

June 11, 1929.

R. E. APPEL

1,716,409

RADIO EQUIPMENT

Filed Aug. 16, 1926

2 Sheets-Sheet 1

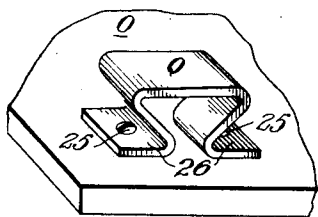


Fig. 9

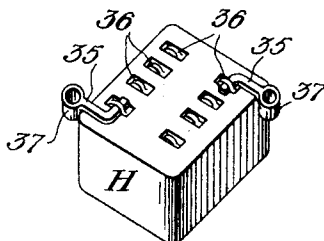


Fig. 10

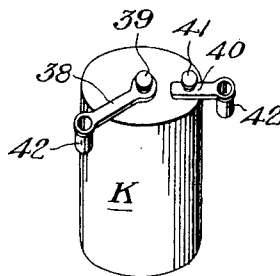


Fig. 11

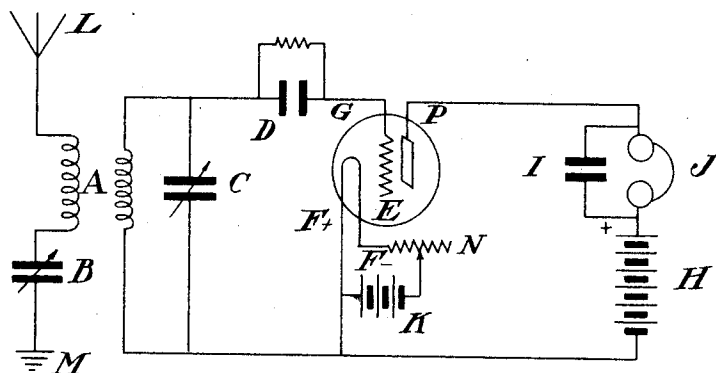


Fig. 2

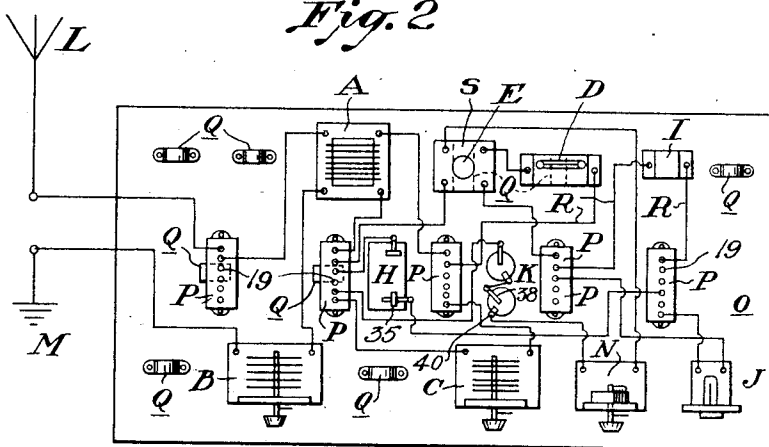


Fig. 1

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2 Sheets-Sheet 2

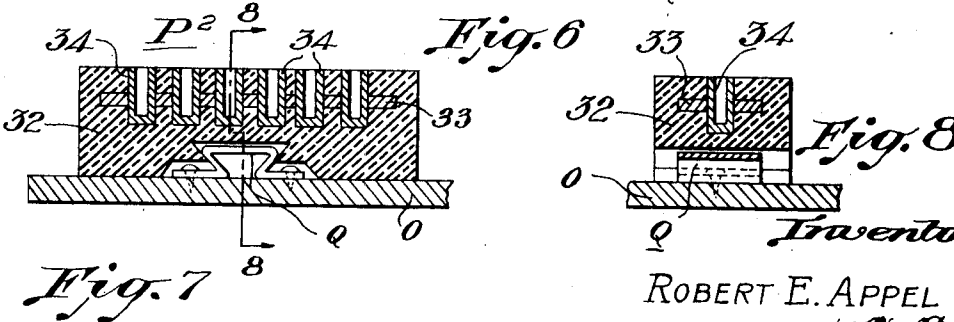
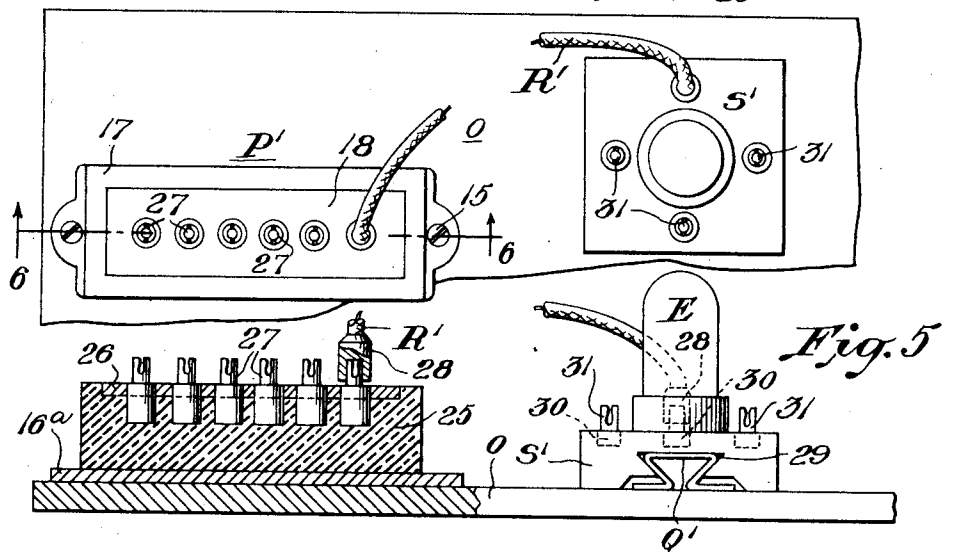
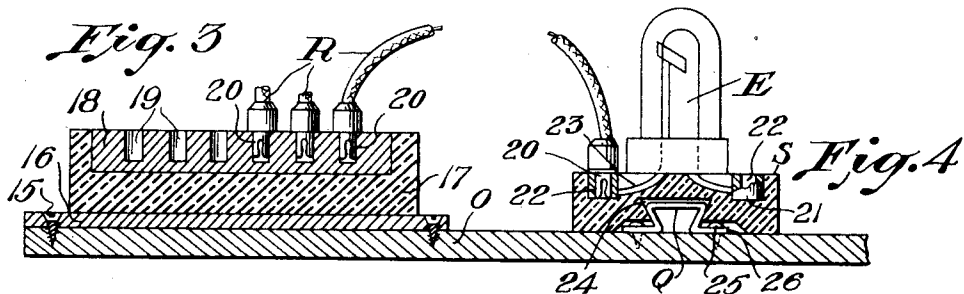
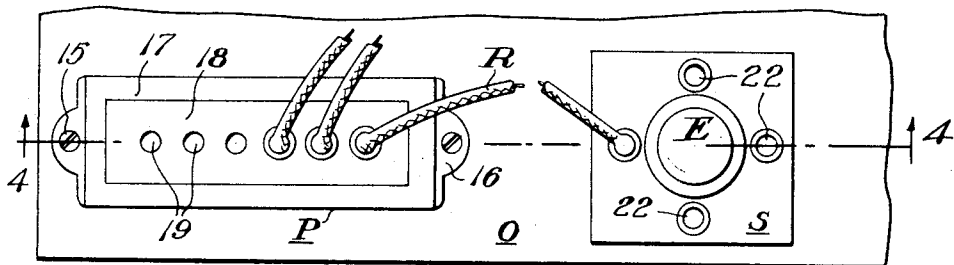


Fig. 8

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UNITED STATES PATENT OFFICE.

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RADIO EQUIPMENT.

Application filed August 16, 1926. Serial No. 129,458.

The invention relates to radio and telegraphic apparatus, and more particularly to means for easily and quickly assembling such apparatus into receiving or sending sets, and arranging, or re-arranging, or increasing the number of instruments in a set.

The method of assembling radio and telegraphic apparatus, hitherto commonly practiced, requires the use of tools and solder. This method consumes much time, requires skill, causes considerable muss, and results in a set which is not easily changed, enlarged or dissembled.

The purposes of my invention are: To make possible and convenient, without the use of tools or solder, the connecting of various apparatus for the reception, detection, amplification, and reproduction, of radio and telegraphic signals, or for cooperative connection of apparatus for the propagation of such signals, thus assembling a receiving or sending set; to provide means whereby a set of associated instruments may be quickly and conveniently changed from one "hook-up" to another, or may be enlarged or dissembled; it is also an object of my invention to provide an easy means to facilitate the making of experiments in radio and telegraphy for the purpose of instruction, research and development; and to provide improved structural details as will herein appear.

With these purposes in view the invention consists in the new and useful features of construction and combination of parts shown in the accompanying drawings to which reference is hereby made.

Fig. 1 is a diagram showing a top view of a radio equipment embodying my invention;

Fig. 2 is a conventional wiring diagram showing the "hook-up" of the radio equipment shown in Fig. 1;

Fig. 3 is an enlarged top view of one connector unit in operative relation to an audion tube and shows a series of leads, one of which is plugged into a socket in the connector and into a socket of the audion tube base;

Fig. 4 is a vertical section taken on the line 4—4 of Fig. 3;

Fig. 5 is an enlarged sectional view of a connector unit of modified construction showing flexible leads having terminal sockets to receive pins on the connector unit and pins on the radio instrument with which the connector co-operates;

Fig. 6 is a vertical section taken on the line 6, 6, of Fig. 5;

Fig. 7 is an enlarged sectional view of another connector unit of slightly modified construction.

Fig. 8 is a vertical section taken on the line 8—8 of Fig. 7;

Fig. 9 is an enlarged perspective view of one of the resilient keepers used to detachably connect the several instruments of a radio set with the main base of the set;

Fig. 10 is a perspective view of a special socket for standard "A" batteries; and

Fig. 11 is a perspective view of a special socket for standard "B" batteries.

Similar reference numerals designate the same parts in the several views.

The invention comprises means whereby a number of electrical instruments, each on its own base, can be quickly associated on a single main base, improved means for detachably connecting the instruments with the main base, a series of connector units, and flexible means for selective connection of the connector units with the instruments.

I will describe: 1st—a preferred embodiment of the equipment shown in Figs. 1 and 2; 2nd—the preferred connector unit shown in Figs. 1, 3 and 4. 3rd—the preferred means shown in Fig. 9 for detachably connecting all the instruments with a single main base; 4th—the modified constructions illustrated in Figs. 5, 6, 7 and 8; and 5th the special sockets for the "B" and "A" batteries shown in Figs. 1, 10 and 11; and I will recite in the claims the new and useful features of my invention.

Referring to Fig. 1; the letter O designates a main base on which all the instruments are associated. The letters P designate a number of connector units of my improved construction, in operative relation to the other radio instruments. The assembly shown on Fig. 1 is merely typical, and obviously may comprise a greater or less number of instruments arranged differently relative to each other and relative to the connector units, and still keep within the scope of my invention.

The radio instruments shown are: a tuning coil A; variable condensers B and C; grid condenser and grid leak D; an audion tube E; a rheostat N; a "B" battery H; a fixed condenser I; a telephone jack J; an "A" battery K and the usual aerial L and ground M. Each instrument, except as stated, has its own base of improved construction to be described later, adapted for detachable connection with the main base O. It is to be noted also that special sockets, shown in detail in Figs. 10

and 11 are provided for the respective batteries H and K.

Flexible insulated leads R, of improved construction, shown in Figs. 1, 3, 4, 5 and 6 which are used to connect the various elements of the equipment, will be described later.

Where it is necessary for two or more leads from instruments to be joined the usual method of soldering is superseded by employing the connector units P. A number of such units are provided for the assembling or enlarging, or rearranging of a set. They are preferably secured on the base O by screws 15, but other suitable securing devices, such as the keepers Q (Figs. 1, 4 and 9) obviously may be used without departure from my invention.

The preferred connector units P shown in Figs. 1, 3 and 4 are all alike, so a description of one will suffice for all. Each connector unit preferably comprises a flat metal bottom plate 16, an insulating body or block 17, a plate 18 of conductive material having a series of sockets 19 adapted to receive resilient slitted plugs 20, connected with the flexible leads R. The plugs 20, being slitted and resilient are dependable to make close electrical contact with the walls of the sockets 19.

In Fig. 1, I have shown a series of connector units P spaced apart from each other, each on its own bottom plate 16 and each having a single insulating block 17 and a single conductive plate 18 having a series of sockets 19; it is obvious however that a number of conductive plates, each having a series of sockets may be associated in a single insulating block without departure from my invention.

The bases of the radio instruments A, E, D, I, etc., are important elements of my invention. These bases are all of similar construction but differ in size and the number of sockets to suit the different instruments. I have shown in Fig. 4 a typical minor or detachable base S supporting an audion tube E. The minor base S is a block of insulating material of suitable dimensions. It has a series of bores 21, each containing a metal socket 22 to receive a corresponding plug 20 on the flexible lead R. Conductors 23 connect the sockets 22 with the electrical instrument E which is mounted on the minor base. A dove tail groove 24 extends a sufficient distance into the minor base and receives a corresponding resilient keeper Q which is secured on the main base O by screws 25, extending through the feet 26 and engaging in the material of the main base.

The modified connector unit illustrated in Figs. 5 and 6, is in the main similar to the preferred connector unit. The modified unit P¹ comprises a body 25 of insulating material and a conducting element 26, having in-

tegral upwardly extending slitted plugs 27.

The minor base S¹ is of insulating material and has a dovetail groove 29 adapted to accommodate a keeper Q¹ of the form already described. Upwardly extending slitted plugs 31 have conducting elements 30 imbedded in the minor base S¹ and electrically connected with the instrument supported on the base. The leads R¹ have sockets at each end; one socket fits on the plug 27 and the other socket fits on the plug 31 to electrically connect P¹ and S¹.

The modified connector unit P² illustrated in Figs. 7 and 8 comprises an insulating body 32; a conducting plate 33 imbedded in the body; and sockets 34 soldered in perforations in the plate. The leads R shown in Figs. 3 and 4 are adapted to fit in the sockets 34 to make the desired electrical connections.

Figure 4 shows a number of leads inserted in the connector unit. One of the leads is shown connected to an electrical socket which replaces the usual binding post on the radio or telegraphic apparatus.

The leads are preferably provided with terminals at each end so designed as to make a firm electrical connection. My invention also includes the resilient keepers Q shown in Figs. 1, 4, 7 and 9 which may serve as a means for attaching apparatus to the main base. A prime purpose of my invention is to make it easy and convenient to change from one "hook up" to another and to provide suitable facilities for adding, detaching, or rearranging apparatus on the main base as may be desired. The keeper shown in Figs. 1 and 9 is adapted to engage the dovetail slot in the minor base which supports the instrument as shown in Fig. 4.

Figs. 5 and 6 show an alternative construction in which the sockets are on the leads and the plugs are on the instruments and the connector units.

A standard "B" battery (H—Figs. 1 and 10) comprises a number of cells adapted for variable connections, as may be necessary to produce the desired variations of voltage. I have therefore devised and used the improved connecting devices shown in detail in Figs. 1, 10, 4 and 6. Each connecting device comprises an angular blade 35 adapted to make close electrical contact with any one of the looped spring-clip terminals 36 Fig. 10; it also has at the free end of the blade a socket 37 to receive a plug 20 such as is shown on the lead R, in Fig. 4; or instead of a socket, a plug 27 such as is shown in Figs. 5 and 6, adapted to engage in the sockets 28 of the lead R¹.

Connecting devices for the "A" battery K are shown in Figs. 1 and 11. The connecting devices are; a relatively long flat arm 38 connected with one terminal of the battery by a screw 39 which is part of the battery, and a shorter arm 40 connected with the other ter-

minimal of the battery by a screw 41 which is part of the battery. At the free end of each arm is a socket 42, or a plug 27 (Fig. 5), as the case may be, as already stated in the description of the B battery connection.

In order to illustrate the mode of use of my invention I have taken as an example a radio receiving set which it is desired to assemble. The wiring diagram for this set is shown in Fig. 2 in which the usual conventional forms are used to represent the various apparatus as follows; A a tuning coil with primary and secondary windings; B and C variable condensers; D fixed condenser; E audion tube; H "B" battery; I phone condenser; J phones; K "A" battery; L aerial; M ground; N rheostat.

Fig. 1 shows the same set assembled in accordance with my invention. In Fig. 1 the reference letters correspond to those in Fig. 2 excepting that in Fig. 1 the letter J represents a telephone jack instead of the telephones themselves shown at J in Fig. 2. Letter J represents the main base which is provided with keepers Q for holding the apparatus in place and is also provided with connector units P. The instruments and other apparatus are provided with socket terminals instead of the usual binding posts. Then by means of the leads heretofore described the connections are made according to the diagram in Fig. 2. Figs. 10 and 11 show special socket attachments for batteries. The sockets are parts of the present invention, which admit of making all necessary connections by means of "plugging in" the terminals of the flexible insulated leads.

It is to be noted that in Fig. 1 extra keepers Q are provided for the purpose of accommodating additional minor bases S and the instruments thereon. They also make it possible to rearrange the instruments in positions suitable to various "hook-ups" according to the work in hand.

Operation.

Many various modes of using the equipment will occur to persons skilled in the art, it is therefore deemed necessary to recite only the following two typical examples.

1st. In laboratory work along the lines of radio and telegraphic research the various changes in "hook up" that suggest themselves to the experimenter can be quickly and easily made. For laboratory experiments in classes of instruction in radio and telegraphy the time allotted for each class is too small to permit much experimentation by the usual method.

In such cases it is very desirable to have at hand means for quick arrangement, or rearrangement, of the elements of the experimental equipment, and means to facilitate the elimination of unused elements and the adding of new elements.

For example, referring to Fig. 1. If the variable condenser B proves to be of the wrong capacity for use with the inductance coil A, it only is necessary to detach the leads R from B, slide it off the corresponding keeper Q and replace it by slipping on a condenser of a different capacity and replacing the leads R.

2nd. Inasmuch as many radio users wish to try the various "hook ups" that come into use from time to time and also wish to make experiments on their own initiative it is desirable to have a means of so doing which will save labor and material, require no soldering, with its attendant muss, and will readily admit of frequent changes. For example the invention herein described would permit one to try several "hook ups" in the same evening. One might connect the apparatus to make a single tube nonregenerative set, then change to a regenerative set, then to a reflux set, or perhaps add a stage of amplification, all in short space of time. When the user gets a "hook up" that suits him he may leave it that way until he desires to try something else.

Having fully described my invention what I claim as new and desire to secure by Letters Patent is:

1. A radio kit comprising a single main base; a number of minor bases disposable on the main base in changeable relation to each other; radio instruments of the plug and socket type mounted on the respective minor bases; attaching devices adapted to connect the minor bases with the main base in changeable relation to each other to suit variable conditions of use; a number of connector units of the plug and socket type on said main base; and flexible leads of the plug and socket type adapted to connect any radio instrument with any connector unit and adapted to electrically connect any radio instrument of the kit with any other allied instrument of the kit, thereby changing the hook up of the kit at the pleasure of the user.

2. A radio equipment comprising a main base; keepers attachable in selective positions relative to each other on said main base; a number of minor bases detachably connected with said keepers; a number of radio instruments, one on each minor base each instrument having each of its electrical elements terminated in a socket; connector units each comprising an insulative block and a conductive plate on said insulative block and having a number of sockets each adapted to receive one terminal of a flexible lead; and a number of leads serving to connect a corresponding number of energized radio instruments through the conductive plates of said connector units.

3. A radio equipment comprising a main base; a number of connector units on the main base, each connector unit composed of an insulating block and a conductive plate im-

movable relative to said insulating block, said plate having a number of fixed contact elements each adapted to co-act with one terminal of a flexible plug and socket lead and adapted to transmit feeble impulses of radio energy unimpeded by appreciable resistance or distributed capacity; a number of radio instruments capable of selective attachment on said main base, each instrument adapted for plug and socket connection with one terminal of a flexible lead; a number of flexible leads each adapted to plug and socket connections with any of said radio instruments, and with any of said connector units, conformably to any desired hook up of said radio instruments at points indicated on any diagram as joined wires, said connectors being themselves normally inert and only energized upon becoming a link between a number of leads connected with instruments which are energized.

4. A connector unit comprising a body of insulating material associated with a body of normally inert conductive material having a number of contact elements, all the parts of said connector unit being in fixed relation and immovable relative to each other and adapted to transmit feeble impulses of radio energy without introducing appreciable resistance or distributed capacity; in combination with an insulating base having a number of electrical contact elements; an electrical instrument supported on said base and electrically connected with the contact elements thereof and an insulated flexible conductor adapted to connect the contact elements of said body of conductive material.

5. A radio equipment comprising a main base, a number of resilient keepers on said main base; a number of sources of electric energy; a number of minor bases adapted to engage said keepers to detachably connect said minor bases with said main base; radio instruments supported on some of said minor bases; a connector unit stationary on one of said minor bases and comprising an insulating block and a conducting plate on said block and having a series of sockets adapted to receive a number of wires plugged into it to electrically connect all wires so plugged into it; and flexible leads each having at one end a terminal adapted to engage in any socket in said contact plate and having at its other end a terminal adapted to engage in any socket of any said radio instrument to correlate said radio instruments connected through said connector unit.

6. A radio kit comprising a single main base; a number of insulative minor bases each having a socket to receive a keeper; a number of metallic keepers adapted for selective placement on said main base and adapted to engage in the sockets of said minor bases; radio instruments, each on its own minor base, in co-operative relation to each other; connector units on said main base; and flexible leads of the plug and socket type adapted for selective connections of the radio instruments with the connector units, with each other and with allied electrical instruments.

In witness whereof I have hereunto signed my name to this specification, at Springfield, Illinois, this 9th day of August, 1926.

ROBERT E. APPEL.