Easy-To-Build Electronic Bass

. . . and even easier to play, because it has only one string!

By FRED MAYNARD

IT looked as though it would be duck soup at first. Playing a string bass, that is. The feeling started that time you watched the bass player in the combo. He didn't seem to be working at all. He appeared to be just standing there holding the instrument with his left hand while beating out the rhythm with his right. You felt encouraged because you always wanted to play an instrument but didn't feel you could master it. The bass, however, looked simple.

You gave it a good try. To your dismay you found you were all thumbs because it's not just a matter of slapping or plucking the strings. There's a good deal more to do with your left hand on the instrument's neck. Upshot of the adventure was that you took up the kazoo.

We have a solution which will get you a musicians-union card yet—a one-string electronic bass which you could learn to play in a week or two. What happened to the other three strings? We did away with them since it takes only one to make electrical contact with the frets on the neck. There's a small price to be paid for this simplification—the bass has a range of only one octave, starting at C_2 and going up to C_1. (The 2½-octave range of a real string bass goes from E_3 up to B_1.)

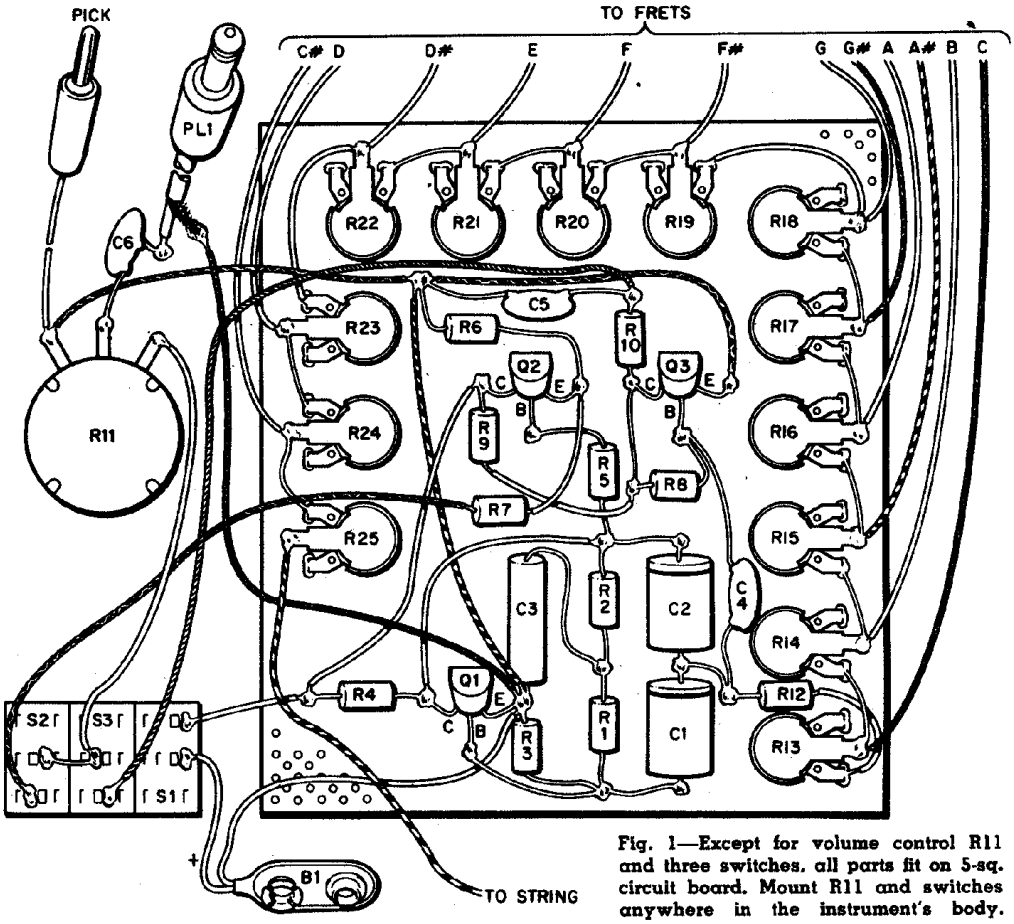

Fig. 1—Except for volume control R11 and three switches, all parts fit on 5-sq. circuit board. Mount R11 and switches anywhere in the instrument's body.

Electronic Bass

However you could expand the circuit to add another octave or two.

Another feature of the bass is that it could be made almost as small as a cigar box. True, our model on the cover and above looks almost as unwieldy as a real bass. However, we built ours for show.

You can build your model the same size as a conventional bass, about the size and shape as ours or, as we said, about the size of a cigar box. And if you build it this small you could eliminate even the single string and install push buttons.

Our one-string bass will put a solid bottom in your combo or spike up your musical-fun evenings at home. It costs only a few dollars and, except for its limited range, produces a sound almost as good as a real bass.

The Circuit

The electronic part is a simple twin-tee oscillator circuit. In the schematic (Fig. 4), transistor Q1 and its associated R/C network form the oscillator. The frequency-determining network is composed of C1, C2, C3, R1 and R2. The tuning network consists of resistor R12 and potentiometers R13 to R25. As far as parts go, the capacitors should be good paper or mylar units and R1 and R2 should have a tolerance of five per cent. The trimpots (R13 through R25) are low-cost Mallory MTC-series units.

Transistor Q2 is an emitter-follower buffer and Q3 is a buffer amplifier. The purpose of these two stages is to prevent amplifier load-

ing from affecting the tuning of the oscillator. The output of Q2 is a nearly pure sine wave, having a deep-tone sound. A tone rich in high harmonics from Q3 provides a string or reed-like sound. Either or both of these transistors may be switched into the output by switches S2 and S3. Potentiometer R11 is a volume control. The power is supplied by a large 9-V battery or six penlite cells. Switch S1 controls power.

The playing part of the instrument is a fret board similar to that on a guitar. The frets are wired to the tuning pots, as will be described later. A metal guitar string or picture wire mounted over the frets contacts the frets as the string is pressed to them. This string is connected to the last tuning pot, R25.

The instrument plays whenever a fret is grounded by the pick. When the pick touches only the string, C_2 (lowest C) sounds. The other chromatic notes, C#, D, D#, etc., are played by simply pressing the string to the frets with the pick. The pick is simply a banana plug on the end of a flexible wire which is connected to circuit ground and which comes up through the top panel of the instrument.

Construction

The construction consists of two parts; first, the circuit board and second, the neck-piece fret board.

Our circuit was built on a 5-in.-sq. piece of perforated board. We used flea clips for tie points. Any layout will do, but you might as well follow ours. The switches, pot, battery, holders, etc., can be mounted in the body of the instrument.

Notice in Figs. 2 and 3 how our neck is made. It is a tapered piece of wood about 20-in. long. The 12 frets are 2-in. long pieces of No. 14 bare solid wire. To the middle of each fret solder a 25-in. length of flexible insulated hookup wire as shown in Fig. 2. Slip the wires through the holes in the neck, and after making sure the fret bars seat in the saw scores, fasten them in place with Duco cement. A component box can be made out of plywood and can be about 2x9x9 in. The top panel can be ¼-in. plywood.

Connect the 12 fret wires to the tuning pots in the proper order, starting with the fret nearest the bottom, which goes to R24. If you become confused by all the wires coming out of the neck, you can locate which is which with an ohmmeter. After the wiring to the switches, batteries, etc., is complete, the instrument is ready to be tuned.

Make sure, after the instrument is finished, to clean off the fret bars by lightly sanding them since they may be covered with cement. If you run into noise while fingering the string, it is because of a dirty fret or a dirty string.

Tuning

The scale the bass plays goes from C_2 to C_1 —the second to the first octave below middle

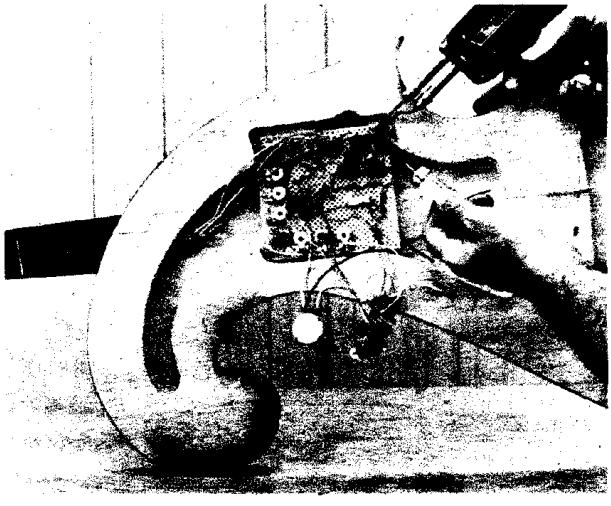

Fig. 2—Circuit board is in upper part of our instrument's body. Note wires going up to neck to frets. Switches, R11 were mounted behind left hand.

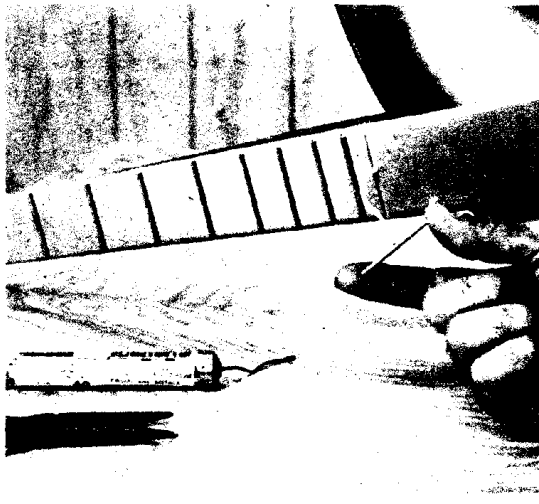

Fig. 3—Fret is 2-in. piece of No. 14 wire to which wire is soldered. Fret is glued in groove cut in neck. Note decrease in spacing near the bottom.

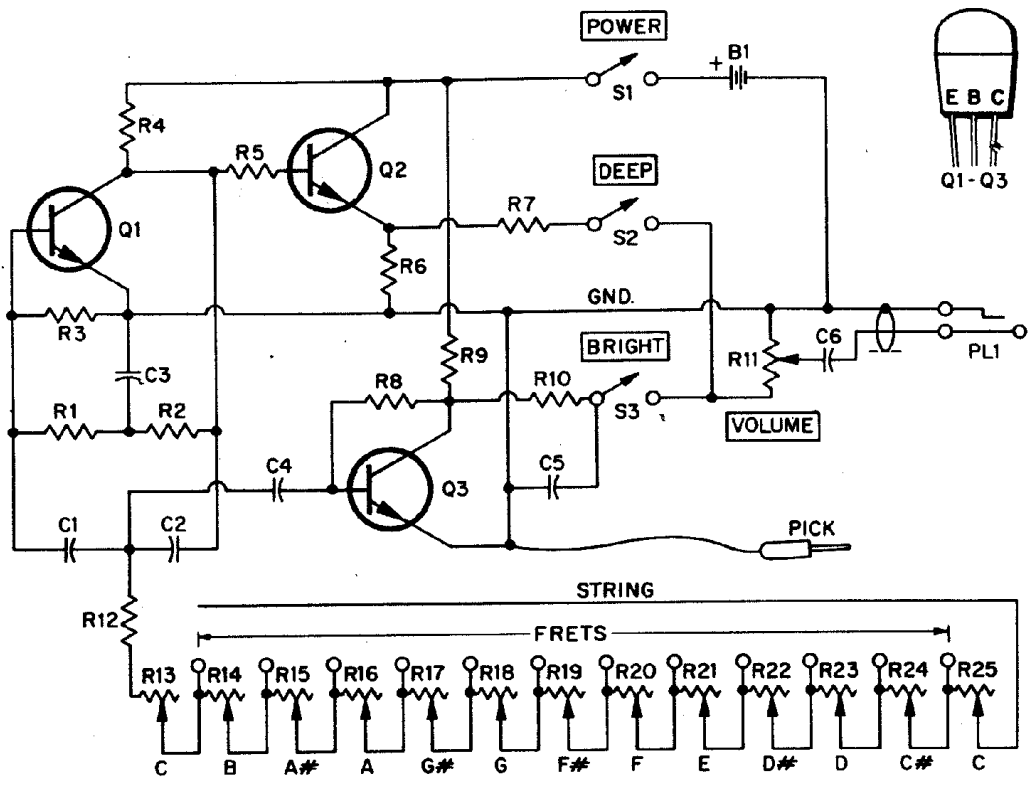

Fig. 4—Schematic. To simplify wiring to frets, we show lowest C at right. To have same range as four-string bass, oscillator (Q1) has to operate from 41.2 to 247 cps. Its range is now 65.4 to 130.8 cps.

Electronic Bass

PARTS LIST

B1—9 V battery (Eveready 266 or six penlite cells in series)
Capacitors: 50 V or higher unless otherwise indicated
C1,C2,C4—.05 μf mylar or ceramic disc
C3,C5—.1 μf mylar or ceramic disc
C6—1 μf 200 V mylar (not electrolytic)
PL1—Phone plug
Q1,Q2,Q3—MPS6514 transistor (Motorola, available from Allied Radio and others. Order Allied Stock No. 49 R 26 MOT MPS6514. 60¢ plus postage. Not listed in catalog)
Resistors: ½ or ¼ watt, 10% unless otherwise indicated
R1,R2—100,000 ohms, 5%
R3—47,000 ohms
R4,R6,R9—6,800 ohms
R5—5,600 ohms
R7—330,000 ohms
R8—100,000 ohms
R10—150,000 ohms
R11—20,000 ohm linear-taper potentiometer
R12—910 ohms, 5%
R13 through R21—1,000 ohm, linear-taper miniature potentiometer (Mallory MTC-13L4 Trimpot, Lafayette 33 T 1671 or equiv.)
R22 through R25—5,000 ohm, linear-taper miniature potentiometer (Mallory MTC-53L4 Trimpot, Lafayette 33 T 1675 or equiv.)
S1,S2,S3—SPST slide switches
Misc.—Perforated circuit board, shielded mike cable, penlite-cell holders, No. 14 solid wire, metal-wrapped guitar string, glue, eyebolts.

C. The table at the end of this article gives the frequencies of these tones in cps. You can tune the bass with a frequency counter, calibrated oscillator, or by direct comparison with a piano or organ. Whichever way you choose, tune R25 first, and follow with R24, R23 etc. in order, adjusting each pot until its tone is in tune to your satisfaction.

In patching the bass to an amplifier, obtain a plug for the shielded cable that will fit the amplifier input jack.

You may have to play with the volume and bass controls on the amplifier to get a good solid tone, and yet not overdrive the amplifier. Once you get this right, it will sound great, and you will have a good enough bass to play anywhere.

FREQUENCIES			
Note	Freq. (cps)	Note	Freq. (cps)
C_2	65.4	G	98.0
C#	69.3	G#	103.8
D	73.4	A	110.0
D#	77.8	A#	116.5
E	82.4	B	123.5
F	87.3	C_1	130.8
F#	92.5		