

- [54] **WIRELESS MICROPHONE AND ADAPTER KIT**
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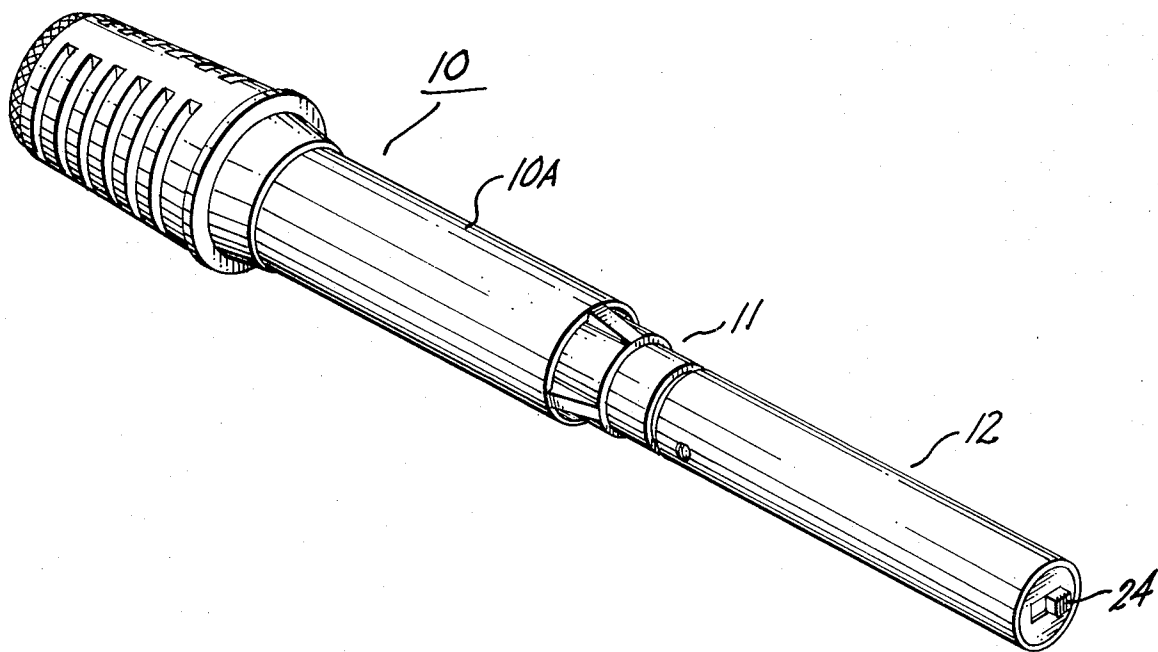
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[57] **ABSTRACT**

A wireless microphone assembly is disclosed which uses a frequency modulated transmitter having improved radiation characteristics and eliminates the need for a separate external antenna. An adapter unit is disclosed as being connectable to a conventional microphone with the adapter unit including a transmitting oscillator having its input circuit coupled with the conventional microphone output circuit via plug connectors and with the output circuit of the frequency modulated oscillator being connected via a grounding terminal to the case of the conventional microphone. The case of the conventional microphone then acts as a radiating antenna giving rise to high strength signals without the need for any protruding antenna arrangements. Mechanical construction details as well as schematic circuit diagrams are provided.

7 Claims, 5 Drawing Figures



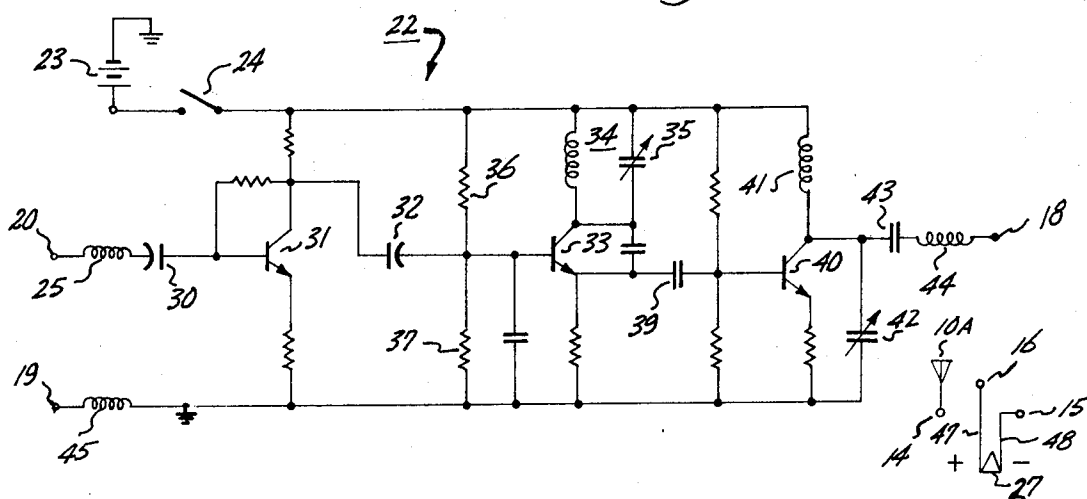
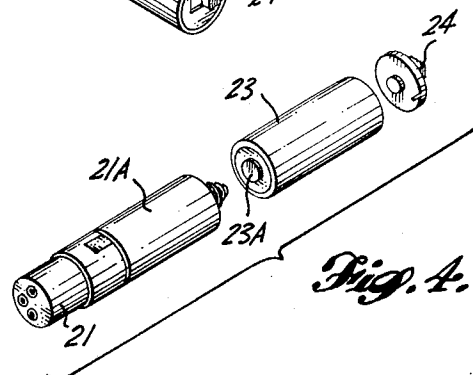
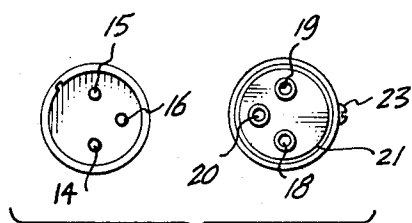
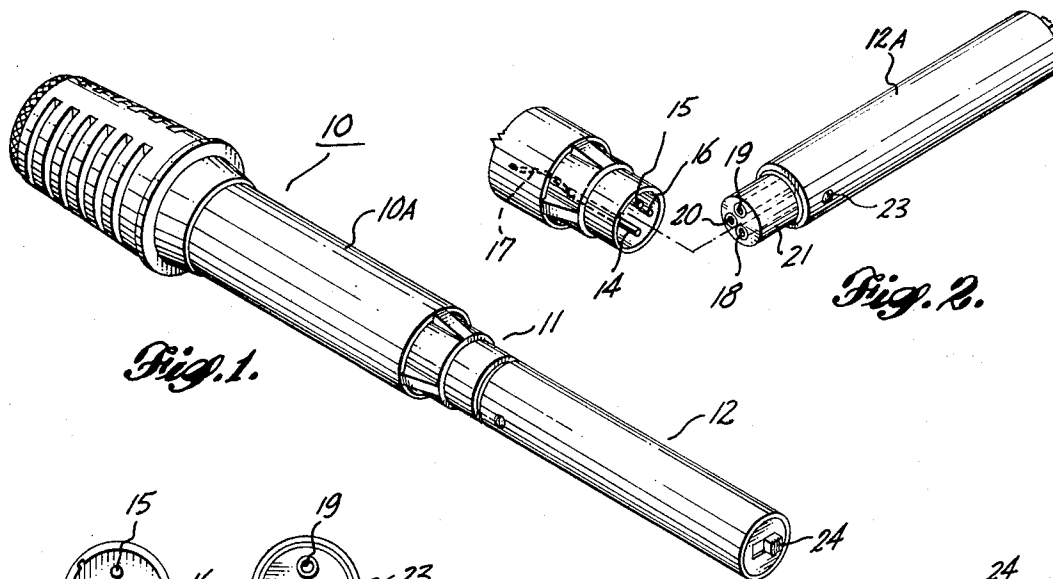


Fig. 5.

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WIRELESS MICROPHONE AND ADAPTER KIT

At the present time microphone units of the "wireless" type are available. In general such units include a frequency modulated transmitter together with some sort of protruding antenna in combination with a pickup unit. The transmitter output is modulated in a conventional manner by the voice or other sound input to the pickup unit. The use of a protruding antenna gives rise to an unwieldy unit from the standpoint of appearance and use.

It is an object of the present invention to provide a low cost wireless microphone unit having increased radiating strength while requiring lower input power than is required by presently available units. Another object of the present invention is to provide a low cost adapter unit for converting conventional wire-type microphones to a wireless microphone assembly.

Another object of the present invention is to provide a wireless microphone assembly wherein the body of the microphone pickup unit is made of metal and acts as the radiating antenna for radiation of modulated signals to an associated receiver. Another object is to provide a novel electronic circuit for use in a wireless microphone.

The above as well as other advantages of the invention are achieved through the use of a compact frequency modulated oscillator which is plugged into the base of a conventional microphone for the receipt of audio signals from the conventional microphone. Most microphones presently in use are provided with a plug-in connector assembly for coupling the lead wires of the microphone to an amplifier in a quick disconnect arrangement. The adapter unit of the present invention couples with the conventional plugs of most microphones and then makes use of the ground connection of the microphone as the output lead of the radiating oscillator. Since most microphones have the metallic cases thereof electrically grounded via a ground connector output the present adapter unit utilizes the ground connection of the microphone as the output circuit of the radiating oscillator. As a result the entire case of a conventional microphone serves as an antenna and high strength radiating characteristics are achieved even though the output power applied is very low. The output circuit of the radiating oscillator is heavily loaded from an electrical standpoint so that shorting of the output circuit has little or no effect on the field strength of the radiated signal. The input circuit to the oscillator includes an inductor which presents a high impedance to the r.f. signal to be transmitted but passes the audio input signals. As a result a highly efficient wireless microphone is provided with the power requirements being extremely low.

The invention will be more clearly understood from the following description when read with reference to the accompanying drawings.

FIG. 1 is a perspective view of a preferred embodiment of the wireless microphone assembly of the present invention.

FIG. 2 is a perspective view of the adapter unit containing the electronics package together with the connector end of the pickup unit.

FIG. 3 is an end view of the input jack assembly for the microphone pickup unit and of the jack assembly for the microphone pickup unit and of the jack assembly for the adapter unit.

FIG. 4 is an exploded view of the components contained inside the housing of the adapter unit.

FIG. 5 is a schematic circuit diagram of the circuitry for a preferred embodiment of the invention.

Turning now to the drawings, there is illustrated in FIG. 1 a wireless microphone including a conventional pickup unit 10 having a base connector 11 connected to the adapter unit 12 which houses the r.f. transmitter assembly. The base 11 of the pickup unit 10 will be seen in FIGS. 2 and 3 to have three bayonet-type connectors 14, 15 and 16. The base of the unit 10 can have either the male or female connectors units, but since many presently available microphones use male connectors the unit of FIGS. 1, 2 and 3 has male connectors. In a typical wiretype microphone assembly the wire connector 14 serves as a ground connector which is electrically connected to the case 10A of the microphone. This is shown by the lead 17 in FIG. 2. Connectors 15 and 16 are connected to the microphone element 27 (FIG. 5) for providing the output signals to the oscillator described below. These three connector pins 14, 15 and 16 are typically plugged into a cable via a mating jack assembly for grounding the microphone housing 10A for providing signals to an amplifier.

In accordance with the present invention the adapter unit 12 is provided with the female connector members 18, 19 and 20 which are respectively adapted to receive the male connectors 14, 15 and 16. An insulating collar 21 supports the jack receptacles 18, 19 and 20 and is of a length such that when the adapter and pickup units are assembled in the manner indicated in FIG. 1, the adapter unit 12 is electrically insulated from the metal case 10A of the pickup unit. A small set screw 23 enters the insulating member 21 and holds it in position inside the case of the adapter unit 12. In practice the case 12A of the adapter unit is an elongated cylindrical member similar to a length of metal tubing. The insulating collar member 21 is provided with an elongated support section 21A which serves to support the electronic circuitry 22 illustrated in FIG. 5. A battery 23 has its positive terminal at its end 23A for engagement with the circuitry 22 and its negative terminal connected via the switch 24 to the metal casing 12A of the adapter unit.

Turning now to FIG. 5 the details of one embodiment of the invention found to work well will be described. As seen in FIG. 5, terminal 16 of the pickup unit connects with terminal 20 of the modulation and transmitter unit so that input signals are applied via inductor 25 and capacitor 30 to the base of the preamplifier transistor 31. Signals from the preamp are coupled by capacitor 32 to the base of the frequency modulated oscillator circuit which includes the transistor 33. The L-C tank circuit 34 determines the frequency of the oscillator with capacitor 35 being adjustable for frequency selection. A bias circuit composed of resistors 36 and 37 provides the usual bias for transistor 33. Frequency modulated signals are provided via capacitor 39 to the r.f. amplifier which includes transistor 40 having the low Q inductor 41 in the collector thereof. Adjustable capacitor 42 connected to the collector of transistor 40 together with the output capacitor 43 and the low Q inductor 44 connected to output pin 18 form part of a pi network which is tuned by capacitor 42.

The circuit shown in FIG. 5 operates in the conventional manner so that a frequency modulated r.f. signal is applied via output terminal 18 to the input terminal 14 of the pickup unit 10. Since the terminal 14 of the pickup unit 10 is electrically connected to the metal frame 10A of the pickup unit 10 it will be seen that the entire frame or housing 10A acts as a radiating antenna. The output of the r.f. amplifier is heavily loaded so that shorting of the case 10A to the case 12A does not prevent proper circuit operation. The capacitor 43 provides D.C. isolation and thus prevents damage to the output transistor 40. An inductor 45 connected to the input terminal 19 and the inductor 25 connected to terminal 20 act as high impedances to any r.f. signals which would otherwise be capacitively coupled from the case 10A (which acts as the antenna) to the leads 47 and 48 extending from the microphone element 27 to the pins 15 and 16. In one system the output frequency was approximately 90 megahertz with inductors 25 and 45 having been 1 millihenry.

It will be seen that the present invention provides not only a composite wireless microphone but also a removable adapter unit which is suited for use with virtually all presently available standard wire-type microphones. The particular jack configuration for the standard microphones might vary but in general it has been found that standard microphones typically include a lead which is electrically connected to the metal frame of the pickup unit together with a pair of power leads for the pickup unit itself. Thus it is only necessary to provide a different physical configuration for the jack connection of the adapter unit to utilize the illustrated electronic circuitry for virtually all conventional microphones. From a practical standpoint this is of extreme importance since a person or organization already having standard wire-type microphones need only purchase the adapter unit and a low cost frequency modulated tuner for receiving the FM output signals radiated from the microphone housing 10A.

The invention has been disclosed by reference to the presently preferred embodiment. The inventive concepts lend themselves well to modifications and adaptations which will be obvious to a person skilled in the art.

What is claimed is:

1. A hand-held portable microphone assembly comprising in combination:

- a. a conventional microphone unit including a transducer element having electric circuit means connected thereto; a housing member having said element disposed therein, and including means defining a radio frequency antenna, said housing member being a metal microphone case having an

electrical ground lead connected thereto with the case serving as the antenna means; and

- b. an adapter unit for said conventional microphone unit including a radio frequency transmitter having said electric circuit means connected thereto as an input circuit, a second housing member having said transmitter disposed therein means insulating said second housing member from said metal microphone case and means connecting the output circuit of the transmitter to said ground lead and to said second housing member, whereby said metal microphone case and said second housing member act as the antenna for said transmitter.

2. The apparatus of claim 1 including a first electrical connector assembly secured to said housing and a second connector assembly connected to said second housing member, said first and second connector assemblies being a matching pair and adapted for connection and disconnection.

3. The apparatus of claim 1 wherein said transmitter is a frequency modulated transmitter.

4. The apparatus of claim 1 including first and second inductors connected in the input circuit of said transmitter, each of said inductors being connected in series between said transducer element and said transmitter to substantially block radio frequency signals but pass audio frequency signals.

5. An adapter unit for converting a conventional hand-held microphone unit having a metal case and a transducer therein and a connector assembly including a pair of output leads connected to said transducer and a lead connected to the metal case, into a portable wireless microphone transmitter comprising: a housing member, a radio frequency transmitter disposed within said housing member having first and second signal input leads, a signal transmission output lead, and a ground lead connected to said housing member; and an electrical connector assembly having said each of said three leads connected thereto and arranged for connection to the connector assembly of the microphone unit with said output lead connected to the lead in the microphone unit which is connected to the metal case and said first and second signal input leads connected to said pair of output leads, said electrical connector assembly further including means insulating said housing member from said metal case.

6. The apparatus of claim 5 including circuit means in the input circuit of said transmitter blocking radio frequency input signals and passing audio frequency signals.

7. The apparatus of claim 6 wherein said circuit means includes first and second inductors connected to said input leads.

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