

AUDIO PATENTS

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THE IDEA of a "wireless microphone" is not new but a new patent of Robert L. Stephens (of the California firm well known to audio people) contains a rather nice design, and incidentally one which should be rather easy to experiment with. These gadgets—microphone-radio transmitter combinations designed to be concealed about the person—can be very useful in TV and motion pictures where without them a microphone boom must follow the performer all over. They have been particularly useful on Ed Murrow's "Person To Person" show where the living quarters of the people interviewed do not have the dimensions or shape of a barnlike TV studio and a boom would have to find itself changing shape like a python to keep in the right position.

The Stephens patent, No. 2,710,345, employs a simple 2-tube FM transmitter with a capacitor microphone^{1, 2} connected directly across the oscillator tank for modulation.

The unit is in two main pieces plus a couple of wires. The general finished form is shown in Fig. 1. The transmitter fits in the left breast "handkerchief" pocket of a man's jacket and there is a pocket clip to keep it there. The microphone is permanently mounted on top of the case and faces the upper air behind a decorative handkerchief which conceals it. The battery case can go in the left jacket pocket. The antenna can go around the wearer's neck under his jacket collar and the battery cable, which also acts as a ground plane or counterpoise can go from pocket to pocket through holes in the jacket lining. The

transmitter case can be brought down to around 1 3/8 in. wide, 1 3/4 in. high (exclusive of microphone), and 5/8 in. thick. The battery case is somewhat larger, about 1 1/2 in. wide, 2 1/2 in. high, and 3/4 in. thick. These dimensions are deduced from what the inventor says.

Figure 2 gives a complete schematic diagram of the unit with—happy day—all circuit values. Both tubes are subminiature 5672 pentodes. V_1 is the oscillator operating in the neighborhood of 25 mc. Its tank coil L_1 consists of 24 turns of No. 31 enamelled wire wound on a 1/4-in. form with an adjustable powdered-iron core. The only capacitor across this coil is the microphone itself, which is fastened rigidly to the top of the case. With the values and frequencies given the mean microphone capacitance should be about 14 μf for best L-C ratio. With normal sound pressures the capacitance changes enough to produce a deviation of around 1.5 kc each way.

V_2 is a frequency doubler, which gives an output of about 50 mc. Its tank coil L_2 is wound on the same iron-core form as L_1 and consists of 8 1/2 turns of No. 24 enamelled wire with the antenna tap 1 turn from the B-plus end.

Note that the B-plus is grounded to the case rather than the B-minus as is customary. There are two reasons. First, this places the antenna and the microphone at ground potential for d.c. While a performer who touched antenna (or microphone) and case simultaneously with B-minus grounded would hardly be hurt by the available 60 volts, he might conceivably be surprised enough to speak a few unscheduled lines. Second, the radiation efficiency of the transmitter is increased by this connection.

The battery box contains two series-connected 30-volt batteries of the type used in hearing aids for a B-supply and a pair of 1 1/2-volt batteries in parallel for the fila-

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¹ Normally known to electronics people as a condenser microphone.—Ed.

² Who wants to be normal? Let's keep up with the times—after all, we know today that condensers are used only in steam engines!—Author

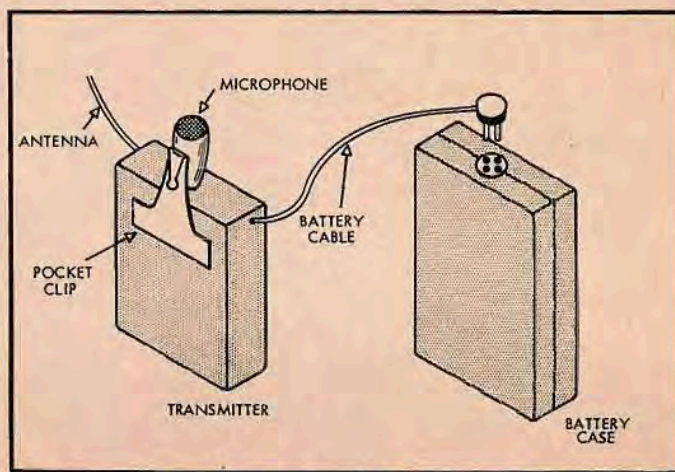


Fig. 1

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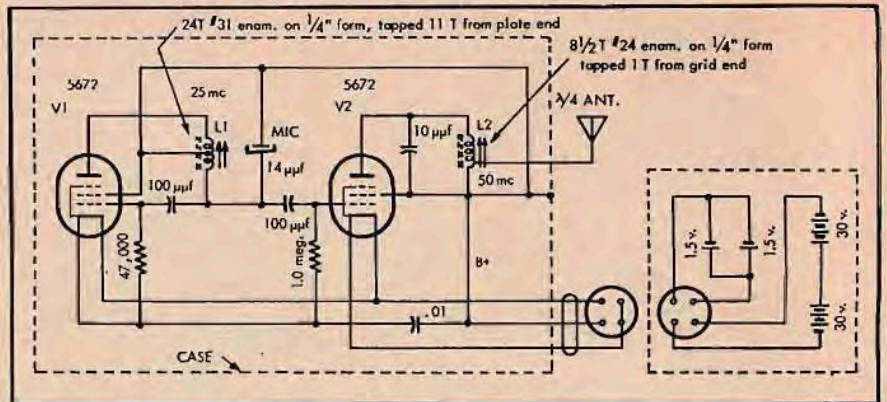


Fig. 2

ments. When the battery cable is plugged in the negative side of the 60 volts and the positive side of the filament supply are paralleled in the transmitter by the strap across pins 3 and 4 of the plug to provide the combined filament and plate return. The small hearing-aid batteries will operate the unit for 1 to 2 hours, while a larger set, for instance a portable radio battery, will keep it going 15 to 20 hours. The latter can be used where concealment is not important. The antenna should be a quarter wave at the operating frequency, which means in the vicinity of 55 in. at 50 mc. It can be draped around the body in whatever way is convenient.

It seems that a unit like this would not be hard to put together and would prove very useful for other purposes than TV and movie work—public address, radio, and concealed in a pot of flowers when you want to hear what your "friends" really think of you.

The deviation produced at the output is on the order of plus and minus 3 kc. While ordinary FM receivers do not go down to 50 mc, many of the prewar ones do, and it should not be hard to make or modify one for the purpose.

Quiet Volume Control

Volume-control potentiometers, even the best, eventually become noisy because of imperfect contact between moving arm and resistance element. While this is not of the highest importance in ordinary audio devices, it becomes a bad problem in electronic organs because the volume control is used so often in the course of playing.

Solomon Heytow and Richard H. Peterson of Chicago have patented a volume control in which this problem is eliminated and a couple of additional advantages are afforded. The circuit is diagrammed in Fig. 3. The patent number is 2,712,040.

The essence of the invention is a pair of voltage-sensitive resistors (thermistors) R_1 and R_2 , used in a voltage-divider arrangement. Signal goes from the plate of the tube through R_1 , the series leg, and R_2 , the shunt leg of a voltage divider. Output is taken from the junction of the two through blocking capacitor C_2 ; C_2 is another blocking capacitor, and both are large so as not to affect the signal.

R_2 is a thermistor whose resistance value can be controlled by the current through it; the larger the current the lower the resistance. The audio signal is not large

enough to cause any appreciable resistance change, and the thermistor is controlled by a d.c. source.

Voltage from the control source is fed through a divider consisting of R_3 and rheostat R_s . R_s is mentioned in the patent as part of the divider but does not appear to have any useful purpose, so it is suggested that experimenters dispense with it. The controlled voltage at the junction of R_3 and R_s is applied through a cascaded pair of time-constant networks R_4-C_3 and R_5-C_4 to the two thermistors R_2 and R_1 . Since C_4 has a large value, the two thermistors are effectively in parallel to ground for signal. As the potentiometer arm nears ground, control voltage across R_2 and R_1 increases as does the current through them, and their resistances decrease, thus lowering the output signal level.

The first advantage of this device is that noise in the rheostat R_s is not transmitted to the signal circuit because the two time constants are too long. In fact, R_s can be a switch or series of contacts with as few as six finite resistance steps; the time constants will still cause a smooth change in signal level. Second, the control R_s can be located as far away from the signal circuits as desired, without any effect on them. And a third, rather incidental advantage is that the value of C_2 can be chosen so that as signal level decreases, the bass does not decrease as much as the middles and highs, giving a loudness control effect which is very important in organs.

The inventors point out that since thermistors respond instantaneously to changes in current, considerable audio distortion would take place if the audio current were large enough to control thermistor resistance. They then say that this is effectively

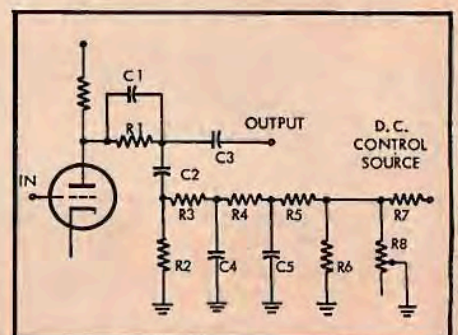


Fig. 3

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obviated by using two thermistors of matched characteristics; this writer does not see how that would be useful. However, they also state—and this is obviously true—that the trick is to keep the d.c. control voltage very much greater than the signal voltage across the thermistors—between 20 and 100 times as high. This, of course, will do the trick.

The patent also shows how to make the circuit work as a volume compressor. If interested, you can get a copy of this as well as any other patent from The Commissioner of Patents, Washington 25, D. C., for 25 cents.

Audio Fair—AES Event Set For Mid-October

More exhibitors will participate in the 1955 Audio Fair than have ever before taken part in a public display of high fidelity equipment. Such was the announcement of Harry N. Reizes, Fair manager, on August 25, who reported that, with more than a month yet remaining for exhibitors to engage display suites, the numbers of executed contracts on hand was considerably greater than the total for any previous Fair.

As in years past the Fair will occupy the fifth, sixth, seventh and eighth floors of the Hotel New Yorker. The Fair will open on Thursday, October 13, and will continue for four days. Exhibit hours are 1 P.M. to 10 P.M. with the exception of Sunday, October 16, when the Fair will open at 12 noon and close at 6 P.M.

In keeping with the policy established with the first Audio Fair, the 1955 event will be open free to all interested parties, professional and amateur alike.

Sponsored each year by the Audio Engineering Society, the Fair is held in conjunction with the Society's annual convention. "Practicality" will be the theme of the 1955 convention, according to Col. Richard H. Ranger, program chairman. Included on the technical program will be panel discussions on transistors, amplifier design, and tape recording. Their purpose will be to bring out the correct and practical manner for handling each type of equipment. The agenda will also include theoretical and scientific papers.

The Society's annual banquet is scheduled for the evening of October 12 in the New Yorker's Grand Ballroom.

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AUDIO Magazine

Room 616

1955 Audio Fair