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J. F. MITCHELL
PORTABLE TRANSMITTER APPARATUS WITH SELECTIVE
DIVERSE ANTENNA MEANS

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2 Sheets-Sheet 1

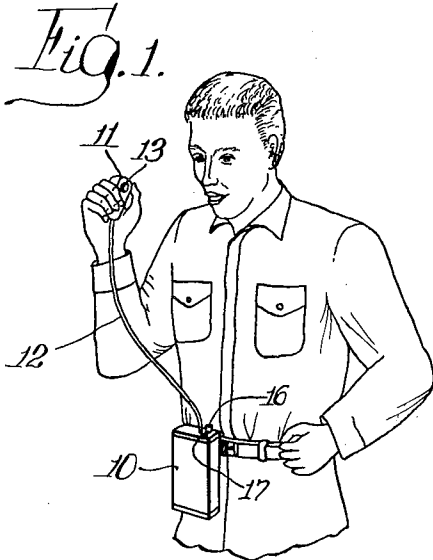
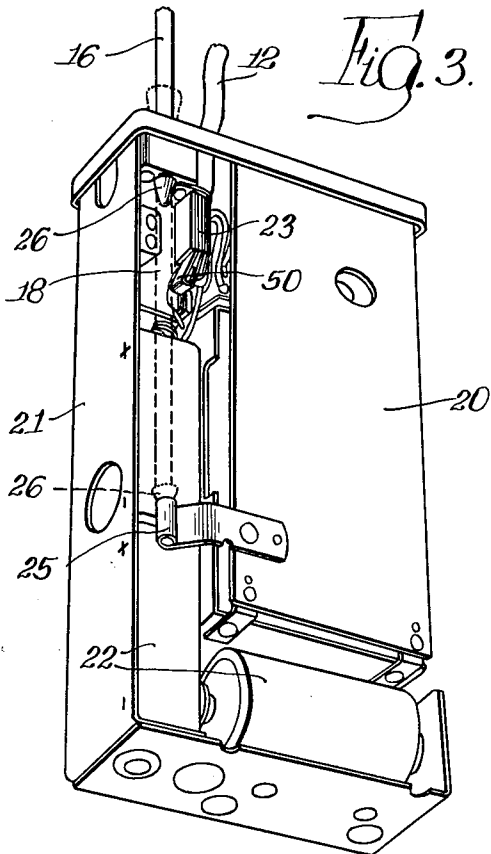
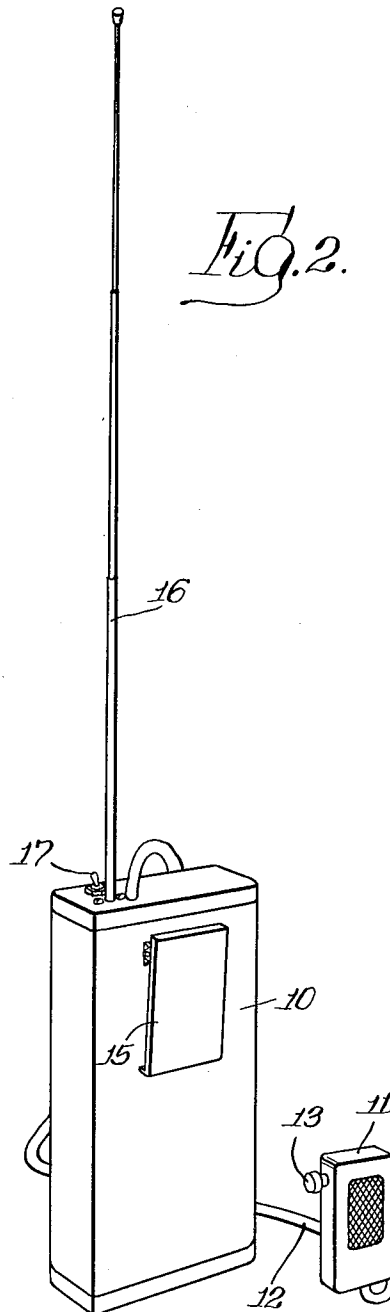


Fig. 2.



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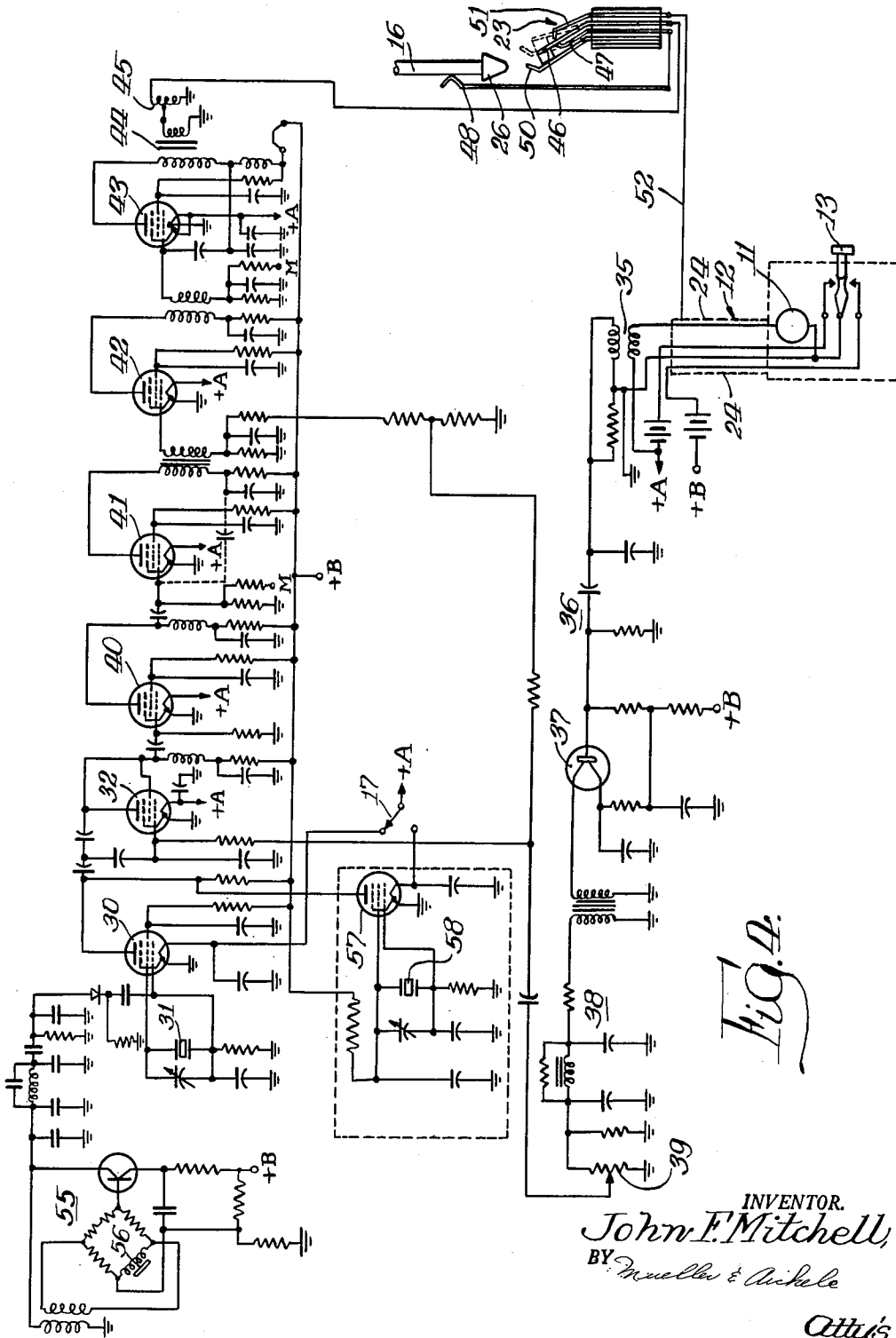


Fig. 4.

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PORTABLE TRANSMITTER APPARATUS WITH SELECTIVE, DIVERSE ANTENNA MEANS

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6 Claims. (Cl. 325—118)

This invention relates generally to portable radio equipment and more particularly to an effective antenna arrangement for a pocket size transmitter and/or receivers which may be worn by a man on foot and useable by him without interfering with his normal duties.

Portable radio equipment has been provided to permit a person on foot to transmit and/or receive a message by radio. One such transmitter unit is covered by Patent No. 2,810,068 assigned to the assignee of the present invention. While such units have been of great value there has been a problem that the units must be held in the hand of the operator and therefore interfere with his normal duties, and are of a size to be difficult to hold. It has been desired to have units which are of small size and light weight and which can be worn by a person in the manner so that they do not interfere with his desired operations. There has also been the problem of providing an effective antenna arrangement for portable units so that they may be used to transmit and/or receive signals over a substantial distance.

It is therefore an object of the present invention to provide a radio unit for use by a person on foot and which may be worn by the user in a manner so that it will not interfere with his normal duties.

Another object is to provide a pocket size radio transmitter and/or receiver with an antenna arrangement which provides effective radio communication.

A feature of the invention is the provision of a portable radio unit which is contained in a pocket size housing which may be worn by the user, with a self-contained antenna which is normally used, and an extensible antenna which may be used to provide a greater range of communication and which is automatically connected in the circuit when the antenna is extended.

Another feature of the invention is the provision of a portable radio transmitter housing with a microphone connected to the transmitter housing by a cable which includes a shield or an extra conductor which serves as the antenna for the transmitter.

Still another feature of the invention is the provision of a portable transmitter contained in a pocket size housing and including a telescopic antenna, and a microphone connected to the housing by a cable which may also serve as an antenna, with a switch in the housing being operated by extension and retraction of the telescopic antenna to selectively connect the telescopic antenna or the microphone cable to the transmitter output.

A further feature of the invention is the provision of a pocket size radio transmitter with self-contained batteries which may be worn on the belt of a user, with a microphone having the operating switch for the transmitter thereon connected to the housing by a cable, so that complete control is provided by a single element which is easily held in one hand of the user.

The invention is illustrated in the accompanying drawings wherein:

FIG. 1 shows a person wearing and operating a portable transmitter in accordance with the invention;

FIG. 2 shows the transmitter with carrying clip, microphone and antenna;

FIG. 3 illustrates the arrangement of the transmitter chassis, batteries and antenna within the pocket size housing; and

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FIG. 4 is a circuit diagram showing the complete circuit of the transmitter and the antennas and switch connected thereto.

In practicing the invention there is provided a pocket size radio unit provided in a small housing which may be carried in the pocket or clipped on a belt so that it does not interfere with the normal duties of the person using the transmitter. Batteries are included in the housing so that the unit is completely self-contained. The unit may be a transmitter having a microphone connected to the housing through a cable of a length so that the microphone can be placed adjacent the mouth of the user while the housing is clipped to his belt. The microphone includes an on-off switch which controls the energization of the transmitter. The microphone cable has a shield or an extra conductor which serves as an antenna for radiating signals. A telescopic antenna is also included in the housing and is coupled to a switch so that when the antenna is extended the telescopic antenna is connected to the circuit, and when the antenna is retracted into the housing the microphone cable shield is connected to the transmitter circuit. The output circuit of the transmitter is connected to ground so that the cable shield is effectively at ground potential for audio frequencies. A receiver unit may be similarly constructed with a telescoping antenna which is connected to the receiver circuit when the antenna is extended and an antenna contained within the receiver housing may be connected when the antenna is retracted.

Referring now to the drawings, in FIG. 1 there is shown a person using a transmitter in accordance with the invention, with the housing 10 clipped to his belt. He is holding the microphone 11 in his hand with the cord 12 connecting the microphone to the housing extending substantially vertically. The microphone 11 includes an operating switch 13 which controls energization of the transmitter. The microphone cable 12 has a shield which serves as the antenna for the transmitter as will be more fully explained.

In FIG. 2 the back side of the housing 10 is in view, and the clip 15 which will support the unit on a belt or the like is shown. The telescopic antenna 16 provided in the housing 10 is extended to serve as the signal radiator for the unit. A switch 17 is provided for selecting one of two frequencies which may be used by the transmitter.

In FIG. 3 the transmitter is shown with a part of the housing removed. The transmitter chassis 20 is provided in a frame 21 which also holds batteries 22 for energizing the transmitter. It is therefore apparent that the unit is entirely self-contained. A switch 23 is provided having a portion extending in the path of the antenna 16, as indicated by the dotted lines 18, to be operated when the antenna 16 is withdrawn from the housing as will be further explained. A pivotally mounted clip 25 holds the batteries in place in the position shown and also serves as a stop for the end 26 of the antenna.

In FIG. 4 there is shown the circuit of the transmitter. The transmitter includes an oscillator having a tube 30, with the frequency of the oscillator being controlled by crystal 31. Signals from the oscillator 30 are applied to the modulator 32 to which audio signals are also applied. The audio signals from the microphone 11 are applied to input circuit including transformer 35. To control the deviation of modulation, the audio signals are applied through differentiating circuit 36, and are then symmetrically clipped by the circuit including transistor 37, and integrated by the circuit 38. A controlled amount of the audio is derived from potentiometer 39 and is applied to the grid of modulator tube 32.

The carrier frequency as well as the frequency modulation thereof is multiplied by the stages including tubes

40, 41 and 42 and applied to the driver stage including tube 43. This applies the output signals to output transformer 44 which is connected to a tap on the output coil 45. The output coil is connected between ground and switch 23 which selectively connects the output to the telescoping antenna 16 or to the conducting shield 24 on the microphone cable 12.

It will be apparent that with the switch 23 in the position shown, the movable contact 46 engages the resilient contact 47 which is connected to the lead 48 connected to the telescopic antenna 16. The switch is in this position when the antenna is withdrawn. When the antenna 16 is telescoped into the housing the end 26 of the antenna will engage the arm 50 of the switch 23. This will cause the movable arm to move to the dotted position so that the movable contact 46 engages the resilient contact 51 which is connected through conductor 52 to the shield 24. Accordingly when the antenna is retracted the output coil 45 is connected to the shield 24 of the microphone cable 12.

As shown in FIG. 1 the microphone cable is held in a substantially vertical position when the microphone is being used so that effective radiation therefrom is provided. As the output coil 45 of the transmitter is grounded (FIG. 4) the shield 24 is effectively grounded for audio frequency signals. Accordingly when the shield is used as an antenna, there is no objectionable noise pickup by the shield to introduce noise into the audio input of the transmitter circuit.

It may be desired to transmit a tone along with the audio transmission to operate a control at the receiver indicating the particular transmitter from which the signal is being received. To accomplish this a bridge type transistor oscillator 55 is provided which may include a reed device 56 for controlling the frequency. In the event that a plurality of systems are operating on the same carrier frequency, the control tone provided along with the transmissions may be used to render only selected receivers operative to reproduce the transmitted signals. The signals from the oscillator 55 are applied to the grid of the oscillator 30 to directly frequency modulate the wave produced thereby. Accordingly the output of the oscillator 30 is frequently modulated, and this modulated wave is further frequency modulated by the audio signals in the modulator 32.

As previously stated a switch 17 may be provided on the housing to select one of a plurality of frequencies. A second oscillator including tube 57 is provided which is connected to the modulator 32 to provide oscillations thereto. A crystal 58 controls the frequency of this oscillator. The oscillators 30 and 57 are selectively rendered operative by switch 17 which selectively applies heater current to the tube 30 or the tube 57. The tone generator 55 may also be used to modulate the oscillator 57, or the oscillator 57 may provide transmission at a frequency wherein the control tone is not used.

It is therefore seen that a portable transmitter is provided which may be very conveniently used by a person on foot without interfering with his other operations. The main housing may be secured to the belt or the user either by the clip 15 as shown in FIG. 2, or by a separate case which may be provided. The microphone 11 is very small so it can conveniently be held in the hand when the transmitter is being used and may be placed in a pocket or be otherwise carried when not being used. The operating switch for the transmitter is provided on the microphone so that it may be operated by the fingers of the hand holding the microphone.

The shield for the microphone cable, or an extra conductor in the cable, serves as an antenna for the transmitter so that a separate element is not required. Inasmuch as the cable between the microphone and the housing for the transmitter extends substantially vertically while the transmitter is used, the shield forms an effective

signal radiator. If it is desired to provide communications over longer ranges, the telescoping antenna may be extended from the housing. By holding the telescoping antenna at a high elevation improved signal radiation may be obtained. The telescoping antenna is coupled to a switch which automatically connects the output coil of the transmitter to the shield or to the telescoping antenna.

A small portable receiver may also be provided with a self contained antenna and a telescoping antenna with the telescoping antenna operating a switch when it is extended and retracted. The self-contained antenna is normally connected to the receiver circuit through the switch, and when the antenna is extended it is connected to the receiver circuit. This provides more effective signal pick-up when needed to extend the range of communications.

I claim:

1. A portable radio unit including in combination, a pocket size housing containing a chassis including components forming a radio circuit, batteries in said housing for energizing said circuit, switch means in said housing connected to said circuit, said unit including means forming a first antenna and connected to said switch means, a second extensible antenna mounted in said housing to be telescoped therein and to extend therefrom, and means electrically connecting said second antenna to said switch means, said second antenna including a portion positioned to mechanically engage said switch means to operate the same to connect said second antenna to said radio circuit when said second antenna is extended, said switch means being operated by said second antenna to connect said first antenna to said radio circuit when said antenna is telescoped into said housing.

2. A portable radio unit including in combination, a housing containing a chassis including components forming a radio circuit, batteries in said housing for energizing said circuit, switch means in said housing connected to said circuit, said unit including means contained therein forming a first antenna connected to said switch means, said switch means normally connecting said first antenna to said radio circuit, a second extensible antenna mounted in said housing to be telescoped therein and to extend therefrom, and means electrically connecting said second antenna to said switch means, said second antenna including a portion positioned to mechanically engage said switch means when said second antenna is extended to operate said switch means to disconnect said first antenna and connect said second antenna to said radio circuit, said switch means being operated by said second antenna when said second antenna is telescoped into said housing to disconnect said second antenna and connect said first antenna to said radio circuit.

3. A portable radio transmitter including in combination, a housing adapted to be secured to the body of a person using the transmitter, a radio transmitter chassis having input and output circuits mounted in said housing, batteries in said housing for energizing the transmitter, switch means in said housing connected to said output circuit, a microphone unit including an energizing switch adapted to be held in the hand of the person using the transmitter, a cable connecting said microphone unit to said transmitter chassis to apply signals to said input circuit thereof, said energizing switch selectively connecting said batteries to said chassis through said cable, said cable having a conductive shield connected to said switch means and selectively connected thereby to said output circuit to serve as a signal radiator for the transmitter, an extensible antenna mounted in said housing to be telescoped therein and to extend therefrom, and means electrically connecting said antenna to said switch means, said antenna including a portion positioned to mechanically engage said switch means to operate the same to connect said antenna to said out-

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put circuit when said antenna is extended, said switch means being operated by said antenna to connect said shield to said output circuit when said antenna is telescoped into said housing.

4. A portable radio transmitter including in combination, a housing containing a radio transmitter chassis having input and output circuits, said output circuit including a winding having low impedance at audio frequencies with said winding being connected between a reference potential and an output terminal, said housing having means for supporting the same at the waist of the user, batteries in said housing for energizing said chassis, a microphone unit adapted to be held in the hand of the user of the transmitter, first switch means in said microphone unit including an energizing switch, a cable connecting said microphone unit to said transmitter chassis to apply signals to said input circuit thereof, said cable having a length to permit holding said microphone unit adjacent the mouth of the user, said energizing switch selectively connecting said batteries to said chassis through said cable, second switch means in said housing connected to said output terminal, said cable having a conductive shield connected to said second switch means and selectively connected thereby to said output terminal to serve as a signal radiator for the transmitter, said shield being connected to the reference potential through said winding to provide an effective shield for audio signals applied from said microphone unit through said cable to said transmitter chassis, and a telescoping antenna mounted on said housing and connected to said second switch means to be connected thereby to said output terminal.

5. A portable radio transmitter including in combination, a pocket size housing containing elements forming a radio transmitter circuit having an input and an output, batteries in said housing for energizing said circuit, switch means in said housing connected to said output of said transmitter circuit, a microphone, a cable connecting said microphone to the input of said transmitter circuit, said cable having a conductive shield connected to said switch means and selectively connected thereby to said output of said transmitter circuit to serve as a signal radiator therefor, an extensible antenna mounted in said housing

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to be telescoped thereon and adapted to extend therefrom, and means connecting said antenna to said switch means, said antenna including a portion positioned to engage said switch means to operate the same to connect said antenna to said output of said transmitter when said antenna is extended, and to connect said shield to said output of said transmitter when said antenna is telescoped in said housing.

6. A portable radio transmitter including in combination, a housing containing a radio transmitter chassis having input and output circuits, batteries in said housing for energizing the transmitter, switch means in said housing connected to said output circuit, a microphone unit including an energizing switch, a cable connecting said microphone unit to said transmitter chassis to apply signals to said input circuit thereof, said energizing switch selectively connecting said batteries to said chassis through said cable, said cable including conductor means connected to said switch means and selectively connected thereby to said output circuit to serve as a signal radiator for the transmitter, an extensible antenna mounted in said housing to be telescoped therein and to extend therefrom, and means electrically connecting said antenna to said switch means, said antenna including a portion positioned to mechanically engage said switch means to operate the same to connect said antenna to said output circuit when said antenna is extended, said switch means being operated by said antenna to connect said conductor means to said output circuit when said antenna is telescoped into said housing.

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