The W.S. No. 46 on Top Band

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AS a result of a large release of Wireless Sets No. 46 to the surplus market, many amateurs have been able to obtain these sets for low power use on the 3·5 and 7 Mc/s bands. The writers have found that by a simple modification to the plug-in coil unit, the apparatus can be made to operate satisfactorily in the 1·8 Mc/s band. This makes the unit suitable for use on RAEN exercises and for low power field days and mobile operation.

The W.S. No. 46 walkie-talkie was described in the June, 1961, issue of the RSGB BULLETIN, and the circuit diagram of the aerial input and frequency changer stage is reproduced in Fig. 1 for reference. The unit operates on three crystal-controlled frequencies. Originally, four plug-in coil units were available covering the range 3·6 to 9·4 Mc/s, and two of these may be used on the 80 and 40m bands.

Circuit Description

The coil, L1, acts as the mixer grid coil on RECEIVE and the p.a. tank circuit on TRANSMIT. It operates as an acceptor circuit with C6 on RECEIVE and its core is adjusted to be series resonant on 1550 kc/s—the intermediate frequency. This acts as an i.f. filter, and it has been found essential in order to reject Third Programme breakthrough on 1546 kc/s. Tuning to the desired band is achieved by the capacitor C2, and one of the trimmers selected by S1a.

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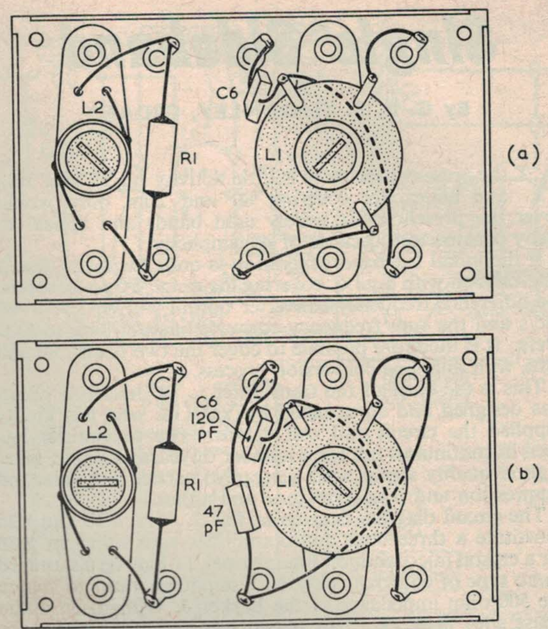

Fig. 2. The coil box. (a) Original wiring. (b) After modification.

Modification

For 1·8 Mc/s band operation, L1 should be re-wound with 134 turns of 40 s.w.g. single silk covered wire. C6 should be a 120 pF silvered mica capacitor to series tune the coil to the intermediate frequency; an additional capacitor of 47 pF is required to enable the circuit to be tuned to 1·9 Mc/s with the trimmers provided. The anode feed to the p.a. is now taken from the top of L1, thus obviating the need for a tapping on the coil.

The receiver local oscillator feedback coil, L2, is identical in the original 3·5 and 7 Mc/s coil boxes and need not be re-wound for the 1·8 Mc/s band as the circuit was found to oscillate readily with the original coil fitted with two iron dust cores.

Fig. 2 shows the inside of the plug-in coil boxes before and after modification.

The receiver local oscillator crystal should be on the transmitter frequency plus 1550 kc/s, i.e., for 1900 kc/s, a receiver crystal of 3450 kc/s would be required.

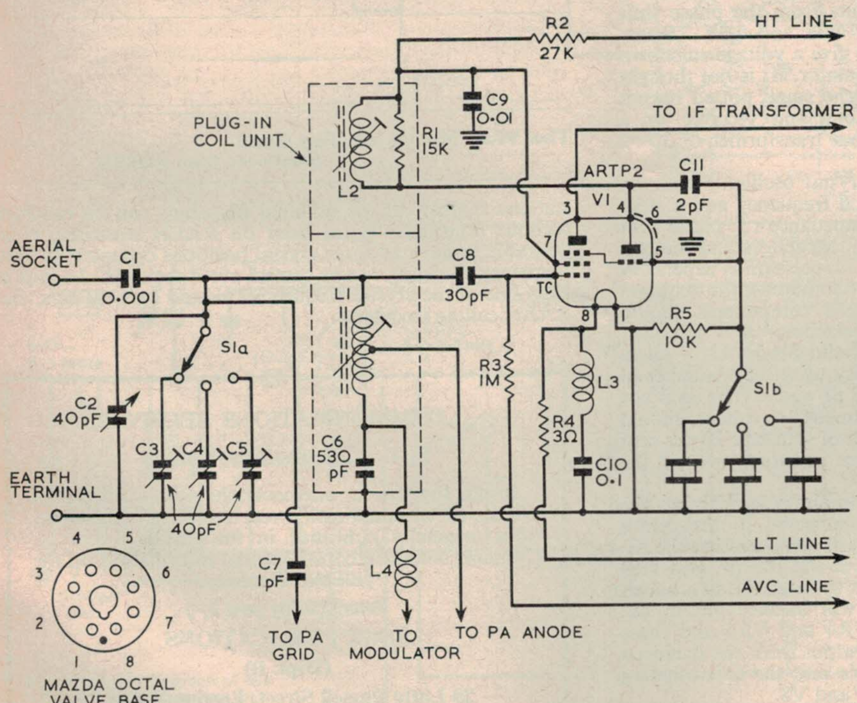

Fig. 1. Circuit diagram of the aerial input and frequency changer stage of the W.S. No. 46.

Results

The modified unit was found to fulfil its purpose admirably for local working on Top Band, using a whip aerial 6 ft. long. Crystal control of the receiver is not a major disadvantage since the i.f. bandwidth is fairly broad, and

(Continued on page 24)

Single Sideband

By G. R. B. THORNLEY, G2DAF*

AT the present time there is little activity on 15 and 10m and an exciter covering 80 and 20m only would cover the present most widely used bands and appeal to many constructors because of its simplicity.

If the initial sideband generation is on 9 Mc/s and this is heterodyned with a v.f.o. covering the range 5·0 to 5·5 Mc/s, the difference frequency converter output will be 3·5 to 4·0 Mc/s and the sum frequency converter output 14·0 to 14·5 Mc/s. It is therefore possible to cover the two bands, 80 and 20m, with only one conversion process.

This is the basis of the transmitter to be described which was designed and constructed by YO3GK who has kindly supplied the circuit and coil details. The transmitter has been in continuous use for a number of years, is stable, gives a good quality signal with acceptable carrier and sideband suppression and is easy to tune and adjust.

The circuit diagram is given in Fig. 1. V1a, V1b and V2a constitute a three-stage audio amplifier with sufficient gain for a crystal microphone. Transformer T1 may be a standard audio type of approximately 4 : 1 stepdown ratio to match the 500 ohm impedance of the Barker & Williamson audio phase shift network. This network is designed to give the required 90° phase shift over the range 300 to 3000 c/s and any frequencies entering the network outside these limits would not be in the correct phase relationship and the sideband suppression would suffer. Accordingly the audio amplifier is given a fairly steep roll-off to the lower register by using small values of coupling capacitors (1000 pF) and the higher frequencies are attenuated above 3000 c/s by the low pass filter consisting of the 45 mH choke and the two 0·1 μF capacitors. The two outputs from the phase shift network are further amplified by V3a and V3b. Transformers T2 and T3 are required to give a voltage stepdown into the grids of the balanced modulator. It is not thought that the ratio will be critical and the small potted output transformer from the surplus Command receiver or a standard replacement speaker output transformer of 30 : 1 or 35 : 1 ratio should be suitable.

V2b is a conventional Miller crystal oscillator with an anode circuit resonant at the crystal frequency and a stepdown secondary to feed the low impedance r.f. phase shift network comprising the two 353 pF capacitors and the two 50 ohm resistors. As the sideband suppression is dependent on the accuracy of this network maintaining the required 90° phase shift, the four associated components should be 1 per cent tolerance types. Capacitors of 1 per cent tolerance may be obtained from Radio Spares Ltd.—these are in preferred values, but it is easy to select a number in parallel to make up the required 353 pF value. The accuracy of an AVO Model 7 or Model 8 testmeter (or similar) should be sufficient to select from a number of standard 20 per cent tolerance, half or one watt *carbon* resistors, two of the required value of exactly 50 ohms.

The balanced modulator V4a, V4b and V5a, V5b has the anodes of each valve push-pull connected to the centre tapped primary winding of L2. It will be noted that the r.f. input to each valve is in parallel via the 100 pF grid feed capacitors and provided the current through the two halves of the valve is equal the carrier will balance out in L2. Current equality is obtained by VR4 and VR5 and these are the carrier balance controls. Output from the balanced modulator is fed via a coaxial cable into the heterodyning and output unit comprising V6, V7 and V8.

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A parallel tuned Hartley circuit is used in the v.f.o. covering the range 5·0 to 5·5 Mc/s and the output is fed via a 25 pF pre-set trimmer capacitor to heterodyne the 9 Mc/s single sideband input in the converter valve V6. Either the sum or the difference frequency output at the anode of V6 is selected by the tuning of the tank circuit—coil L5 may be a plug-in unit (the two windings for 80 and 20 are given in the coil winding details) or may be switched in the usual manner. The 807 p.a. output circuit is a conventional pi-tank circuit with the whole of the 30 turn winding used for 80m and the tap shorted across to the output end of the coil when it is used on 20m.

Socket CS1 marked "crystal" refers to a crystal microphone. The two r.f. chokes 0·5 mH may be standard 1·5 mH types, but the 1 mH anode feed choke to the p.a. should be the sectionalized low capacity type.

YO3GK states that a 150 volt stabilizer may be used instead of the VR105 indicated and that this will give more drive without decrease in stability. The 807 grid stopper may be reduced to 20 ohms 1 watt carbon. The 25 pF capacitor feeding the v.f.o. output to the converter is adjusted until the sideband drive into the p.a. is maximum.

COIL TABLE

L1 (anode of crystal oscillator), 20 turns 30 s.w.g. silk covered close wound on ½ in. diam. dust-cored former.

L2, two by 12 turns 30 s.w.g. silk covered bifilar wound on ½ in. diam. dust-cored former.

L3 (mixer input), 20 turns 30 s.w.g. silk covered close wound on ⅜ in. diam. dust-cored former.

L4 (v.f.o. coil), 9 turns, tapped at 2½ turns from earthy end, 22 s.w.g. enam. on ¾ in. diam. ceramic former, winding length 7/16 in.

L5 (mixer output), 24 s.w.g. enam. wound on ¾ in. diam. former:
3·8 *Mc/s* 26 turns close wound.
14·3 *Mc/s* 6 turns spaced to ⅜ in.

L6 (p.a. coil), 30 turns, tapped at 8 turns, 18 s.w.g. silvered, 3 in. winding length, on 1½ in. diam. ceramic former.

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(Continued from page 23)

stations slightly off the nominal frequency can be received without difficulty. When used on RAEN exercises, it is desirable to have all three crystal positions occupied so that frequency changing can be carried out if required. In such a case, one of the crystal frequencies should be 1980 kc/s, the RAEN calling frequency.