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G. M. WRIGHT ET AL

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COUPLING DEVICE

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Fig. 1

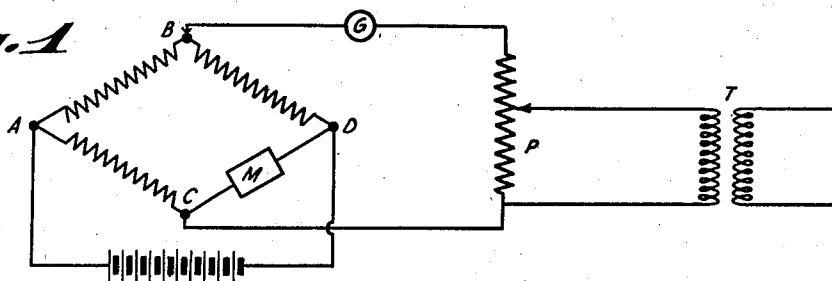


Fig. 2

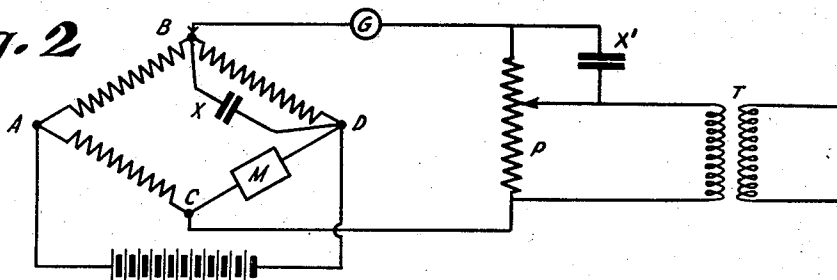


Fig. 3

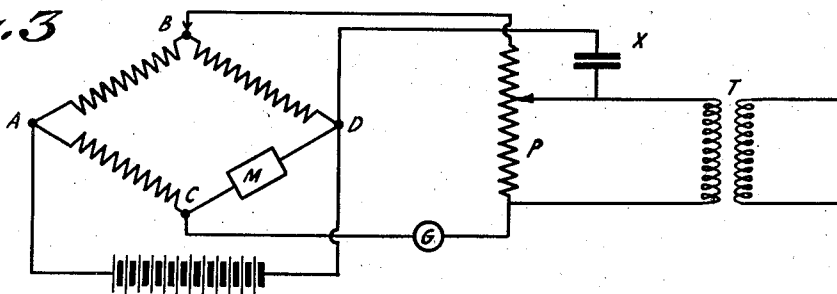
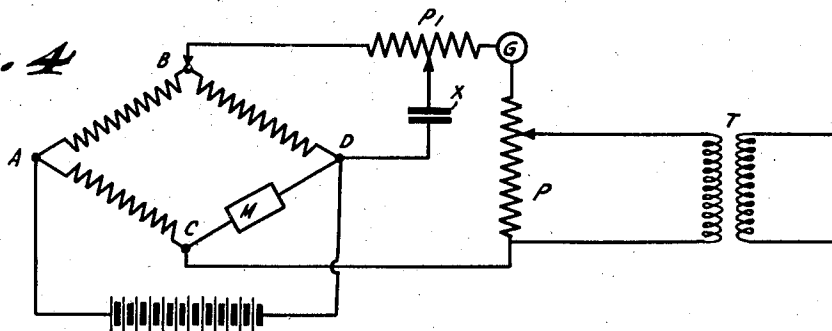


Fig. 4



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COUPLING DEVICE

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6 Claims. (Cl. 179-1)

This invention relates to coupling devices and more particularly to coupling devices for use with carbon and other microphones of the kind which are operated under the influence of direct current.

Though not limited thereto, the invention is particularly suitable for use with arrangements in which the output from a microphone of the kind referred to is passed through a transformer as a preliminary to further amplification. In such arrangements, it is very desirable more especially if the transformer is one having a core of high permeability alloy that direct current should be prevented from flowing through the primary of the transformer since if such direct current is allowed to flow the core becomes more or less polarized. Even if the direct current be very weak the core may be subjected to a steady flux sufficient to cause the said transformer to operate at a point on its B-H curve at which the effective permeability is substantially reduced as compared with that which would obtain were there no polarizing current.

Where a transformer is energized from the plate of a thermionic valve it is usual to prevent the direct current component from the valve from flowing through the primary of the transformer by employing the so-called choke capacity coupling method but if ordinary condensers are used this method becomes impracticable with carbon and like microphones owing to the very low impedance which such microphones have as compared with thermionic valves. If therefore it is desired to couple a microphone to a transformer by choke capacity coupling, it becomes in practice, necessary to employ a special condenser e. g. an electrolytic condenser, in order to obtain the high capacity necessary to transfer the lower frequencies effectively to the primary of the transformer. The objections to the employment of an electrolytic condenser for this purpose are:—

(1) A direct current fed to the microphone must be of predetermined polarity and an accidental reversal of this polarity is likely to ruin the electrolytic condenser.

(2) The leakage current from an electrolytic condenser though not large enough to polarize the core of a transformer seriously, is sufficiently large to make it impracticable to effect control of the effective microphone output by means included in the primary circuit of the microphone transformer as is often desirable for purposes of so-called microphone "mixing", "fading" and so forth.

(3) The choke capacity coupling arrangement

is apt to become of large bulk and heavy if the choke is made of sufficiently high inductance to be efficient over a wide frequency range.

The present invention provides an arrangement whereby these disadvantages are overcome and which may be regarded in essence as a coupling device wherein only alternating or periodic current appears at the output terminals without the presence of any substantial direct current component.

According to this invention, a coupling arrangement for use with a carbon or similar microphone of the kind referred to comprises a substantially balanced Wheatstone bridge, one arm of which includes the microphone, the polarizing potential for said microphone being applied across one pair of conjugate points of the bridge, the other conjugate points of which constitute the output terminals of the coupling arrangement.

The invention is illustrated in the accompanying drawings in which:

Figure 1 shows a coupling device in the form of a Wheatstone bridge arranged in accordance with the present invention to couple a microphone to an outgoing line; while,

Figures 2 to 4 inclusive show modifications of the arrangement of Figure 1.

Referring to Figure 1 the coupling arrangement therein shown comprises a Wheatstone bridge A B C D one arm C D of which is constituted by a carbon microphone M for example a carbon microphone of the kind at present in common use for broadcasting and known as the Marconi-Reiss microphone. One arm A C of the bridge adjacent the microphone is constituted by a resistance which may be for example of 300 ohms in the case of the particular microphone referred to the remainder of the bridge being made up of the resistance winding of a potentiometer whose slider constitutes that point B of the bridge which is conjugate with the junction point of the 300 ohm resistance and the microphone. A polarizing battery of 12 volts, say, is connected between the conjugate points A D of the bridge and the slider of the potentiometer is connected through a sensitive galvanometer G and the resistance winding of a second potentiometer P to the point C. The primary of a coupling transformer T is connected between this junction point and the slider of the second potentiometer P.

It will be seen that with this arrangement, when the bridge is balanced no current from the polarizing battery will flow through the primary

of the transformer since the said primary is in effect associated with conjugate points of the bridge.

In a modification, illustrated in Figure 2 an electrolytic condenser X is connected between the points B and D and if desired a second electrolytic condenser X' may be connected between the slider of the second potentiometer P and the galvanometer G. These two condensers, may if desired, be replaced by a single electrolytic condenser connected as shown in Figure 3 between the slider of the second potentiometer P and the point D and the galvanometer G may, if desired, be connected between the point C and the adjacent end of the resistance winding of the second potentiometer P. The arrangements shown in Figures 2 and 3 have the advantage over the first described arrangement, that adjustment of the bridge end of the second potentiometer (which serves for controlling the input to the primary of the transformer) may be effected without setting up any objectionable noises or rustle. A minor objection to the arrangement shown in Figure 3 resides in the fact that the condenser constitutes a short circuit as respects alternating current across that part of the resistance winding of the first potentiometer which lies between the microphone and the slider of the said first potentiometer. This is apt to result in the curve of control effected by the second potentiometer departing from the desirable straight line and giving sudden control at one end and gradual control at the other, assuming of course that the second potentiometer is of ordinary construction. This defect may be avoided as shown in Figure 4 by connecting the resistance winding of a third high resistance potentiometer P1, e. g. one of 5,000 ohms, between the point B and the resistance winding of the second potentiometer, the galvanometer, if desired, being interposed between the adjacent ends of the resistance windings of the potentiometers P and P1. The electrolytic condenser is then connected between the slider of the potentiometer P1 and the point D.

An incidental advantage obtained with the arrangements described is that the galvanometer gives a very clear and reliable indication of the occurrence of microphone "blast". This defect which may be caused for example by excessive noise amplitude or strong breathing on the microphone consists in that the microphone no longer gives an alternating output directly proportional to the sound input pressure. The defect in question is almost invariably accompanied by rectification with the result that the effective direct current resistance of the microphone alters and the galvanometer flickers. It will be noted that any alteration of balance likely to occur in practice (due for example to shifting the microphone, accidental tapping and so forth), is not sufficient to polarize the transformer, it being found in practice that with the microphone and values of resistance as stated, the out-of-balance current never exceeds about one quarter of a milliamper.

Indication of microphone blast is very useful in practice and the absence of a reliable indication in the past has led to the placing of microphone too far away from the source of sound from which they are to be operated due, of course, to the desire to be sure that the microphone will be immune from blasting. Such "distant" placing of a microphone results in the proportion of hiss to desired sounds becoming in many cases un-

necessarily high. A sensitive blast indication thus allows mere effective positioning of the microphone.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. Means for coupling a microphone to a relaying transformer comprising, a Wheatstone bridge circuit having three arms composed of resistances, a microphone in the fourth arm, a source of polarizing potential connected across one pair of conjugate neutral nodal points of said bridge, and means for connecting the primary winding of said transformer across another pair of conjugate neutral nodal points of said bridge.

2. Means as recited in claim 1 wherein the transformer has a core of high permeability.

3. Means as recited in claim 1 including a potentiometer interposed between said last named pair of conjugate neutral nodal points of said bridge circuit and the primary winding of said transformer whereby the intensity of the audible indications reaching said transformer from said microphone may be controlled.

4. Means for coupling a microphone to a relaying circuit comprising a Wheatstone bridge one arm of which includes said microphone, a source of polarizing potential for said microphone connected across a pair of conjugate points on said bridge, means for deriving output electrical variations from said bridge circuit comprising a potentiometer connected across another pair of conjugate points on said bridge, a connection between said potentiometer and said relaying circuit, a condenser connected in parallel with an arm of the bridge adjacent the microphone arm of the bridge, and a second condenser connected between the variable point of the potentiometric device and that point of the bridge circuit to which the terminal of the first condenser remote from the microphone is connected.

5. A coupling arrangement for use with a carbon or similar microphone, comprising a Wheatstone bridge one arm of which includes a microphone, a source of polarizing potential for said microphone connected across a pair of conjugate points of said bridge, means for deriving output electrical variations from said microphone including a potentiometer connected across another pair of conjugate points on said bridge, a high resistance potentiometer in series with said first named potentiometer, and an electrolytic condenser connected between the point of the bridge common to the microphone and to the source of polarizing potential and the variable point on said second named potentiometer.

6. Resistive means for coupling a microphone to a relaying transformer and for preventing the flow of direct current potential through the transformer winding comprising a bridge circuit having three arms composed of resistances, a microphone in the fourth arm, a source of polarizing potential connected in one diagonal of said bridge circuit, a potentiometer resistance connected in the other diagonal of said bridge circuit, means for connecting the primary winding of said relaying transformer in parallel with a portion of said potentiometer, and a condenser connected in parallel with an arm of said bridge circuit.

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