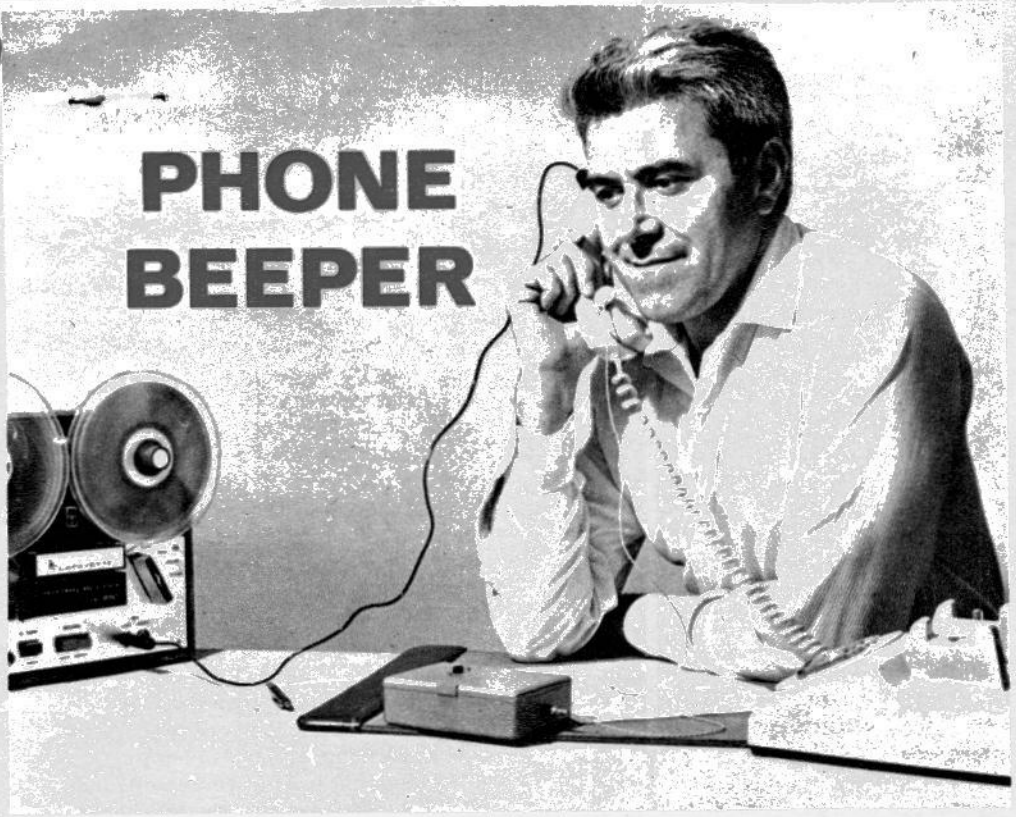
PHONE BEEPER



By **NORMAN H. CROWHURST**

HOLD on, there. Are you about to record a telephone conversation? It's not as simple as just setting up a tape recorder and attaching one of those inductive pickup coils to the phone base or handset. You may be required to put a beep tone on the line.

You've heard this tone many times—especially when you are listening to news broadcasts. The reporter may be phoning in his story, which is being taped for later broadcast. And every 15 seconds a beep comes through loud and clear. It is a warning to the other person on the line that the conversation is being recorded.

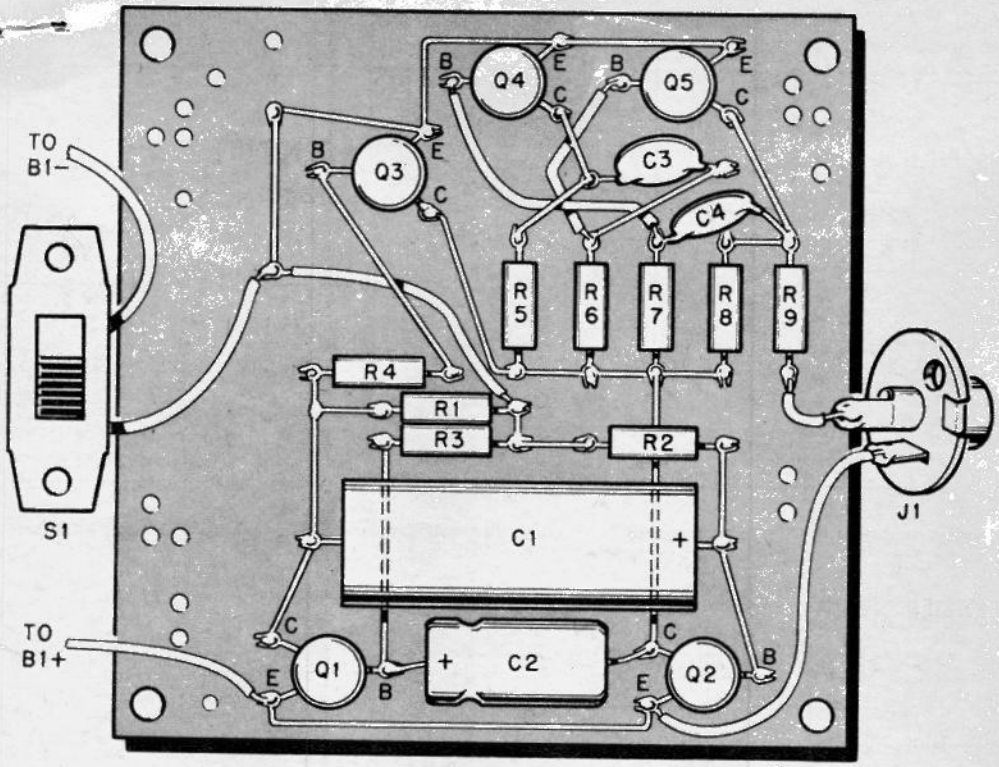
All of this comes about because of a communications law regarding the use of tape recorders and telephones. What it boils down to is that you must give the person you are calling a sporting chance by letting him know he's being recorded. There are some exceptions such as bugging your own phone under certain circumstances but, not being guardhouse lawyers, we'll leave that to the courts and say if you're beeping while bugging you can't be doing *everything* wrong.

Easiest and cheapest way to stay on the right side of the law when you record conversations is to build our five-transistor beeper. It has no moving parts and does not have to be connected electrically to your phone line. Its output is fed to an earphone, which blasts the tone directly (acoustically) into the mouthpiece on the handset. It's a one-evening project which will set you back about $10.

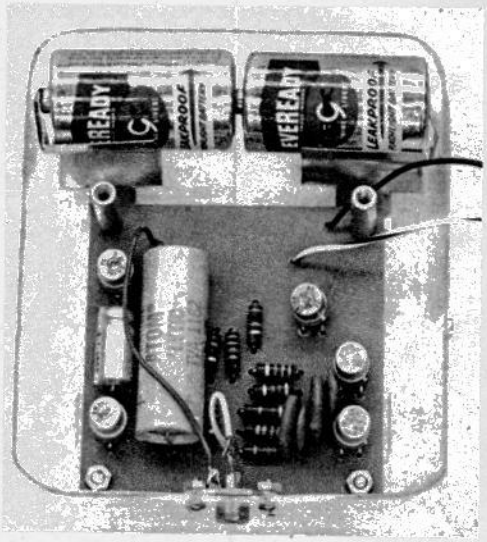
How It Works. Now you can't get away with just whistling into the phone every few seconds. There are strict rules about the tone. First, the beep, as specified by the FCC, must be a 1,400-cps (± 10 per cent) tone lasting 0.2 second (± 20 per cent) and repeated every 15 seconds (± 3 seconds).

Our beeper consists of two multivibrators, or oscillators. The first, made up of transistors Q1 and Q2, turns the tone on and off. It could be called the timer. The other multivibrator, consisting of Q4 and Q5, generates the tone. The tone is produced only when Q2 conducts, which is for 0.2 second every 15 seconds. Q1 conducts for the remainder of the 15-second period, during which time Q2 is cut off.

The frequency of the tone is determined by the values of resistors R6 and R7 and capacitors C3 and C4, which are associated with Q4 and Q5. The values we used are 0.125 μf and 4,700 ohms for the capacitors



Complete circuit can be built on a 3-in.-square piece of perforated board. Standard flea clips are shown for all tie points on this model. Author used a custom-made printed-circuit board (below) for his model and made his own battery clips.



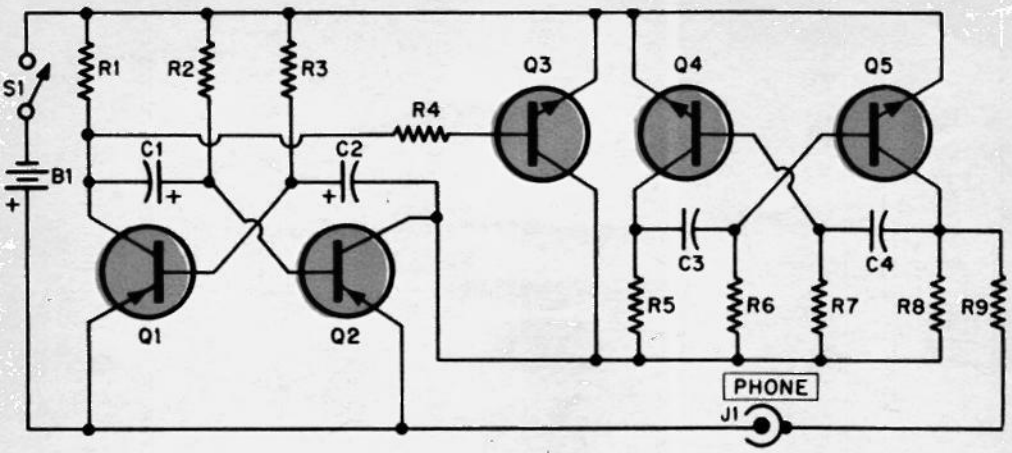
and resistors, respectively. The tone is required to be within plus or minus 10 per cent of 1,400 cps so it is well to use 5 or 10 per cent tolerance parts and to check frequency, if you have an audio oscillator and an oscilloscope.

We paralleled a 0.025 μf capacitor and 0.1 μf capacitor (total of .125 μf) and got a frequency of just about 1,400 cps. In the pictorial, we show just one capacitor for C3 and C4. In the photograph of the author's model you can see two capacitors for C4 and C5.

But if you use 0.1 μf capacitors that are close to true value you may come close to 1,400 cps without paralleling.

Timing is controlled by the value of parts associated with Q1 and Q2. The interval between beeps is set by the 500 μf capacitor (C1) and the 33,000-ohm resistor (R2). With a 500-μf capacitor, a 33,000-ohm resistor produces an interval of about 13.5 seconds (which is within tolerance). A 39,000-ohm resistor (the next value we tried) made the interval about 19 seconds, which is too long. The beep duration is controlled by the 50-μf capacitor (C2) and 6,800-ohm resistor (R3).

Transistor Q3 is needed in the circuit to prevent the tone from dying slowly; the tone must stop abruptly at the end of the 0.2-second interval. Without Q3 the tone would die slowly because current in the tone multivibrator (Q4, Q5) is not stopped when



Timing multivibrator (Q1, Q2) turns the tone multivibrator (Q4, Q5) on and off. Q3 cuts the tone off sharply.

PHONE BEEPER

Q2 is cut off suddenly. Adding Q3 (whose base is controlled via R4 by the collector of Q1) shorts the voltage across the tone multivibrator at the same moment Q2 is cut off.

Construction. The beeper shown in the photograph was built by the author on his own custom-made printed-circuit board. Realizing it might be difficult to duplicate this board, we show a pictorial of the circuit built on a 3-in.-square piece of perforated board on which we used flea clips for all of the circuit's tie points.

The layout is not particularly critical. However, be sure to use spaghetti on all bare leads where they cross. Also, be careful when installing the transistors that you do not apply heat to them too long. Matter of fact it's better to make other connections to the flea clips to which the transistors are soldered before soldering the transistor leads. Be sure to get the polarity correct when installing C1 and C2 and make sure you identify the transistor leads correctly.

Next, drill holes in the plastic box for the four screws which will hold the circuit board, output jack and the power switch. Install the board with ¼-in. spacers to keep the back of the board from touching the box. So far as the batteries go, they may be installed in a holder or you can solder the leads to them directly. We used two C cells in our model, which were slightly less than the width of the box. We could have held them in place with some home-brew clips made from an old discarded tin can.

PARTS LIST

B1—1½-V battery (2 reqd.)
C1—500 μf, 6 V electrolytic capacitor
C2—50 μf, 6 V electrolytic capacitor
C3,C4—.125 μf, ceramic disc capacitor (made up of .1 μf and .025 μf capacitors in parallel. See text)
J1—Phono jack
Q1,Q2—2N396 transistor (RCA)
Q3,Q4,Q5—2N388 transistor (RCA)
R1,R5,R8—330 ohm, ½ watt, 10% resistor
R2—33,000 ohm, ½ watt, 10% resistor
R3—6,800 ohm, ½ watt, 10% resistor
R4—10,000 ohm, ½ watt, 10% resistor
R6,R7—4,700 ohm, ½ watt, 10% resistor
R9—220 ohm, ½ watt, 10% resistor
S1—SPST slide or toggle switch
Misc.—125-ohm earphone (Telex EMV-2. Newark Electronics Corp., 500 N. Pulaski Rd., Chicago, Ill. 60624. $4.55 plus postage. Stock No. 27F380), flea clips, perforated board, 4¾ x 4¼ x 1½-in. plastic sandwich box.

Operation. Best way to get that beep tone into the mouthpiece is to make a holder for the earphone with a piece of heavy wire. This will be strictly cut and try. The object is simply to clip the earphone at the edge of the mouthpiece so the sound goes right in. Properly placed, the phone will inject a good beep which the person at the other end of the line will not miss. Just in case he wonders what the tone is for, tell him your conversation is being recorded. But don't be surprised if he hangs up. Some people get terribly shy when they know they're being taped.