

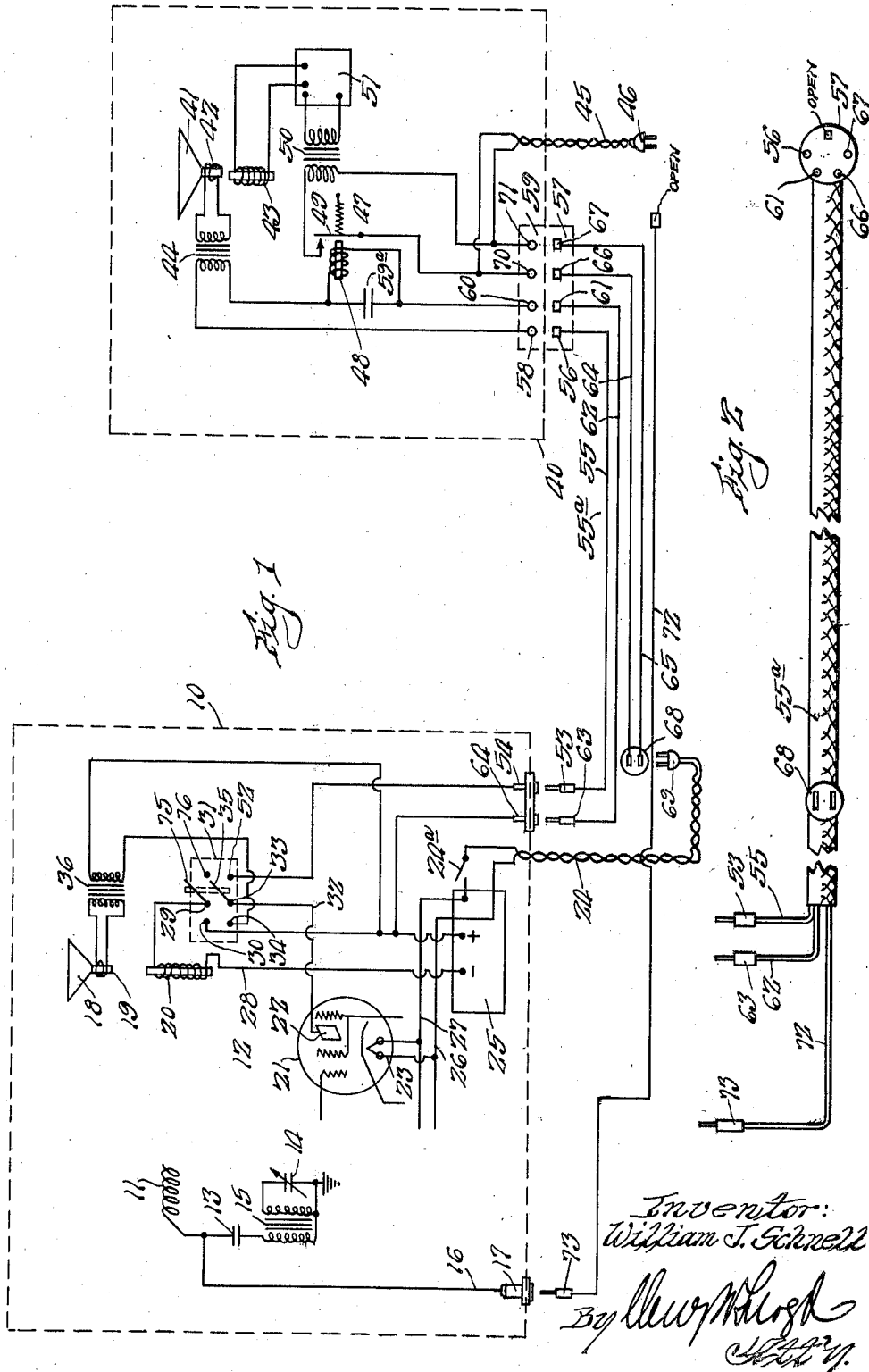
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RADIO RECEPTION

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## UNITED STATES PATENT OFFICE

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## RADIO RECEPTION

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This invention has to do with a radio receiver having a local and remote loud speaker generally of the electrodynamic type, and relates particularly to an operating means for completely de-energizing one of said speakers concurrently with the energization of the other.

The primary object of the present invention is to provide, for use with a portable radio set and particularly with the so-called midget sets, an auxiliary loud speaker of greater size than that contained in the midget receiving set and remote from said set but which will be energized concurrently with de-energization of the speaker in the set, the volume and reproduction of such remote loud speaker being regulated from the dial and other controls upon the receiving set.

It is a further object of the present invention to provide a novel electric circuit whereby an electrodynamic loud speaker may be conveniently operated remotely to a receiving set proper and controlled from said set as simply and satisfactorily, mechanically, as a speaker forming an integral part of such set.

Another object of the present invention is the provision of an improved control circuit for operating an electrodynamic speaker remotely of a radio receiving set and whereby a speaker forming a part of the receiving set proper may be used alternately but not concurrently therewith.

Another object of the present invention is the provision, in connection with a radio receiver having an electrodynamic loud speaker, of a new control circuit for operating a remote electrodynamic speaker and for the independent operation of such speakers.

Another object of the present invention is the provision of an improved circuit for controlling an electrodynamic loud speaker at a distance from a radio receiver, the circuit employing the plate current of a thermionic tube of the receiver for controlling the excitation of the field coil of the distant speaker.

Still another object of the present invention is to provide, in combination with a radio receiver operating in conjunction with a remote loud speaker of the electrodynamic type, a multiple conductor cable for supplying energy to the receiver from a source near the remote speaker.

Still another object of the present invention is to provide, in a multiple conductor cable extending between a radio receiver and a loud speaker placed remotely thereof, a conductor suitable for use as an antenna for the receiver.

With the above and other desirable objects in

view, the novel arrangement, improved combination and unique construction of the parts comprising a single form of the invention which will be hereinafter described in conjunction with the accompanying single sheet of drawings hereby made a part of this specification, and in which:

Figure 1 is a digrammatic representation of one form of the invention showing the manner of its installation in relation to a radio receiver; and

Figure 2 is a fragmentary view of a multiple conductor cable and connecting means thereon comprising a part of the device illustrated in the preceding figure.

Like reference characters will be used in the several figures of the drawing and throughout the following description for designating similar parts of the illustrated device.

Reference will first be had to Figure 1, in which the dotted line 10 is representative of a cabinet for enclosing the main parts of a radio receiving set. The invention is not limited in its application to any particular type of radio receiver. For that reason, many parts are omitted from the diagram of the receiver illustrated in Figure 1. Only those parts necessary to the operation of the present invention and which are conventional parts of any radio receiver employing vacuum tubes are shown.

The reference character 11 designates a compact antenna unit, which may be transported together with the main part of the receiver indicated by the ordinal 12. Condensers 13 and 14 and a transformer 15 are connected to the antenna 11 in a customary manner. A conductor 16 leads from antenna 11 to a jack-receptacle 17.

Within the main part of the receiver 12 is an electro-dynamic speaker 18 comprising a voice coil 19 and a field coil 20. The output tube 21 contains a plate 22, a filament 23 and other conventional elements. The invention is equally applicable for use with a receiver employing simple triodes having but a filament, a grid and a plate. Power may be conducted to the main part of the receiver through a "twisted pair" 24, which leads to a unit 25 for providing "B" battery energy for the receiver. Circuit legs 26 and 27 extend from the terminals of the conductor cord 24 to conduct energy to the tube filaments within the receiver. If desired, the unit 25 may be replaced by a group of dry cells.

A circuit designated generally by the numeral 28 leads from the source 25 of "B" energy

through the field coil 20 of the speaker 18, terminals 29 and 30 of a switch 31 when the switch blade 75 is thrown to the left and back to the source of "B" energy. A second circuit 32 leads from the plate 22 of the vacuum tube, through terminals 33 and 34 of switch 31, when the switch blade 35 is thrown to the left, through the primary of a transformer 36 to the positive terminal of the source 25 of "B" energy. Transformer 36 transforms the potential of the energy impressed across its primary coil to the proper potential to be impressed onto the voice coil 19 of the speaker 18.

At the right side of Figure 1 is a cabinet 40 represented by dotted outline. Cabinet 40 is suitable for housing an electrodynamic speaker 41 comprising a voice coil 42 and a field coil 43. A small transformer 44 similar to transformer 36 is in circuit with the voice coil 42. A circuit for conducting electrical energy to the field coil 43 includes a "twisted pair" 45 which may terminate in an outlet plug 46, a relay 47 comprising a magnetic coil 48 and a switch 49, a transformer 50 and a current rectifier 51. If preferred, dry cells may be employed in place of the rectifier 51.

The coil 48 of the relay 47 is connected in series with a circuit leading from the plate 22 of vacuum tube 21 through terminals 33 and 52 of switch 31, when the switch blade 35 is thrown to the right, through a jack consisting of a plug 53 and a receptacle 54, conductor 55 in the multiple conductor cable 55a, through the terminal 56 in terminal block 57 and the corresponding terminal connector 58 in terminal block 59, through the primary of transformer 44, through the parallel arrangement of the coil 48 and condenser 59a, through complementary terminals 60 and 61 in the terminal blocks 59 and 57, through conductor 62 in the multiple conductor cable 55a, through jack plug 63 and receptacle 64 therefor and thence to the positive terminal of the source 25 of "B" energy.

Conductors 64 and 65 of the cable 55a lead from terminals 66 and 67 in terminal block 57 to a side outlet 68 of the cable. Outlet 68 may be connected with the fixture 69 at the end of the "twisted pair" 24. Terminals 66 and 67 automatically connect, respectively, with terminals 70 and 71 within terminal block 59 when the two blocks 57 and 59 are placed together.

A fifth conductor 72, in the cable 55a is illustrated as being free of the terminal members in the terminal block 57. Conductor 72 is suited for use as an antenna in conjunction with the antenna 11, and has a jack plug 73 attached to an end thereof for engaging the jack-receptacle 17.

In the description of the operation of the device, it will be assumed that the main part 12 of the set is energized in some such manner as by inserting a terminal plug (not shown) into a suitable wall outlet or the like, to connect with a source of electrical energy. Jack plugs 73, 63 and 53 will be inserted into their respective receptacles. The plug 69 will be inserted into receptacle 68. The switch blades 35 and 75, which are mechanically interlocked, are moved to the left to make connection with the switch points 30 and 34. When the switch blades are thrown to the left, the field coil 20 of speaker 18 and the voice coil 19 thereof will be supplied with energy from the source 25 of "B" energy and from the plate of the output tube respectively, and the speaker 18 will be properly ener-

gized for operation. When, however, the switch blades of switch 31 are thrown to the right, the circuit to the field coil 20 will be opened as will the circuit for conducting energy from the plate 22 to the voice coil 19.

The switch blade 75, when thrown to the right, will be dead ended at the switch point 76. At the same time, the blade 35 will complete a circuit between switch points 33 and 52. Incidental to switch blades 35 and 75 being thrown to the right, a path for energy will be traced from plate 22 through switch points 33 and 52, jack parts 54 and 53, the conductor 55, terminals 56 and 58, the primary of transformer 44, the electro-magnetic coil 48, terminals 60 and 61, conductor 62, jack parts 63 and 64 and to the positive terminal of the "B" source of energy. The amount of direct current through the plate circuit just described is sufficient to actuate the relay 47 to close switch 49 whereby the field coil 43 of the speaker 41 is energized.

The condenser 59a serves as a by-pass about the coil 48 to permit the impulses of energy of audio frequency to pass to the voice coil 42 of speaker 41. By throwing the blades of switch 31 in one direction one of the electro-dynamic speakers may be wholly de-energized and the other energized, and by throwing the blades of said switch 31 in the opposite direction, the energization and de-energization of the speakers will be reversed.

Hereinabove it is mentioned that the conductors 26 and 27 are energized from a source of electrical energy not shown. Hence energy for the field coil of the speaker 41, when switch 49 is closed, may be conducted from such undisclosed energy source by way of conductors 26 and 27, the "twisted pair" 24, conductors 64 and 65, and the circuit within the cabinet 40 including the relay switch 49, the transformer 50 and the rectifier 51.

If it happens that the main part 12 of the receiver set is small enough to be portable, such part of the receiver may be transported by placing the plug 46 into a suitable wall outlet and by disconnecting the heretofore mentioned attachment for supplying energy to the part 12. The part 12 of the receiver may then be transported pursuant to receiving energy by way of the "twisted pair" 45, conductors 64 and 65 and the "twisted pair" 24. That is, if it is desired to move the cabinet 10 to a more suitable position where there may be no source of energy for the regular means (not shown) for tapping energy, the plug 46 may be connected to a source of energy whereby the parts within the cabinet 10 may receive energy by way of the multiple conductor 55a.

When the receiver 12 has energy conducted thereto by way of the "twisted pair" 24, the switch 24a may be used for turning "off" and "on" the energy.

What is claimed as new and is desired to be secured by Letters Patent of the United States is:

1. In combination, a radio receiving set and a case therefor having a built-in dynamic loud speaker with voice and field coils, a second dynamic loud speaker with voice and field coils remote from said receiving set, a first circuit between said receiving set and said built-in loud speaker, a second circuit between said receiving set and said remote loud speaker, a unitary switch for selectively impressing the output of said receiving set upon the voice coils of said speakers by means of said circuits, a third cir-

cuit for impressing electrical energy upon the field coil of said remote loud speaker, a relay comprising a switch in said third circuit for the closing thereof, and electromagnetic means in said second circuit for actuating said relay switch, said electromagnetic means being energized incident to the impression of such output upon the voice coil of said remote loud speaker.

2. In combination, a radio receiving set and a case therefor having a built-in dynamic loud speaker with voice and field coils, a second dynamic loud speaker with voice and field coils remote from said receiving set, a cable having conductors therein and extending between said receiving set and said remote loud speaker, a first circuit between said receiving set and said built-in loud speaker, a second circuit between said receiving set and said remote loud speaker and comprising conductors in said cable, a unitary switch for selectively impressing the output of said receiving set upon the voice coils of said speakers by means of said circuits, a third circuit for impressing electrical energy upon the field coil of said remote loud speaker, a relay comprising a switch in said third circuit for the closing thereof, and electro-magnetic means in said second circuit for actuating said relay switch, said electromagnetic means being energized incident to the impression of such output upon the voice coil of said remote loud speaker.

3. In combination, a radio receiving set and a case therefor having a built-in dynamic loud speaker with voice and field coils, a second dynamic loud speaker with voice and field coils remote from said receiving set, a cable having conductors therein and extending between said receiving set and said remote loud speaker, an antenna for said receiving set and comprising a conductor in said cable, a first circuit between said receiving set and said built-in loud speaker, a second circuit between said receiving set and said remote loud speaker and comprising other conductors in said cable, a unitary switch for selectively impressing the output of said receiving set upon the voice coils of said speakers by means of said circuits, a third circuit for impressing electrical energy upon the field coil of said remote loud speaker, a relay comprising a switch in said third circuit for the closing thereof, and electromagnetic means in said second circuit for actuating said relay switch, said electromagnetic means being energized incident to the impression of such output upon the voice coil of said remote loud speaker.

4. A radio wave receiver comprising a local electrodynamic speaker including a voice coil and a field coil, an output thermionic tube including a plate, and there being a source of electrical energy for said field coils and said tube, in combination with a remote electrodynamic speaker including a voice coil and a field coil, a circuit from said source of energy to the field coil of the remote speaker, a relay adapted to close said circuit to energize said field coil, a circuit from said source of energy for energizing the field coil of the local speaker, a switch for opening and closing the field circuit of the local speaker, and a circuit including a switch for connecting said plate to the voice coil of the local speaker or to the voice coil of the remote speaker, said relay being connected in circuit with the plate circuit leading to the voice coil of the remote speaker and being energized incident to the closing of said circuit, said switches being interlocked so that the circuit to the field

coil of the local speaker is closed concurrently with the closing of the circuit from the plate to the voice coil in the local speaker, and the circuit to the field coil of the local speaker is opened concurrently with the opening of the circuit to the voice coil of the local speaker and the closing of the circuit to the voice coil of the remote speaker.

5. A radio wave receiver comprising two electrodynamic speakers, each of said speakers comprising a voice coil and a field coil, one of said speakers being housed with said receiver and the other remote therefrom, an output thermionic tube including a plate in said receiver, there being a source of electrical energy for said tube, and a source of energy for the field coil of each of said speakers, a circuit for connecting the field coil of the first of said speakers to the said source of energy therefor and including a switch for the opening and closing of said circuit, a circuit leading from said source of energy for the field coil of the second of said speakers and including a relay switch for closing said circuit incident to energization of said relay, a circuit for connecting the voice coil of the first speaker to the plate of said tube, a circuit for connecting the voice coil of the second speaker to the plate of said tube, said circuit to the voice coil of the second speaker including said relay for the actuation thereof when said circuit is energized, a switch for singly completing the circuits from said plate to the voice coils of the respective speakers, and means for interlocking said several switches so that the first named switch is closed concurrently with the manipulation of the second named switch for closing the circuit to the voice coil of the first speaker, the first switch being opened concurrently with manipulation of the second named switch to open the circuit to the voice coil of the first speaker and to close the circuit to the voice coil of the second speaker.

6. A radio receiver comprising an electrodynamic loud speaker including a field coil and a voice coil, a thermionic output tube including a plate, there being a source of electrical energy for energizing said field coil, a circuit for connecting said field coil to said source of energy, a switch for opening and closing said circuit, a circuit for connecting the voice coil of said speaker to said plate, a switch for opening and closing the circuit connecting said plate and voice coil, a cabinet for enclosing the named parts of said receiver, a second cabinet, an electrodynamic speaker in said second cabinet and including a field coil and a voice coil, a multiple conductor cable extending between said cabinets, there being a source of energy for the field coil of said second speaker, a circuit for connecting the field coil of the second speaker to the source of energy therefor and including a relay for closing said circuit, conductors in said multiple conductor cable, the voice coil of said second speaker, said relay, the secondly named switch, and the plate of said tube, said circuit being adapted to be opened and closed by said switch, the last named circuit when closed conducting energy to said relay and the voice coil of the second speaker, said switches being interlocked, the closing of the first switch being concurrent with the closing of the plate circuit to the voice coil of the first speaker by said second switch.

7. A radio receiver comprising an electrodynamic loud speaker having a field coil and a voice coil, a thermionic output tube including

a plate and a filament, a source of electrical energy for energizing said field coil, a circuit for connecting said field coil to the source of energy, a switch for opening and closing said circuit, a circuit for connecting the voice coil of said speaker to said plate, a switch for opening and closing the circuit connecting said plate and voice coil, a cabinet for enclosing the named parts of said receiver, a second cabinet, an electrodynamic speaker in said second cabinet, said speaker having a field coil and a voice coil, a multiple conductor cable extending between said cabinets, there being a source of energy for the field coil of said second speaker and for the filament of said tube, a circuit having a leg for connecting the field coil of the second speaker to the source of energy therefor and having a relay therein, for closing said circuit, said circuit leg including conductors in said cable, and a circuit for conducting energy from said plate to the voice coil of the second speaker and comprising other conductors in said cable, the secondly named switch, and said relay, the last named circuit being opened and closed by said secondly named switch, said relay being energized incidental to the passing of energy through the last named circuit, all of said switches being interlocked so that the closing of the first switch occurs coincidentally with the closing of the second switch to connect the voice coil of the first speaker to said plate, and the opening of the first switch occurs coincidentally with the manipulation of the second switch to disconnect the voice coil of the first speaker from said plate and to connect the voice coil of the second speaker.

8. A radio receiver unit comprising an electrodynamic speaker, a cabinet for said unit and said speaker, a second speaker remote from said receiver, a cabinet for said second speaker, a multiple conductor cable extending between said unit and said second speaker, a first circuit for conducting energy to the receiver and comprising energy intake means through said second cabinet and conductors in said cable, a second circuit for conducting energy to said second speaker, a relay comprising a switch in said second circuit for the closing thereof, and electromagnetic means for actuating said switch, and means for energizing said electromagnetic means comprising a third circuit comprising conductors in said cable and leading from said unit.

9. A radio receiver unit comprising an electrodynamic loud speaker and means for attaching an antenna, a cabinet for said receiver, an electrodynamic speaker removed from said unit, a multiple conductor cable extending between said cabinet and said second speaker, a first circuit for conducting electrical energy to said receiver and including conductors in said cable and energy intake means associated with said second speaker, an antenna in said cable for engagement with said antenna attaching means, a second circuit for conducting energy to said second speaker, a relay comprising a switch in said second circuit for the closing thereof, and electromagnetic means for actuating said switch, and means for energizing said electromagnetic means comprising a third circuit comprising conductors in said cable and leading from said unit.

10. A radio receiving unit including an electrodynamic speaker, a voice coil in said speaker, a field coil in said speaker, a thermionic output tube including a plate, a circuit for conducting power to said field coil, a second circuit for conducting power from said plate to the voice coil of said speaker, a switch mechanism disposed in said circuits and adapted to open and close said circuits simultaneously, a cabinet for enclosing the unit and said speaker, a second cabinet removed from said first named cabinet, a multiple conductor cable extending between said cabinets, an electrodynamic speaker in said second cabinet and having a field coil and a voice coil, there being a source of energy for said receiver and for the field coil of the second speaker, a third circuit for conducting power from said source of energy to said receiver and including conductors in said cable and energy receiving means at the second of said cabinets, a fourth circuit for conducting energy from said source of energy to the field coil of the second speaker, a relay in said fourth circuit and adapted to close said fourth circuit, and a fifth circuit for conducting energy from said plate to the voice coil of the second speaker through said switch mechanism, conductors in said cable and said relay, said fifth circuit, when closed, conducting energy from said plate to cause energization of said relay, the said switch mechanism closing said fifth circuit subsequent to the opening of said first and second circuits.

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