A "BASKET CHASSIS" TRANSMITTER

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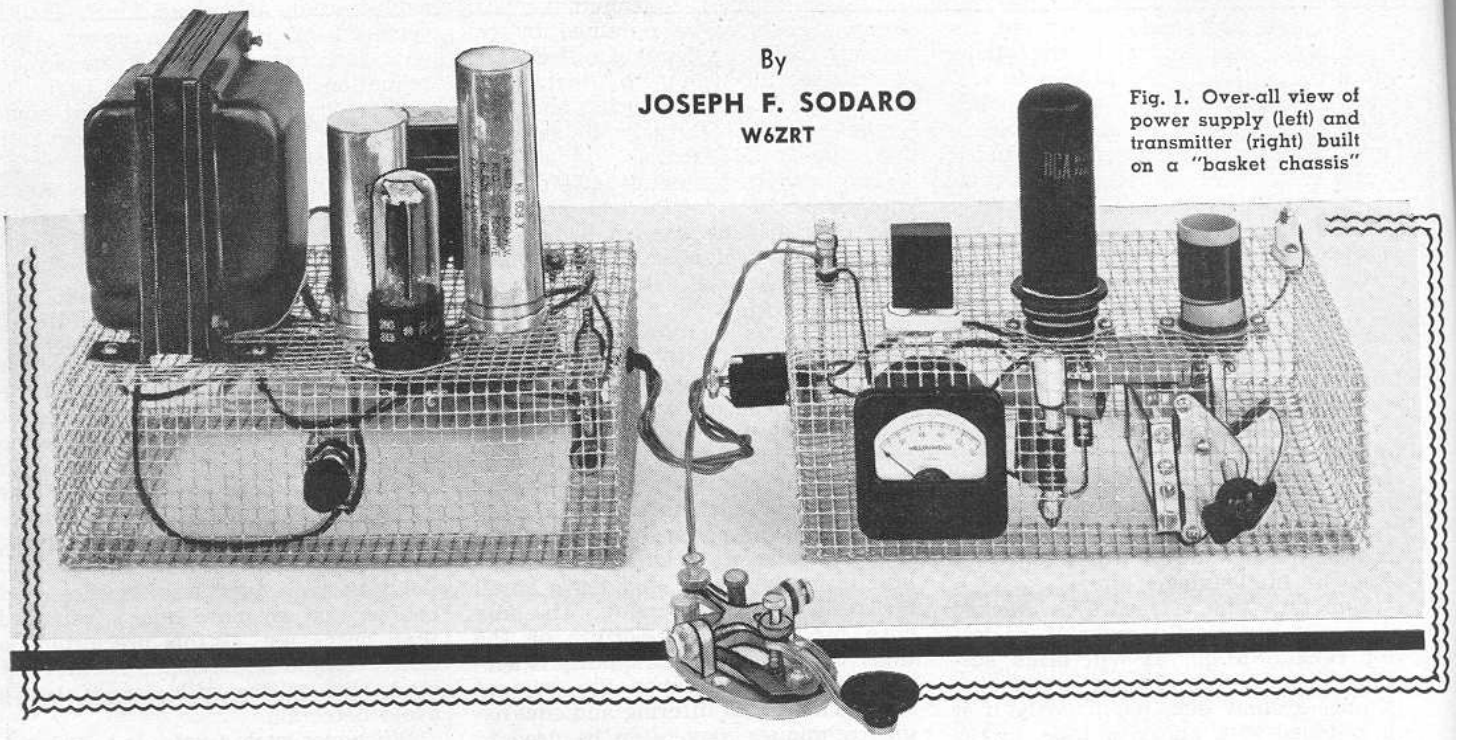


Fig. 1. Over-all view of power supply (left) and transmitter (right) built on a "basket chassis"

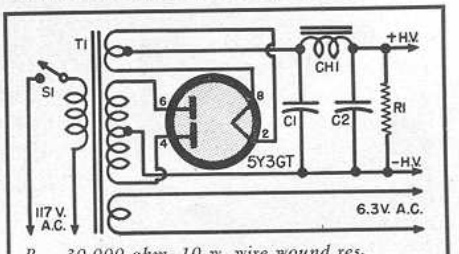
A simple construction technique that can be applied to a variety of experimental projects at minimum expense.

AMONG other problems which confront the newcomer to the amateur ranks is that of equipment construction. He has the choice of either building his first transmitter on a wooden breadboard or on a sheetmetal chassis. The breadboard lacks shielding and presents exposed wiring and shock hazard. Furthermore, some parts cannot be conveniently mounted on this type of chassis without special brackets and angles. On the other hand, the metal chassis requires special tools and a knowledge of the use of these tools. Even when drills, handsaws, hole punches, and other tools are available there's the problem of irregularly shaped openings which usually require drilling around the periphery of the opening followed by filing. If a prefabricated chassis of suitable dimensions is not available, the sheetmetal cutting and bending problems are added to this complex procedure.

With these problems in mind a search was made to find a chassis material which would simplify electronic equipment construction for those with limited facilities. The basket chassis described in this article was developed and used in the construction of a low power transmitter as a first application. This construction technique requires only simple hand tools and a minimum of effort. It goes together like "a Christmas toy designed for any eight year old boy."

The material used in the construction of the basket chassis is ¼-inch hardware cloth. This material seems to have the desired electrical and mechanical characteristics. It is easy to cut with tin shears or diagonal cutting pliers. It can be formed by hand and "woven" into a solid structure by bending or wrapping the wire ends using long nose pliers. Mounting holes are simply opened with diagonal cutters. Mounting screw holes and feedthrough holes are available everywhere. It is sufficiently continuous to provide electrical shielding at most frequencies. It is inexpensive and readily available.

Fig. 2. Power supply suitable for use with transmitter described. Any supply which gives 400 volts at 100 ma. can be used.



R_1—30,000 ohm, 10 w. wire wound res.
C_1—4 μfd., 600 v. elec. cond.
C_2—8 μfd., 600 v. elec. cond. (Cornell-Dubilier KR608)
CH_1—Filter choke, 10.5 hy. @ 110 ma. (Merit C-2993)
T_1—Power trans. 350-0-350 v. @ 110 ma.; 5 v. c.t. @ 3 amps; 6.3 v. @ 4.5 amps (Merit P-3153)
S_1—S.p.s.t. switch
1—5Y3GT tube

Although any size hardware cloth can be used, the ¼-inch spacing probably gives maximum strength and shielding without excessively close wire spacing. The cross-hatch design is helpful in layout, and the ¼-inch units afford an approximate measure which is often adequate for parts location.

Parts mounting and hookup is simpler with the basket chassis because this process can be observed through the loops in the hardware cloth. This transparency eliminates dark corners and permits a higher concentration of parts. In addition this feature allows the observance of almost all parts on either side of the chassis during prove-in. Thus, overheating or arcing can be quickly detected. Furthermore, this feature makes the equipment particularly well suited for demonstration or instruction purposes. Finally, the mesh material allows better ventilation.

Chassis Construction

The only tools required for the construction of the chassis are tin shears, long nose pliers, and diagonal cutters. As a first step, the material is cut to size. For the 9-inch by 6-inch chassis used for this transmitter and power supply the over-all dimensions are 17 inches by 14 inches. This allows three inches for depth and one inch for a flange. In this first cut the material should be close trimmed to remove all wire stubs. In the second cut remove four inch squares from the four corners. In this case maximum wire stub length is allowed. These stubs

are later used to weave the corners together.

Next, bend up the one inch flange at right angles as shown in Fig. 3. The line of bend can be made straight by following the wire one inch from the edge. The edge straightness and sharpness can be improved by working against a wooden block as shown in this photograph. For the chassis shown, bending was done entirely by hand. Edge sharpness can be further improved, if desired, by using a light hammer.

After the chassis has been bent to approximate shape the corners can be formed. Draw together those wires which will form the vertical edge of the chassis, and wrap around the wire stubs so as to fix this edge. Repeat this procedure for each corner. The overlay of the flange can be fixed in the same way with stubs wrapped about either horizontal or vertical wires. The transmitter chassis was completed from sheet material in 45 minutes.

Heavy components were mounted on the power supply chassis without excessive sag. However, if in a larger size chassis this should become a problem, the surface can be reinforced with small stiffeners at the points of weight concentration.

Screen compartments can be added in a similar manner, if desired. For example the transmitter coil can be shielded by a hardware cloth enclosure. Similarly, sections of the chassis could be isolated by weaving in hardware cloth enclosures. Another possibility would be the addition of a front panel if desired. The only precaution to observe in designing these adjuncts is that of allowing stub length wherever a joint is to be made to the chassis proper.

Transmitter Construction

The transmitter is a 6L6 in a conventional crystal oscillator. The schematic and parts list are shown in Fig. 4. Shunt feed is used to keep high voltage within the chassis. A 0-100 milliammeter is used for tuning and loading indications. The plate circuit coil is tapped for coupling to a simple voltage feed antenna. Keying is in the negative high voltage lead. Any power supply capable of approximately 400 volts at 100 milliamperes with good regulation and 6.3 volts at 0.9 ampere can be used. A power supply, Fig. 2, has been included for those who wish to build one.

The power supply uses a full-wave rectifier and simple filter with bleeder resistor. The schematic and parts list for the power supply are shown in Fig. 2.

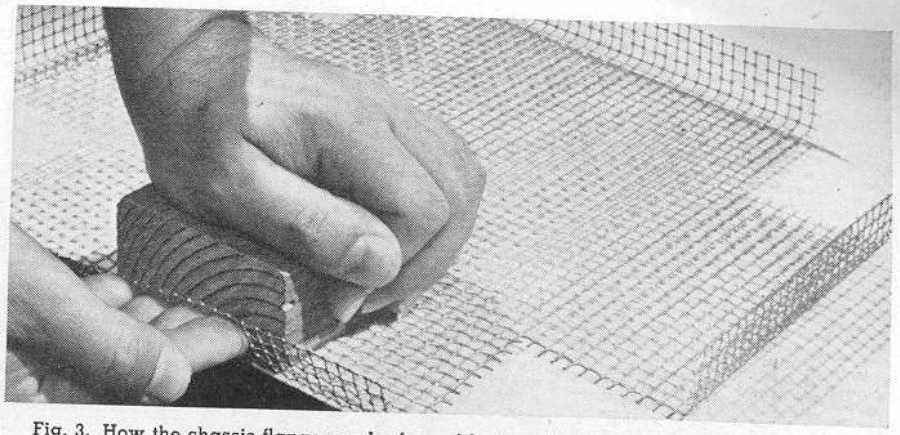


Fig. 3. How the chassis flange can be formed by hand by bending the material against a wooden block. If unusually heavy components are to be mounted on a "basket chassis" stiffeners, in the form of additional pieces of the hardware cloth, may be fixed to the chassis by working the wire stubs into the chassis surface. These structures could also be used to form shielded compartments within the chassis proper.

Construction

The arrangement of component parts is shown in Fig. 5. First, lay out the parts for short lead length, then make the openings for mounting. Openings are cut by means of diagonal cutters. No difficulty was encountered in opening mounting holes for any of the parts. The tube and crystal sockets were held on the opposite side while openings were cut. By this means each opening was cut to the required shape without outline markings.

Parts were mounted with 6-32 or 8-32 machine screws of ⅜ to 1 inch

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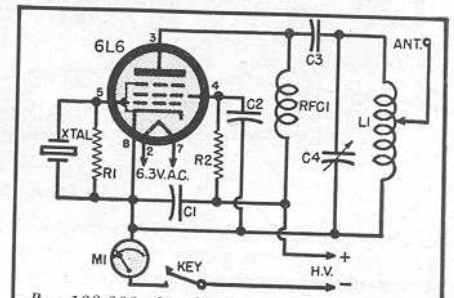
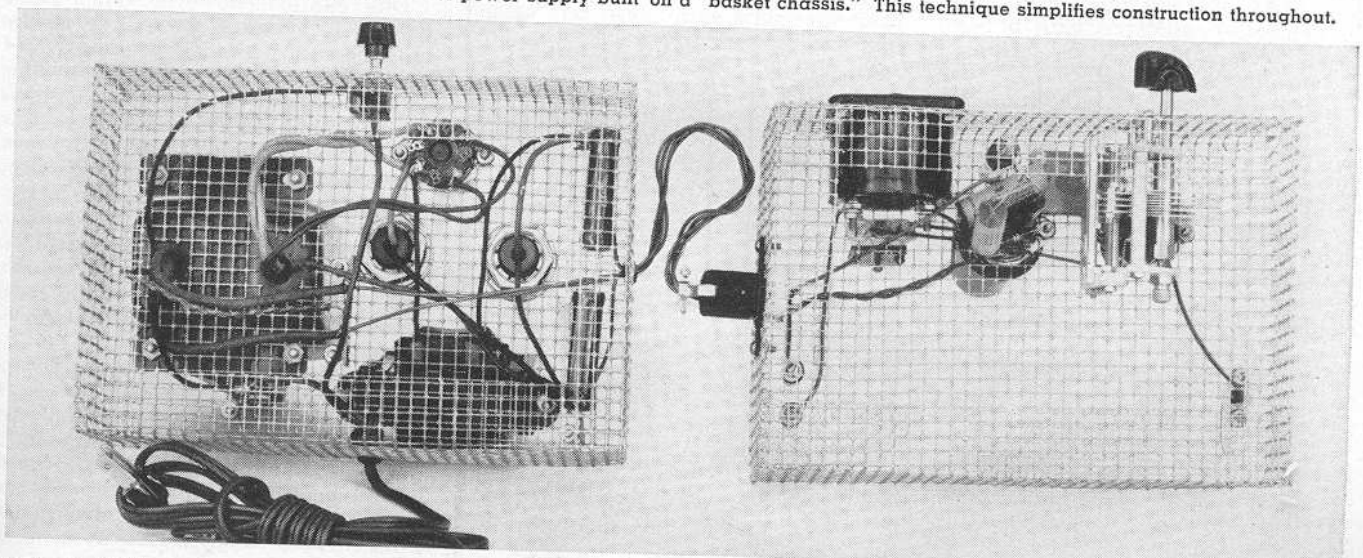


R_1—100,000 ohm, ½ w. res.
R_2—15,000 ohm, 2 w. res.
C_1, C_2—.05 μfd., 600 v. cond.
C_3—.01 μfd., 600 v. mica cond.
C_4—100 μμfd. midget var. cond. (National TMS100)
RFC_1—R.f. choke, 2.5 mhy. @ 125 ma. (National R-100U)
L_1—1.8 mc.—55 t. #22 en. closewound on 1½" dia. form (National XR-4)
3.5 mc.—35 t. #22 en. closewound on 1" dia. form (National XR-1)
7 mc.—18 t. #22 en. closewound on 1" dia. form (National XR-1)
Xtal.—Crystal for desired band
M_1—0-100 ma. milliammeter
Key—Telegraph Key
1—6L6 tube

Fig. 4. Schematic of the low power transmitter which can operate on 1.8 mc., 3.5 mc., or 7 mc. See Fig. 2 for power supply.

Fig. 5. Underchassis view of the transmitter power supply built on a "basket chassis." This technique simplifies construction throughout.



that one or the other of these tube grids can have the vertical scanning frequency impressed on it.

To remedy this, redress this lead away from the audio grids. —30—

The "Basket Chassis"

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lengths. Round head screws were used, but binder head screws probably are preferable.

Feedthrough leads should be protected by forcing ¼-inch rubber grommets into the mesh at the feedthrough point. This method was used to protect the a.c. input and power output cables on the power supply.

Adjustment

After constructing the power supply, operate this unit without connection to the transmitter. If there are no indications of overheating it is probable that the unit has been correctly wired. If a voltmeter is available this conclusion can be verified by measuring output voltages. These may measure slightly high since load currents are not being drawn. A d.c. output of 440 volts was measured for the power supply shown.

After connecting the transmitter to the power supply wait for about a minute for the tube to warm up. Without the antenna connected and with the proper plate coil in the socket, press the key and rotate the tuning condenser, C_4, until oscillation is indicated by a dip in the plate current reading.

This transmitter was designed for use with a simple voltage feed antenna. This type of antenna consists of a single wire cut to the operating frequency. The approximate lengths are 260 feet for the 1.8 mc. band, 126 feet for the 3.5 mc. band, and 66 feet for the 7 mc. band.

The antenna can now be connected, and the key closed. Once more rotate the tuning condenser until the plate current dips. With maximum coupling this dip will be slight. To increase coupling move the tap toward the plate end of the coil. To decrease coupling move the tap away from the plate end of the coil. The tap connection is made by carefully sanding away the enamel insulation from the turns and soldering the tap to a suitable turn. Be careful not to short adjacent turns.

Power output is dependent upon applied voltage and the ability of the transmitter to accept loading. Excessive loading may stop oscillations. This limitation is dependent upon circuit components and arrangement. After loading and tuning, key the transmitter to be sure that the circuit keys well. If keying is poor decrease antenna coupling slightly. An output of 15 to 20 watts can be expected in most cases. The unit shown draws approximately 15 milliamperes unloaded and 60 milliamperes with the antenna attached. —30—