PORTABLE TWO-WAY WAVE SIGNAL SPACE-COMMUNICATION SET

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PORTABLE TWO-WAY WAVE-SIGNAL SPACE-COMMUNICATION SET

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This invention relates to a portable two-way wave-signal space-communication set and more particularly to such a set of the type comprising a complete self-contained radio transmitter-receiver set including a mouth-piece and an ear-piece and dimensioned and shaped so that it may be readily grasped in the hand of the operator and used in the manner of a conventional telephone receiver.

In applicant's copending application Serial No. 431,722, filed February 20, 1942, now U. S. Patent Number 2,439,408, entitled "Portable radio device," and assigned to the same assignee as the present application, there is described and claimed a portable radio transmitter-receiver of the type referred to. The present invention constitutes an improvement on that of the said copending application.

It is an object of the invention to provide a new and improved portable two-way wave-signal space-communication set by means of which the replacement of components becoming defective in service is facilitated.

It is another object of the invention to provide a new and improved portable two-way wave-signal space-communication set in which the antenna and the chassis are removable from the housing independently of each other and of any other portion of the set.

It is a further object of the invention to provide a new and improved portable two-way wave-signal space-communication set of increased simplicity of construction and operation and of improved performance.

For a better understanding of the invention, together with other and further objects thereof, reference is had to the following description taken in connection with the accompanying drawings while its scope will be pointed out in the appended claims.

In accordance with the invention, a self-contained portable two-way wave-signal space-communication set comprises an elongated unitary chassis including transmitting and receiving circuit means, and signal-transmitting and signal-reproducing devices. The set also comprises an elongated housing closely fitting about the chassis and being longitudinally divided into base and cover portions proportioned, when open, to expose normally replaceable elements of the chassis for replacement. The set also includes provisions within the housing for receiving power supply means for the set, which may be one or more dry batteries, a vibrator power pack, or a selected one of either of these two conventional forms of power supply.

Further in accordance with the invention, a self-contained portable two-way wave-signal space-communication set comprises an elongated chassis including transmitting and receiving circuit means, and signal-transmitting and signal-reproducing devices. The set also comprises an elongated housing closely fitting about the chassis and comprising base and cover portions proportioned, when open, to permit removal of the chassis. The set is also provided with an extensible antenna supported solely from and within the housing and mechanically independent of the chassis but electrically connectible thereto, whereby the chassis may be removed from the housing independently of the antenna or vice versa.

In the drawings,
Fig. 1a is a perspective view in elevation of the portable set of the invention with the cover opened;
Fig. 1b is a perspective view of a power supply unit for use in connection with the set of Fig. 1a, while
Fig. 1c is a perspective view of batteries which may be used in lieu of the power supply unit of Fig. 1b;
Fig. 2a is a top perspective view of the chassis portion of the set of Fig. 1a, while
Fig. 2b is a bottom perspective view of such chassis;
Fig. 3 is a circuit diagram, partially schematic, of the transmitting and receiving circuit of the set of Fig. 1a;
Fig. 4 is a view of the set of Fig. 1a in use as a hand-held set;
Fig. 5a is a view of the set of Figs. 1 and 1a, supported from the operator by strapping means and utilizing an auxiliary headset, while
Fig. 5b is rear view of the same application of the set of the invention;
Fig. 6a is an elevation and
Fig. 6b is a longitudinal section of the improved extensible antenna utilized in the set of Fig. 1a;
Fig. 6c is a view of the enclosing case for the antennas of Figs. 6a and 6b;
Fig. 7a is a front elevation and
Fig. 7b a side elevation of a switch for controlling the energization of the set, while
Fig. 8 is a detail of a vent for the set housing. Referring now to Figs. 1a, 2a and 2b of the drawings, there is represented a self-contained portable two-way wave-signal space-communication set embodying the invention and compris-
ing an elongated chassis 10 including transmitting and receiving circuit means. The set also includes a signal-transmitting device such as a microphone 11 and a signal-reproducing device or loud speaker 12. The set also comprises an elongated housing longitudinally divided into a base portion 13a and a cover portion 13b, closely fitted about and enclosing the chassis 10, the cover portion 13b having mounted thereon the microphone 11 and loud speaker 12. As indicated in Fig. 1a, the portions 13a and 13b of the housing are proportioned so that, when open, they expose the normally replaceable elements of the chassis 10 for replacement. The cover portion 13b may be secured to the base portion 13a by hinge-like hasps 16 and locked in place by hasps 15. Preferably, there is disposed a sealing gasket or washer 16c in the top of the cover portion 13b near the periphery thereof for engaging a rim 15c of the base portion 13a for tightly closing or sealing the housing of the set.

There are included within the housing 13a, 13b provisions for receiving the power supply means for the set. Preferably, these provisions are incorporated in the chassis and may be in the form of a compartment consisting of a well 16a and a pair of end brackets 16b which together are proportioned selectively to receive battery means, such as an A battery 16 and a B battery 17 (Fig. 1c), or a self-contained power supply unit 18 (Fig. 1b) preferably including a storage battery and a vibrator or other means for converting the low-voltage direct current into a suitable operating voltage. In either event, the power supply means of the type described are supported solely by the chassis compartment of the type described rather than being supported from the housing 13a, 13b. The compartment comprising the well 16a and the end brackets 16b includes resilient means such as springs 19 and 23 for retaining the battery means in the compartment. As apparent from a consideration of Figs. 1 and 3c, the A battery 16 is adapted to be disposed in the well 16a and the B battery 17 is adapted to be held by the end brackets 16b of the compartment. Preferably, each of the springs 19 and 23 includes auxiliary locking means (not shown) for retaining the same in the compartment. When the set is to be operated from the power supply unit 18, the power supply unit 18 is of such configuration that it can be positioned on the chassis in the compartment with a portion thereof extending in the well 16a and the remainder extending in the space between the end brackets 16b. The unit 18 is provided with a plug 18a, cooperating with a socket 18c for making suitable electrical connections between the power supply means and the transmitter-receiver chassis 10.

The transmitter-receiver circuit incorporated in the chassis 10 may be of any type suitable for the service intended. By way of example, there is illustrated in Fig. 3 a circuit diagram, partially schematic, of a complete wave-signal receiving and transmitting circuit and a separate wave-signal transmitting circuit which is suitable for embodiment in the chassis 10. Since the circuit of Fig. 3 is substantially conventional, it is considered unnecessary to describe it in detail; however, the basic components will be identified and indicated by the reference numerals which are also applied to corresponding components of the chassis in Figs. 2a and 2b. In brief, the receiving circuit comprises an antenna 20, a radio-frequency amplifi
cer 21 coupled in cascade with an oscillator modulator 22, an intermediate-frequency transformer 23, an intermediate-frequency amplifier 25, a second intermediate-frequency transformer 26, a detector and first audio-frequency amplifier 27, a second audio-frequency amplifier 29 and an output transformer 30, having a secondary winding adapted to be connected to the loud speaker 12 through a "press-to-talk" selector switch 44.

The transmitting circuit of Fig. 3 comprises an input transformer 31 adapted to be connected to the internal microphone 11 through the selector switch 44. The contacts X and Y of the selector switch 44 also serve selectively to energize the filament of the tube of the receiving channel and the transmitting channel, respectively. The switch 44 is provided with an operating push button 44a (Fig. 2b) adapted to register with a flexible diaphragm sealing an aperture in the housing base 13a so that it may be pressed from the exterior of the housing by the operator to transfer the circuits of the set from operation as a receiver to operation as a transmitter.

The output transformer 33 also has an additional secondary winding adapted to be connected to an external signal-reproducing device or earphones, while the input transformer 31 also has an additional primary winding adapted to be connected to an external signal-transmitting device or microphone. For this purpose, there are provided the jacks 29, 32 for individually receiving plugs associated with the remote signal-reproducing and signal-transmitting devices, respectively, and there is provided a switch 45 (Figs. 1a and 1c) mounted in the housing cover 15d and accessible when the housing cover is open for individually connecting the signal-input circuit of the transmitting circuit and the signal-output circuit of the receiver circuit to the said signal-transmitting and signal-reproducing devices, respectively, or to the jacks 29 and 32, respectively.

The secondary winding of input transformer 31 is coupled to the duplex tube 32a comprising an oscillator and first audio-frequency amplifier which, in turn, is coupled to a second duplex tube 33 comprising a modulator and power amplifier. The output circuit of the power amplifier 33 is coupled to the antenna 20. In the circuit of Fig. 3, the chassis is illustrated as being energized from the A battery 16 and the B battery 17; however, if desired, the power supply unit 18 may be substituted therefor, the circuit diagram thereof being as illustrated and connectible to the power circuits of the receiver and transmitter of Fig. 3 by means of the plug 18a and socket 18c.

The receiver set also preferably includes a unit assembly of the tuned circuits for the radio frequency amplifier 21, the power amplifier 33 and the crystals for the oscillator 22 of the receiver and the oscillator 33 of the transmitter. This tuning unit is represented at 34 and includes a socket 34a adapted to register with a plug 18d of the chassis. The tuning unit 34 is provided in Figs. 1a is provided with a recess including a shielding cap which fits over and encloses the radio-frequency amplifier 21.

The set also includes an extensible antenna 35 supported within the base portion 13a of housing and preferably supported solely therefrom so as to be mechanically independent of the chassis but electrically connectible thereto. The details of the antenna 35 are illustrated in Figs. 6a and
from which it is seen that it comprises the well known telescopic construction comprising an outer cylinder 35c and a plurality of inner sleeves 35b, 35c, 35d and 35e, terminating in a friction or gripping knob 35f. Each of the inner sleeves 35b to 35e, inclusive, is provided with a spring contact element 35g which is fastened to the inside of the sleeve near the end thereof, as by a spot-weld, and extends outwardly through an aperture to make a sliding spring contact with the next outer sleeve, thus insuring a good electrical continuity from the innermost sleeve 35e to the outer sleeve 35a. Between the successive sleeves and near the outer ends thereof there is provided an extended washer of packing material 35h, to minimize the entrance of dust, moisture, etc., at the outer end of the antenna.

There are provided means external of the housing base 30a for removably supporting the antenna 35 from the housing and securing it thereto, this means constituting the sole support of the antenna, wherein the antenna may be removed from the housing independently of the chassis or of any other portion of the set. This securing means comprises a ferrule 36 having a head 36a formed thereon for actuation by a wrench and having a threaded portion 36b for engaging an internally-threaded mounting bracket 37 secured to the back of the housing base 12a (see Fig. 6c). The head 36a cooperates with a gasket 38 of rubber or other resilient material to form a sealing flange; that is, the ferrule 36 and gasket 38 provide a sealing flange for sealing the antenna to the housing base 12a while permitting removal of the antenna. The ferrule is also provided with an inwardly projecting sleeve 36c on which is supported a resilient split contact sleeve 39 for establishing and maintaining electrical contact with the mounting bracket 37. Extending from the mounting bracket 37 is a tubular sleeve 39 of insulation material, such as “Bakelite,” the other end of which is supported in a mounting bracket 40 disposed at the outer end of the housing base 12a. The bracket 40 is provided with apertures 40a registering with holes in the jacket 29 and 32, Figs. 2a, 2b, for connection to an external headset. Attached to the inner end of the sleeve 35c is an enlarged cap 35i which engages the sleeve 35c when the antenna is extended to prevent complete withdrawal of the antenna from the housing except upon the yanking of the ferrule 36. The outer end of the ferrule 36 is a cup-shaped packing member 41 for packing the joint between the ferrule 35 and the outermost sleeve 35g against entry of dirt, moisture, etc. The supporting bracket 37 is provided with a machined electrical contact element 21g which, when the chassis 10 is inserted in the casing, registers with a contact 42 (Figs. 2b, 3) connected to the tuning unit plug 10a.

The set also includes switch means mounted on the chassis for controlling the energization thereof and including actuating means engageable by the antenna 35 when it is substantially inserted within the housing for operating the switch to circuit-opening position but normally being biased to circuit-closing position and operable thereto upon extension of the antenna from the housing. This switch may be in the form of a slide switch 30 (Fig. 2b) provided with an actuating lever 30a which, when the antenna is withdrawn from the casing, extends through a slot 39c (Fig. 6c) of the antenna tube 38. Upon insertion of the antenna for a substantial distance into the tube 38, and thus into the housing, the antenna cap 35i ejects the actuating lever 30a from the tube 38 to operate the switch.

The details of the slide switch 30 are shown in Figs. 7a and 7b. The pivoted lever 30a is provided with an angularly projecting arm or lug 30b, the end of which is pivotally connected with a slide member 30c by means of a pin 30d. The slide member 30c is provided with a pair of pins 30e riveted or otherwise secured thereto and extending through slots 30f in a mounting plate 30g, to the other side of which is riveted a sheet of fiber or other insulating material 30h. To the other end of the guide pins 30c is riveted or otherwise secured an electrical shorting plate 30i co-operating with the three spring clip contacts 30j, the center one of which is connected to a terminal 30k mounted on the grounded mounting plate 30q, while the other clips are connected to insulated terminals 30m and 30n, respectively. The ends of the mounting plate 30k are formed as upturned flanges 30p for suitably mating the switch. The slide member 30c is biased by a spring 30q to the position shown in Figs. 2b and 7a with the lever 30a extending beyond the limits of the switch and into the aperture 35a (Fig. 6c) for engagement by the antenna upon insertion thereof.

In case the set is used with the power supply unit 18, Fig. 1b, including a wet storage battery and a vibrating power pack, the storage battery generates gas during operation and it is desirable to release this gas, at the same time sealing the housing (13a, 13b) at all other points and at this point except when utilizing the power supply means 18. To this end, the storage battery 18c (Fig. 8) of the power pack 18 is provided with a nipple-like gas vent 18b, where the housing cover portion 13b is provided with an aperture 13e therein and a self-sealing vent 43 is so disposed therein as to register with the battery vent. The self-sealing vent 43 comprises a cylindrical plug 43a provided with an enlarged head 43b and with longitudinal fluting 43c and a cross fluting or channel 43d intersecting the fluting 43c at the face of the enlarged head 43b. Fitting over the plug 43a and its enlarged head is a flanged sleeve 43e of rubber or like resilient material cooperating with a second flanged sleeve 43f closely surrounding the plug 43a and projecting through the aperture 13e in the housing cover 13b. The flanges of the sleeves 43e and 43f are sealed together and to the housing 13b by a cup-shaped member 43g which is riveted or otherwise suitably secured to the housing 13b. Surrounding the sleeve 43e is a spiral biasing spring 43h which, when the chassis and the power supply unit are in position, biases the sleeve 43e into engagement with the battery vent 18b. The other end of the plug 43a is provided with an enlarged cap or head 43i secured thereto by suitable means such as a screw 43j. Thus it is seen that, when the cover portion 13b and the power supply unit 18 are in the relative positions shown in Fig. 8, there is a tight seal between the casing 13a and the battery vent 18b to permit escape of gas generated by the battery of the power supply means while at the same time the housing 13d is sealed with respect to all other portions of the set. When the set is operating from batteries and the power supply unit 18 is removed, the biasing spring 43h forces the rubber sleeve 43e inwardly and this sleeve, in turn, engages the head 43f of the plug 43a.
forcing it inwardly until its head engages the sealing sleeve, whereupon the aperture of the housing is completely sealed; that is, the self-sealing element is disposed to be opened by the battery vent when the battery is in place but includes means for biasing it to seal the housing vent or aperture except for connection to the battery vent.

In Fig. 4 is a pictorial representation of the use of the set as a hand held set. The elongated casing is shaped so that it may be conveniently grasped by the operator while the sound reproducer or earpiece and the microphone or mouthpiece are relatively disposed as in an ordinary telephone hand receiver, so that the operator may utilize the apparatus in a similar fashion. The set is normally connected to operate as a receiver but by actuation of the button of the "press-to-talk" selector switch located with respect to the fingers of the operator when held in the left hand, as illustrated, the filaments of the tubes of the receiving circuit of the set are de-energized while those of the tubes of the transmitting circuit are energized and the set is ready to operate as a transmitter.

Figs. 5a and 5b illustrate the operation of the set with an extension hand-set 50 provided with a connecting cable 51 and plugs 52 for insertion in the jacks 28, 32 of the chassis. For this use, the set is provided with strap fittings 53, 54 at each end of the housing base 13a and a midpoint strap fitting 55. An extendible shoulder strap 56 is connected between the end fittings 53, 54, while an extendible chest strap 57 is attached to the midpoint fitting 55 and includes provisions for detachably engaging one of the strap fittings 52 or 54 and, when detached, to pass around the operator's body and engage the shoulder strap at a point approximately opposite the midpoint fitting, thus to support the set securely from the operator's body without any manipulation. When used with the extension head-set, as illustrated in Figs. 4, 5a and 5b, the operation is the same as when used as a hand held set, except that in this instance the switch 44 is replaced by a switch included in the grip of the headset.

While the portable two-way wave-signal set of the invention is adaptable to a wide range of service applications, there follows by way of example the primary electrical characteristics of a particular set which has been found to be satisfactory in operation.

Frequency of both transmitting and receiving tuned circuits and crystals of unit 34 Frequency of the intermediate frequency channel 28, 29, 30 mc 0.455 Tube types: X. F. amplifier 21 174 Oscillator modulator 22 125 I. F. amplifier 24 174 Detector first audio 25 155 A. F. amplifier 27 174 Oscillator and first A. F. amplifier 33 356 Power amplifier and modulator 356 While there has been described what is at present considered to be the preferred embodiment of the invention, it will be apparent to those skilled in the art that various changes and modifications may be made therein without departing from the spirit or scope of the invention.

I claim:

1. A self-contained portable two-way wave- signal space-communication set comprising, an elongated unitary chassis including transmitting and receiving circuit means, signal-transmitting and signal-reproducing devices, an elongated housing enclosing said chassis and said devices and being longitudinally divided into base and cover portions, said chassis being positioned in said housing so that when said base and cover portions thereof are open said power supply means and normally replaceable elements of said circuit means are exposed for replacement, said compartment being proportioned to receive either battery means or a self-contained power converter supply unit and including disengageable connectors for making electrical connections thereon.

2. A self-contained portable two-way wave-signal space-communication set comprising, an elongated unitary chassis including transmitting and receiving circuit means and a compartment for receiving power supply means for energizing said transmitting and receiving circuit means, signal-transmitting and signal-reproducing devices, an elongated housing enclosing said chassis and said devices and being longitudinally divided into base and cover portions, said chassis being positioned in said housing so that when said base and cover portions thereof are open said power supply means and normally replaceable elements of said circuit means are exposed for replacement, said compartment being proportioned to receive either battery means or a self-contained power converter supply unit.

3. A self-contained portable two-way wave-signal space-communication set comprising, an elongated unitary chassis including transmitting and receiving circuit means, signal-transmitting and signal-reproducing devices, an elongated housing closely fitted about and enclosing said chassis and also enclosing said devices and comprising base and cover portions proportioned when open to permit removal of said chassis, and an extendible antenna supported within said housing and including securing means external of said housing, said securing means being movable so that said antenna can be removed from said housing independently of any other portion of the set.

4. A self-contained portable two-way wave-signal space-communication set comprising, an elongated unitary chassis including transmitting and receiving circuit means, signal-transmitting and signal-reproducing devices, an elongated housing closely fitted about and enclosing said chassis and also enclosing said devices and comprising base and cover portions proportioned when open to permit removal of said chassis, and an extendible antenna supported within said housing and including securing means external of said housing, said securing means being removable so that said antenna can be removed from said housing independently of any other portion of the set, said external securing means comprising also means for sealing said antenna to said housing.

5. A self-contained portable two-way wave-signal space-communication set comprising, an elongated unitary chassis including transmitting...
and receiving circuit means, signal-transmitting and signal-reproducing devices, an elongated housing closely fitting about and enclosing said chassis and also enclosing said devices and comprising base and cover portions proportioned when open to permit removal of said chassis, said housing having an opening in one end thereof, and an antenna assembly supported within said housing and including an extensible antenna and a ferrule for receiving said antenna and provided with a sealing flange and a threaded portion engaging and extending into said aperture in said housing, said ferrule being removable from said housing so that said antenna assembly can be removed from said housing independently of any other portion of the set, said sealing flange serving to seal said aperture through which said antenna extends.

6. A self-contained portable two-way wave-signal space-communication set comprising, an elongated unitary chassis including transmitting and receiving circuit means, signal-transmitting and signal-reproducing devices, an elongated housing closely fitting about and enclosing said chassis and also enclosing said devices and comprising base and cover portions proportioned when open to permit removal of said chassis, and an extensible antenna including supporting means for supporting the same solely from and within said housing and mechanically independent of said chassis, said antenna and its supporting means being out of the path of movement of said chassis during its removal, and switch means mounted on said chassis for controlling the energization of said circuit means and operable to circuit-closing position upon extension of said antenna from said housing.

7. A self-contained portable two-way wave-signal space-communication set comprising, an elongated unitary chassis including transmitting and receiving circuit means, signal-transmitting and signal-reproducing devices, an elongated housing closely fitting about and enclosing said chassis and also enclosing said devices and comprising base and cover portions proportioned when open to permit removal of said chassis, and an extensible antenna including supporting means for supporting the same solely from and within said housing and mechanically independent of said chassis, said antenna and its supporting means being out of the path of movement of said chassis during its removal, and switch means mounted on said chassis for controlling the energization of said circuit means and biased to circuit-closing position and including actuating means engageable by said antenna when substantially inserted within said housing for operating the switch means to circuit-opening position.

8. A self-contained portable two-way wave-signal space-communication set comprising, an elongated unitary chassis including transmitting and receiving circuit means, signal-transmitting and signal-reproducing devices, an elongated housing closely fitting about and enclosing said chassis and also enclosing said devices and being longitudinally divided into base and cover portions proportioned when open to expose normally replaceable elements of said chassis for replacement, and provisions for receiving within said housing a power supply means for the set including a storage battery having a gas vent, a vent in said housing disposed to register with said battery vent, and a resilient seal for said housing vent disposed to be opened by the battery vent when in place and including means for biasing it to seal said housing vent except for connection to said battery vent.

9. A self-contained portable two-way wave-signal space-communication set comprising, an elongated unitary chassis including transmitting and receiving circuit means including a transmitter signal-input circuit and a receiver signal output circuit, signal-transmitting and signal-reproducing devices, an elongated housing closely fitting about and enclosing said chassis and also enclosing said devices and being longitudinally divided into base and cover portions proportioned when open to expose normally replaceable elements of said chassis for replacement, and provisions for receiving within said housing a power supply means for the set including a storage battery having a gas vent, a vent in said housing disposed to register with said battery vent, and a resilient seal for said housing vent disposed to be opened by the battery vent when in place and including means for biasing it to seal said housing vent except for connection to said battery vent.

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