by connection to lugs 34.

Terminal panel 35 comprises a sheet-like member of insulating material, as fiber board or the like, and is secured by bolts or studs 36 and 36*c* extending therethrough to bracket members 34 which are in fixed relation to housing 31. As viewed in Fig. 6, the top portion of the panel comprises studs or bolts 37, which are of conducting material and serve to provide electrical contact between elements cooperating therewith, hereinafter described, and the terminal connecting members 37*a*, 37*b*, etc., mounted along the edges of panel 35, to which conductors may be readily connected as by soldering. Terminal members 37*a*, 37*b*, etc., are clamped to panel 35 on either side thereof by bolt heads 37*t* (Fig. 3) and clamping plates 37*w*. Clamping plates 37*w* also serve to position terminals 37*a* etc., and each comprise a shoulder at one end to position a nut, and a flange at the opposite end extending beyond the edge of panel 35 and having bifurcations between which a terminal member is positioned. Studs 37 extend an appreciable distance beyond the upper surface of panel 35, and are maintained in such position by holding nuts 38. A strip of insulating material 39 is mounted upon the top surface of panel 35, bolts or studs 36*c* and 36 serving as common mounting means for the insulating strip and panel. A grid biasing resistance 40 is wound upon one portion of the insulating strip, and a second grid biasing resistance 41 is wound upon the remaining portion, the resistances having a common contact 42 connected to a conductor 43 leading through an aperture to the lower side of the panel. The terminal 44 of resistance 40 is connected to a conductor 45 leading through an aperture 45*a* to the underneath portion of panel 35. Terminal 46 of resistance 41 is connected by connected by conductor 47 to the terminal ele-

ment 37*d* and to a conductor 48 leading to the underneath portion of the panel.

Referring now to Fig. 3 which is a view of the underneath portion of panel 35, the head portions 37*t* of bolts or studs 37 serve in certain instances to provide means for mounting a plurality of insulating strips 49, 50 and 51 upon the panel. Element 49 has mounted thereon an audio frequency filament shunt resistance 52 which has a central tap 53 connected by conductor 48 to terminal 37*d* to which the conductor 47, referred to above, is connected. The opposite terminals of resistance 52 are electrically connected to the terminals 37*a* and 37*b* through head portions 37*t* of studs 37. Apertures 36*a* in panel 35 are adapted to receive the mounting studs 36*c* and 36 above referred to. The insulating strip or element 50 has mounted thereon a resistance 55, having its end terminals electrically connected to the terminals 37*e* and 37*f*, and a central portion thereof connected to a terminal 56, to which is connected conductors 45 and 57. Conductor 57 is connected to one of the terminal elements 37*x*. Insulating element 51, as in the previous instances, has mounted thereon a resistance 58 connected to terminals 37*g* and 37*h*, and whose central portion is connected to a terminal 59 to which conductors 43 and 60 are connected. Conductor 60 is connected to a terminal 61 which is in electrical contact with one of the mounting studs 36 when panel 35 is in position as indicated in Fig. 6. Mounting studs 36 and 36*c* being grounded when panels 35 and 70 are mounted thereon, it is apparent that the central portion of resistance 58 is connected to ground.

Mounted upon supply panel 35 are two sets of clips 62 and 63, which engage and hold in position resistances 64 and 65 respectively. Resistance 64 comprises an audio frequency plate circuit resistance, the terminals of which, 64*a*, engage clips 62. A tubular glass portion, within which the resistance is mounted, connects terminals 64*a*. One of the clips 62 is connected by a conductor 66 to terminal 37*i*, the other clip being connected by conductor 67 to terminal 37*m*, to which one of the clips 63 of resistance 65 is also connected. Resistance 65 is similar in construction to that of resistance 64, its terminals 65*a* engaging and in electrical contact with clips 63. One terminal clip 63 is connected by conductor 67 to the common terminal 37*m*, the other terminal clip being connected to terminal 37*k*.

Panel 35, together with the resistance elements mounted thereon, is adapted to be mounted as a unit within housing 31, and to be detachably secured thereto so that if inspection or testing of the same becomes necessary, the power unit need not be disturbed other than to unloosen the securing means for studs 36 and 36*c* and thereupon lifting panel 35 out of engagement with the same. To this end the conductors (Fig. 7) connecting panel 35 with the individual sources of potential are of sufficient length so that panel 35 may be lifted from studs 36 and 36*c* and both sides thereof inspected. By this provision, replacement or repair of the conductors or resistance elements mounted upon the panel may be easily and quickly effected, and which would not be the case if the same elements and connections therefor were imbedded in the usual waxy mass W comprising a portion of the power unit structure. Furthermore the grouping of these resistances in a unit which may be readily assembled and mounted within the power unit, affords a very practical advantage over prior methods of assembly wherein the resistances were often mounted individually in different parts of the radio receiving set, thereby making it difficult to locate and test each of them individually.

Referring to Fig. 5, there is shown a chassis upon which radio receiving apparatus is mounted, and to which a conductor cable 29 is connected. Cable 29 comprises an outer sheath or protecting covering 29*a*, within which conductors 29*b* are grouped. The terminal of cable 29, remote from the receiving apparatus, comprises a terminal distributing panel 70 upon which the conductors are fanned out and connected to terminal elements thereon. Referring now more particularly to Fig. 4, panel 70 comprises a sheet-like member of insulating material, such as fiber board for example, and has apertures 72 drilled in spaced relation along its sides and central portion. Mounted within apertures 72, and engaging the edges thereof, are elements 71*a*, 71*b* etc., comprising grommets or the like, having terminal extensions to which the conductors *a*, *b*, etc., of cable 29 are connected.

Apertures 72 of panel 70, and connecting studs 37 of panel 35 are adapted to be in registry, and are preferably so arranged that they are only in registry when proper terminal members 71*a*, etc., of panel 70 are in contact with studs 37. When in this relation, the distributing panel 70 is placed upon panel 35, the connecting studs 37 extending through apertures 72, and is detachably mounted and clamped with respect thereto by means of nuts engaging the portions of studs 36 and 36*c* extending through and above panel 70. When panels 35 and 70 are so connected and clamped to each other, proper connections are provided between the sources of potential derived by the power unit, and the radio receiving apparatus above referred to. It follows therefore that the power unit and radio receiving apparatus may be easily and quickly detached from each other, and separately inspected and tested. This advantage is furthermore apparent by

referring to Figs. 5 and 6, wherein both the chassis upon which the radio receiving apparatus is mounted, and the power unit 7, are shown entirely removed from housing 1, the same being detachable therefrom as individual units.

Referring to Fig. 8, the connections between the elements of the power unit and panel 35 are diagrammatically illustrated. A source of alternating current E, which may be, and generally is the usual 110 volt house supply, is adapted to energize the primary winding 73 of a transformer through a lamp socket, attachment plug or the like. A set switch S is included in the primary circuit of the transformer. A voltage regulating or ballast resistance 78 may be included in that circuit. Primary winding 73 is inductively related through a core, diagrammatically illustrated by 74, to a plurality of secondary circuits for supplying both alternating and direct current to circuits of the radio receiving apparatus. Secondary windings 75 and 76 are adapted to supply alternating current to the filaments of audio frequency tubes, and secondary 77 is adapted to supply current to the heater filament of the detector tube. To this end, windings 75, 76 and 77 are connected to corresponding pairs of terminal elements, 37*a* and 37*b*, 37*e* and 37*f*, 37*g* and 37*h* respectively, carried by panel 35. Resistances 52, 55 and 58, mounted upon panel 35, are consequently connected across the terminals of secondaries 75, 76 and 77 respectively. Resistances 52 and 55 have their midportions interconnected by resistances 40 and 41, the common terminal of resistances 40 and 41 being connected to ground at 36*c'*. As previously explained with reference to Fig. 3, resistance 58 also has its midportion connected at 36*c'* to ground. The midportion of resistance 52 is also connected through conductor 52*a* to terminal 37*d*. The midportion of resistance 55 is connected by conductor 55*a* to terminal 37*x*, in turn connected by conductor 55*b* to condenser 78 and terminal 37*i*.

Secondary windings 79 and 80 are connected to the anode circuit, and the filament circuit of a rectifying tube 81 respectively. The rectifying tube comprises a filament or cathode 82 heated by current from secondary winding 80, and anodes 83 for effecting double wave rectification of the current. Winding 79 is tapped at its central portion to connect the same with stud 36*c*, which is in turn connected to a ground at 85. Cathode 82 is connected to a filter comprising series choke or reactor elements 87 and 89, and shunt impedances or condensers 88 and 91 connected to ground. Choke 90 is the customary means to supply the direct current to the plate of the power tube and to couple the plate to the speaker, in cooperation with b stopping condenser 131. The detector filter condenser 92 is connected to ground by conductor 95, and has its other terminal connected to a terminal of panel 35. A terminal of the speaker choke 90 is connected by conductor 94 to terminal 37*m* on the panel 35, which terminal also forms a common high potential connection for resistances 64 and 65. The other terminal of the choke is connected by conductor 93 to another terminal 37*j* of panel 35.

For the purpose of illustrating the operative connections between the panel 70 and the radio receiving apparatus, a detector circuit, and two stages of audio frequency are illustrated in Fig. 9 connected to the conductors leading from cable 29. The voice currents of radio frequency, amplified to a desired extent through a plurality of radio frequency stages (not shown), is transmitted to a detector tube 97, and afterwards amplified by the audio frequency tubes 98 and 99. Conductor 100 connects the primary 102 of a transformer to the plate of the last stage of radio frequency amplification. Lead 101 connects with the other radio frequency primaries. C is a radio frequency by-pass to ground for the radio frequency plate circuits. The secondary of the transformer 103 has one terminal thereof connected by conductor 104 to the cathode 105 of detector tube 97. The cathode is also connected by conductor 106 to ground, and to the grid leak resistance 107, in turn connected to the grid 108. The cathode heater 109 is heated by current through conductors *g* and *h* leading by way of the cable 29, and the terminal panels 35 and 70 from the secondary winding 77 (Fig. 8). The opposite terminal of the detector input coil 103 is connected to grid 108 through the grid condenser 111. Condenser 113 is the usual radio frequency by-pass connected between anode 114 and cathode 105. The anode circuit of tube 97 comprises the primary winding 115 of an audio frequency transformer, the secondary 116 of which is connected to the grid circuit of amplifying tube 98 in the usual manner. One terminal of secondary 116 is connected to grid 117, and the opposite terminal to the metal chassis or ground 119. As in the previous instance, filament or cathode 120 is connected to conductors *e* and *f* leading to cable 29, and is heated by current from a filament winding 76 shown in Fig. 8. Anode 121 is connected to one terminal of a primary winding 123 of the second audio frequency transformer, the other terminal being connected by conductor *i* through cable 29, etc. to a source of potential. The secondary winding 125 of the audio frequency transformer has one terminal connected to ground 119, and the other terminal to the grid of the last audio frequency tube 99. Cable conductor C connects chassis 119 to metal container 31 of the power unit to insure that container 31 is at ground potential.

Filament or cathode 128 is connected to conductors *a* and *b* leading to cable 29, and in operation is heated by current from secondary winding 75 (Fig. 8). Anode 129 is connected to a condenser 131 having comparatively low impedance at audio frequency. Condenser 131 is connected to one of the sound reproducer or loud speaker terminals 132, the other terminal 133 being connected by conductor *d* through cable 29, and corresponding connections to the mid-point of filament resistor 52. Plate 129 is connected to the audio frequency choke coil 90 through lead *j* and corresponding terminals on panel 35. Conductors 137 which are connected to conductors *e* and *f* supply current from the secondary winding 76 of the power unit to the filaments of the radio frequency tubes (not shown). The second stage of audio frequency comprises a power tube, and its filament will therefore be energized at a voltage different than that supplied to either of the filament circuits of tubes 97 or 98. Resistances 65 and 64 mounted upon panel 35 are connected in a well-known manner in the detector plate circuit and first audio frequency plate circuit supplies respectively, and in a similar manner resistance 140 is connected to terminal 37*m* by conductor *m* in the plate circuit supply of radio frequency stages.

It will be apparent from the above description that the radio receiving apparatus, which is connected by means of the conductor cable 29 and panels 70 and 35 to different and individual sources of potential, is entirely a separate unit with respect to said sources, and is easily and quickly connected thereto by means of detachable panel 70. By so assembling the apparatus, the radio receiving apparatus, independently of the power supply, speaker choke 90 and the resistances mounted upon panel 35, may be entirely removed from housing 1 by loosening the securing means holding the chassis to said housing, and the same quickly inspected or serviced without disturbing the remaining apparatus. In the same manner, by disconnecting panel 70, the power unit itself may also be removed from the housing by loosening the means securing flanges 31*a* to the bottom portion, and by removing the same therefrom.

As diagrammatically illustrated in Figs. 5 and 9, the set ground 119 is at earth potential through terminal 118*b*, as previously described with reference to Fig. 1. Consequently, referring to Figs. 8 and 9, there exists a ground connection *c* from ground 119 through cable 29, terminal element 71*c* on panel 70 and stud terminal 36*c* which protrudes through hole 36*a* in supply panel 35, said last named terminal being electrically connected through post 34 to the metallic partition 34*a* and housing 31 of the power unit. Accordingly, even though housing 31 were imperfectly connected to the set housing 1, there will still be a perfect ground connection for the power unit through the set ground 119 or 118*b*, thereby insuring that all grounds both in the power unit, including grounds 36 and 36c for the filter system, and the receiving set are at earth potential.

For the purpose of simplicity, two ground terminals, namely 36*c* and 36*c'*, have been indicated on panel 35 in Fig. 8. As a matter of fact, however, terminal 36*c'* is the only ground connection on panel 35 to which conductors thereon are connected and the resistances 40 and 41 are connected to terminal 36*c'* by conductor 43 as illustrated in Figs. 3 and 6, instead of to terminal 36*c*, which is a component part of the power container.

It is therefore evident that even though the power unit housing should be insulated from the set housing 1, as in the case where it is remotely positioned therefrom, nevertheless there will be a ground connection by way of conductor *c* insuring that all grounds both within the power unit and set are at the same or earth potential. In other words, conductor *c* connected through the distributing and supply panels to terminal 36*c*, is a positive means for assuring that the metallic power unit casing and all the apparatus therein electrically connected thereto, shall be at the same potential as the chassis 8 (Fig. 1), which is in turn grounded to earth by means of conductor 118*d* connected to the volume control and housing 1.

While my invention has hereinbefore been described more particularly with relation to an alternating current power unit, it shall be understood that it relates also to filter systems or power units supplied through a lamp socket, plug receptacle or otherwise, by current from a direct current lighting or power system of any suitable voltage, in which case the unit 7 is one which comprises sources of different potentials derived from the direct current system, and may also include or comprise combinations of various types of reactive and non-reactive impedances to constitute a smoothing or filter system for any substantial ripple existing in the current at the direct current mains.

It shall therefore be understood that in the appended claims the term "power unit" is not limited to the alternating current type but refers broadly to a unit adapted to be interposed between a power or lighting circuit and the electrode circuits of tubes of radio apparatus.

What I claim is:

1. A radio receiving system comprising a receiving set, a power unit, a metallic housing therefor, supply and distributing panels detachably secured to each other within said housing, said supply panel having a terminal for said unit grounded to said hous-

ing and having other terminals connecting to said housing and having other terminals connecting to said power unit, a terminal on said distributing panel detachably engaging with said grounded terminal on said supply panel, other terminals on said distributing panel disposed in contacting register with other terminals of said supply panel and connected to said receiving set, and a separate ground for said receiving apparatus connected to that terminal of said distributing panel which contacts with the grounded terminal of said supply panel.

2. A power unit for supplying current to thermionic tubes of radio apparatus comprising conductors for connecting the input of said unit to a power or lighting circuit, a supply panel mounted upon said unit with connections to the output system thereof, a distributing panel detachably mounted upon said supply panel and having conductors for connecting said output system to electrode circuits of said tubes, and impedance for determining the relative potentials of the electrodes of said tubes removably carried by said supply panel.

3. A power unit for supplying current to thermionic tubes of radio apparatus comprising a housing, a plurality of inductances and capacities disposed within said housing and forming a filter network, conductors for connecting the input side of said unit to a power or lighting circuit, a supply panel mounted upon said housing with connections to the output side of said filter network, a distributing panel detachably mounted upon said supply panel and having conductors for connecting the output side of said network to electrode circuits of said tubes, and conductive impedances for determining the anode potentials of different tubes mounted upon said supply panel.

4. A power unit for supplying current to thermionic tubes comprising a housing, a transformer having primary and secondary windings, conductors for connecting the primary winding of said transformer to a power or lighting circuit, a supply panel mounted upon said housing, a distributing panel detachably mounted upon said supply panel and having conductors to electrode circuits of said tubes, a resistor connected across a secondary winding of said transformer supplying filament current, a resistor adapted to be included in the grid and anode circuits of at least one of said tubes connected to a point of fixed potential of said first resistor, and means removably securing said resistors to said supply panel.

5. A power unit for supplying current to thermionic tubes of radio apparatus comprising a housing, transformer structure within said housing, conductors for connecting a winding of said transformer structure to a power or lighting circuit, a plurality of inductances and condensers within said housing comprising a filter and associated with a high-potential secondary winding of said transformer structure, a supply panel mounted upon said housing having terminals connected to the output side of said filter and to low-potential secondary windings of said transformer, a distributing panel detachably mounted upon said supply panel having terminals engaging said supply panel terminal to connect to electrode circuits of said tubes, and resistors carried by said supply panel and included in circuit with said high-potential and low-potential secondary windings to determine the relative potentials of the electrodes of said tubes.

ROBERT C. DA COSTA.

CERTIFICATE OF CORRECTION.

Patent No. 1,791,123. Granted February 3, 1931, to

ROBERT C. DA COSTA.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, line 72, for the word "in" read the; same page, lines 129 and 130, strike out the words "by connected"; page 6, lines 1 and 2, claim 1, strike out the words "connecting to said housing and having other terminals"; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 10th day of March, A. D. 1931.

(Seal)

M. J. Moore,
Acting Commissioner of Patents.