

3. B relay operates.

- (i) Contact B2 closes and completes the bobbin "hold-on" circuit and releases A relay
 - (ii) Contact B4 breaks and thus continues to keep the thermal relay heater circuit broken after A2 has closed.
 - (iii) Contact B1 closes and completes the 24 volt +ve supply to one side of the bobbin of the H.T. Contactor (K102). K102 does not operate until contact E2 is made.
 - (iv) Contact B3 closes and completes the 50 volt +ve supply to one side of the keying relay (K101). If the R/T-W/T switch (S109) is over to "R/T" relay K101 operates at once, but if the switch is to "W/T" the "Operator's Control Switch" (S108) must be made and the morse key pressed in order to complete the circuit.
- (c) E relay is operated by the microphone Pressel Switch when the R/T-W/T switch (S109) is to "R/T" and by the Operator's control switch (S108) when the R/T-W/T Switch is to W/T.

Contact E2 completes the bobbin circuit of the H.T. contactor as explained above, while contact E1 completes the circuit to the "Set Busy" Lamp (LB) and Noise Suppressor relay K103. The Noise Suppressor relay (K103) connects a resistance across the receiver output and thereby limits the output to the telephones and hand-set receiver when transmitting on R/T.

- (d) The operation of Control Unit Design B is similar in principle to that described above for design C and can easily be followed by reference to Fig. L. It should be noted that this unit employs only one rectifier and that the operator has no local control over the H.T. contactor (K102) Design C units will eventually replace all earlier types.

16. SPEECH AMPLIFIER. (Fig. m).

The Speech Amplifier consists of three resistance-capacity coupled stages with transformer coupled input and output circuits.

A 1620 or 6J7 pentode valve (V1), connected as a triode, is used in the first stage. The input voltage, applied to the control grid is governed by the position of the potentiometer R1 connected across the secondary winding of the input transformer T1. Grid bias is provided by the cathode resistance R2 which is by-passed to earth by the condenser C1.

The H.T. supply, which is smoothed by a resistance-capacity filter circuit C11, C12, C13 and R16, R17, R18 is reduced to a suitable value by the anode coupling resistance R3. The audio frequency voltages built up across this resistance R3 are capacity coupled to the control grid of valve V2 by the coupling condenser C2.

The second stage also uses a 1620 or 6J7 pentode valve V2 connected as a triode. Grid bias is obtained by the voltage developed across the cathode resistance R5 and also by the grid leak resistance R4. The cathode resistance is by-passed to earth by condenser C19.

The H.T. supply voltage is taken from a tapping on the resistance-capacity filter circuit and is taken to the anode of V2 via the anode coupling resistance R7.

The output from this stage is required to operate the next stage which uses two valves joined in push pull. In order that the push-pull stage may be operated from the valve V2 an additional valve is introduced to invert the phase of the voltage applied to the control grid of valve V5, and thus obtain the correct conditions for push-pull operation.

The speech voltage developed across the anode resistance R7 is capacity coupled to the grid of valve V4 by the condenser C5. Resistances R9 and R10 are grid leak resistances for valve V4, and a tapping from the junction of R9 and R10 applies the voltage, developed across resistance R10, between grid and cathode of the phase inverter valve V3. The anode coupling resistance of this valve V3 is capacity coupled by condenser C6 to the grid of valve V5, and as the change in anode voltage will be in anti-phase to the grid voltage that produced it, the voltages applied to the grid of V5 will be in anti-phase with that applied to the grid of valve V4. The condition for push-pull operation is thus obtained with a resistance-capacity coupled amplifier. The value of resistance R10 is of such a value that the voltage applied between grid and cathode of valve V3, although opposite in phase is equal in magnitude to that applied between grid and cathode of valve V2. This condition reduces the possibility of distortion to a minimum and also ensures that the push-pull valves are operated at the same amplitude of applied grid voltage.

Resistance R11 is used as the grid leak for valve V5. Two 1622 tetrode valves are employed in this stage, grid bias being provided by a common cathode resistance R12, condenser C7 being the cathode resistance by-pass condenser.

The screen voltage for valves V4 and V5 is obtained from an H.T. potentiometer, the anode voltage being supplied via a centre tap on the primary of the output transformer T2. The primary of the transformer is shunted by two resistance R13 and R14 with the junction connected to earth and by the H.T. blocking condensers C8 and C9.

To improve the quality of the amplifier a small amount of the A/F output is fed back to the cathode of valve V2, via resistance R15, in the form of negative feed back.

The secondary of the output transformer is connected to the primary of the modulator driver transformer T202 (Fig. j), and so to the modulator stage, where the speech voltages are again amplified before being applied, via the modulator transformer T203, to the anode and screen of the output valve V102.

17. SPEECH AMPLIFIER POWER SUPPLIES.

The power unit is self contained and is part of the Speech Amplifier. It consists of a mains transformer T3, the primary of which is tapped to accommodate single phase A.C. at a voltage of 190, 210, 230 or 250 volts, a full wave rectifier valve, 5U4G, V6 and a resistance capacity smoothing unit.

The three secondary windings of the mains transformer provide, 5 volts for the heater of the rectifier valve V6, 370 volts for the H.T. supply and 6.3 volts for the heaters of the valves in the amplifier.

Condensers C16 are the reservoir condensers and resistance R20 and condenser C15 provide the first stage of smoothing. From this point the anodes of the output valves V4 and V5 are supplied. A tapping on the H.T. potentiometer provides the screen voltage for valves V2, V3, V4 and V5. Two further stages of resistance capacity smoothing is provided by resistances R17, R18 and condensers C12, C13 and from this point the anode supply to valves V2 and V3 is taken. An additional filter circuit for the anode supply of valve V1 is provided by resistance R16 and condenser C11.

An emergency H.T. supply of 350 volts may be connected to the emergency terminal for supplying the anode voltage for the amplifier in case of failure of the A.C. supply mains.

The centre point of the heater secondary winding is made common with that of the H.T. winding and earthed.

The heater supply may also be supplied from an external source by means of emergency supply terminals.