

PATENT SPECIFICATION

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(54) TELEPHONE MICROPHONE

(71) We, STANDARD TELEPHONES AND CABLES LIMITED, a British Company, of 190 Strand, London, W.C.2., England, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

This invention relates to microphones, and in particular to a microphone assembly having an electrical output similar to that of a carbon microphone and adapted to be fitted to a telephone subscriber's instrument.

According to one aspect of the invention there is provided a microphone assembly adapted to be fitted to a telephone subscriber's instrument, including a moving coil transducer, a two stage DC coupled amplifier coupled to the transducer output, and a reverse voltage and overvoltage protector circuit for interfacing the amplifier with the line, and in which the amplifier includes a first transistor operated in the common emitter mode and directly coupled to a second and third transistor which second and third transistor form a compound common emitter output stage to the line.

According to another aspect of the invention there is provided a telephone subscriber's instrument fitted with a microphone assembly as defined in the preceding paragraph.

An embodiment of the invention will now be described with reference to the accompanying drawing in which Fig. 1 is a plan view of the microphone and amplifier assembly, and Fig. 2 is a circuit diagram of the assembly of Fig. 1.

Referring to Fig. 1, the arrangement, which may be fitted to a telephone instrument, includes a moving coil transducer 11 together with an associated amplifier 12 both of which are mounted on a circuit board 13. The assembly is adapted to fit into a housing (not shown) which has

dimensions corresponding to those of a standard telephone carbon transmitter. In particular the arrangement may be employed to replace the BPO No. 16 carbon granule transmitter in Post Office 700 type subset circuits.

The circuit shown in Fig. 2 includes an amplifier and a protection circuit.

Amplifier

The amplifier consists of the transistors V_1 , V_2 and V_3 . The transistors form a two stage dc coupled amplifier with full dc and partial ac feedback.

Transistor V_1 operates in the common emitter mode and causes signals from the microphone connected to its base to appear, amplified, across its collector resistor R_3 . The signal then passes to the base of the compound common emitter stage formed by V_2 and V_3 , the resulting amplified output appearing across R_5 , R_6 and the load connected across terminals T_1 , T_2 .

Overall dc feedback is provided by resistors R_1 and R_2 , such that the dc voltage V_{CE3} appearing across V_3 is defined by $V_{CE3} = V_{BE1} (R_1 + R_2) / R_3$, where V_{BE1} is the base-emitter voltage of V_1 .

In order to obtain sufficient gain from a two stage amplifier, the ac feedback provided by resistors R_1 and R_2 is decoupled by capacitor C_1 in the speech frequency band of interest (300Hz to 3.4kHz). Thus only local emitter ac feedback is operating for the first stage gain stabilization. The gain of the second stage is more closely defined by means of resistors R_5 and R_6 . The compound second stage is necessary in order that it shall be able to cope with the normal operating currents of 25 to 110mA and still provide a relatively high input impedance so as not to significantly load the first stage.

Protection Circuit

Protection against polarity reversal is provided by the diodes V_4 and V_5 and the

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zener diodes V_4 and V_5 operating in their forward mode. Protection against short term overload such as 'Ring-trip failure' is provided by V_4 , V_5 and R_5 , the voltage drop across R_5 causing either V_4 or V_5 to conduct before the current can reach a value sufficient to exceed the capabilities of V_3 .

Protection against high voltage transients, such as that due to a strike by lightning is provided by resistor R_6 and zener diodes V_4 and V_5 . Capacitor C_2 provides some protection against the pickup of radio frequency interference.

WHAT WE CLAIM IS:

15 1. A microphone assembly adapted to be fitted to a telephone subscriber's instrument, including a moving coil transducer, a two stage DC coupled amplifier

coupled to the transducer output, and a reverse voltage and overvoltage protector 20 circuit for interfacing the amplifier with the line, and in which the amplifier includes a first transistor operated in the common emitter mode and directly coupled to a second and third transistor which second 25 and third transistor form a compound common emitter output stage to the line.

2. A microphone assembly substantially as described herein with reference to the accompanying drawing.

3. A telephone subscriber's instrument when fitted with a microphone assembly as claimed in claim 1, 2 or 3.

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