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ANTENNA TRANSFORMER

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Fig. 1

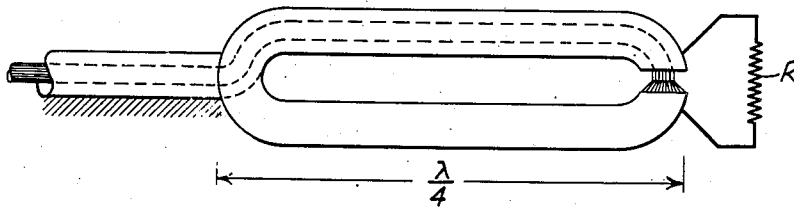


Fig. 2

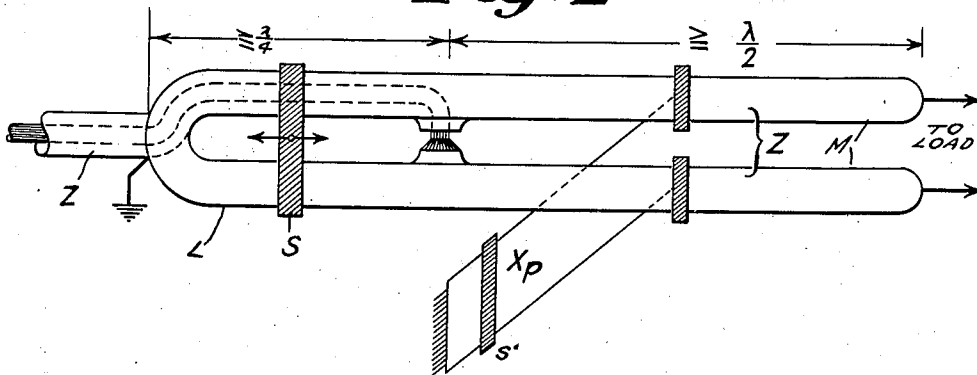
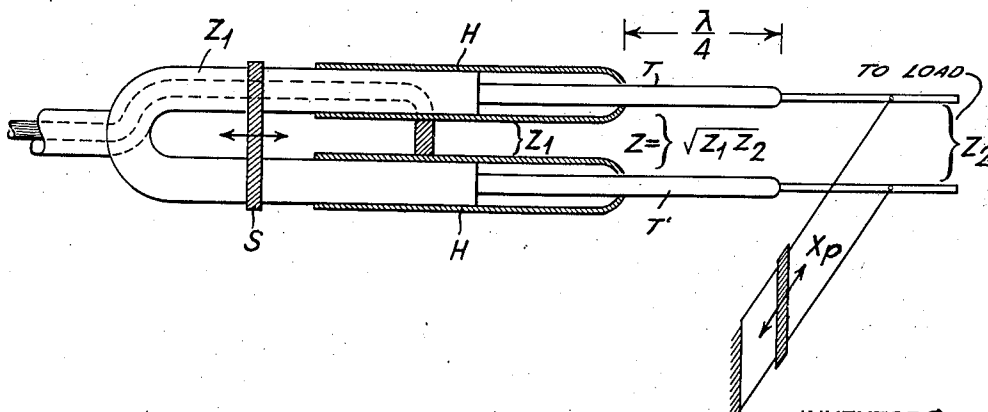


Fig. 3



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ANTENNA TRANSFORMER

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10 Claims. (Cl. 178—44)

The present invention involves a simple adapter or matching means mounted in the open air between a symmetrical antenna and a unilaterally grounded cable.

An object of the invention is to provide an antenna matching device of a particularly simple form of construction.

Another object is to provide a particularly convenient wave adjustment for a matching device which allows a water-proof closure of the entire inner structure.

It is feasible to establish a junction or transition from a two-conductor system to a three-conductor system, or vice-versa, by the aid of a conductor loop having a length of $\lambda/4$, where λ is the length of the operating wave, which is included in a circuit organization as shown in Figure 1. Figure 2 shows an embodiment of the invention, as applied to the structure of Figure 1, while Figure 3 shows a modification allowing improved adjustment for matching. In Figure 1 the conductor loop must have exactly the length of a quarter-wave, for it is only under this condition that the loop assumes the nature of a rejector circuit looking from the signal source. Hence, if an arrangement of this kind is to operate satisfactorily, and if exact tuning is to be insured, it must be made extensible telescope-fashion, and this requirement is likely to meet with serious mechanical difficulties where open-air installations are dealt with, such as in antenna matching transformers, because of the necessity of providing adequate packing to prevent the entrance of moisture, etc.

Now, according to the present invention the said practical difficulty is obviated, as shown in Figure 2, by simply choosing for the loop L a length slightly over $\lambda/4$, while precise tuning is accomplished by the agency of a short-circuiting slide S connected between the outer conductors, the midpoint of the slide, for the sake of symmetry, being at ground potential. Inasmuch as the short-circuited part of the loop is also in reference to the slide in a symmetric position, nothing will be changed so far as the symmetricizing or balancing effect of the whole arrangement is concerned. However, there is the advantage that the entire line can be designed in a perfectly water-proof manner; also, in a case where a great number of such devices designed for different waves would be needed such as found in all large-power stations, all waves could be covered by a single type of mechanical construction.

which has so far not been fixed is so chosen that the characteristic impedance thereof, as parallel lines, is made equal to the characteristic impedance of the concentric feeder cable, then, if the two conductors are extended in the form of a parallel length of line of at least $\lambda/2$, a matched state may be found by the arrangement of a suitable parallel reactance X_p at a suitable place. Reactance X_p comprises a loop having a length greater than half the length of the operating wave which may be adjusted to the proper length by shorting slide S' . The point of connection of reactance X_p is slidable over the matching section M.

If the characteristic impedance Z_2 of the antenna feeder lead is substantially higher than the characteristic impedance Z_1 of the cable, it may, under certain circumstances, be advisable to introduce between the symmetricizing loop and the antenna feeder lead a transformation length equal to $\lambda/4$ having a characteristic impedance

$$\sqrt{Z_1, Z_2}$$

as shown in Figure 3 and comprising conductors TT'. The length of the conductors can be easily adjusted by the aid of sleeves H which are slidable over the symmetricizing or balancing loop so as to result in the desired free length of the transformation length for the wave used. In the same way, of course, the transformation section may consist of two inter-engaging sleeves so that the shiftable outer sleeve engages over the antenna feed lead having a characteristic impedance Z_2 .

We claim:

1. A device for coupling together a concentric conductor feeder line having an outer sheath and an inner conductor and a symmetrical load comprising an auxiliary conductor having one end placed adjacent the end of the feeder line and connected to said inner conductor and having the other end connected to the outer sheath of said feeder line, the length of said auxiliary conductor being greater than a quarter of the length of the longest wave with which the device is to be operated and an adjustable short-circuiting slide connecting said auxiliary conductor and said sheath whereby the length of said auxiliary conductor between said slide and said inner conductor may be adjusted to one-quarter of the length of the operating wave.

2. A device for coupling together a concentric conductor feeder line having an outer sheath and an inner conductor and a symmetrical load comprising an auxiliary conductor having one end

being so chosen that the impedance of the symmetrical load is equal to that of the feeder line.

6. A device for coupling together a concentric conductor feeder line having an outer sheath and an inner conductor and a symmetrical load comprising an auxiliary conductor having one end placed adjacent the end of the feeder line and connected to said inner conductor and having the other end connected to the outer sheath of said feeder line and forming an elongated loop, the length of said conductor being greater than a quarter of the length of the longest wave with which the device is to be operated and an adjustable short-circuiting slide connecting said auxiliary conductor and said sheath whereby the length of said auxiliary conductor between said slide and said inner conductor may be adjusted to one-quarter of the length of the operating wave, the outer sheath of said feeder line and said auxiliary conductor being extended as a pair of parallel conductors beyond the end of said feeder line a distance at least as great as half the length of the longest wave with which said device is to be operated and said symmetrical load connected to the ends of said parallel conductors.

7. A device for coupling together a concentric conductor feeder line having an outer sheath and an inner conductor and a symmetrical load comprising an auxiliary conductor having one end placed adjacent the end of the feeder line and connected to said inner conductor and having the other end connected to the outer sheath of said feeder line and forming an elongated loop, the length of said conductor being greater than a quarter of the length of the longest wave with which the device is to be operated and an adjustable short-circuiting slide connecting said auxiliary conductor and said sheath whereby the length of said auxiliary conductor between said slide and said inner conductor may be adjusted to one-quarter of the length of the operating wave, the outer sheath of said feeder line and said auxiliary conductor being extended as a pair of parallel conductors beyond the end of said feeder line a distance at least as great as half the length of the longest wave with which said device is to be operated, said symmetrical load being connected to the ends of said parallel conductors and an adjustable reactance connected across said pair of parallel conductors.

3. A device for coupling together a concentric conductor feeder line having an outer sheath and an inner conductor and a symmetrical load comprising an auxiliary conductor having one end placed adjacent the end of the feeder line and connected to said inner conductor and having the other end connected to the outer sheath of said feeder line and forming an elongated loop, the length of said conductor being greater than a quarter of the length of the longest wave with which the device is to be operated and an adjustable short-circuiting slide connecting said auxiliary conductor and said sheath whereby the length of said auxiliary conductor between said slide and said inner conductor may be adjusted to one-quarter of the length of the operating wave, the outer sheath of said feeder line and said auxiliary conductor being extended as a pair of parallel conductors beyond the end of said feeder line a distance at least as great as half the length of the longest wave with which said device is to be operated, said symmetrical load being connected to the ends of said parallel conductors and an adjustable reactance connected across said pair of parallel conductors, the point of con-

nection of said reactance being variable along the length of said conductors.

5 9. A device for coupling together a concentric conductor feeder line having an outer sheath and an inner conductor and a symmetrical load comprising an auxiliary conductor having one end placed adjacent the end of the feeder line and connected to said inner conductor and having the other end connected to the outer sheath of said
10 feeder line and forming an elongated loop, the length of said conductor being greater than a quarter of the length of the longest wave with which the device is to be operated and an adjustable short-circuiting slide connecting said auxiliary conductor and said sheath whereby the
15 length of said auxiliary conductor between said slide and said inner conductor may be adjusted to one-quarter of the length of the operating wave, the outer sheath of said feeder line and said auxiliary conductor being extended as a pair of parallel
20 conductors beyond the end of said feeder line a distance at least as great as one-quarter of the length of the longest wave with which the device is to be operated, said symmetrical load being connected to the ends of said parallel conductors, the
25 diameter of said parallel conductors being so related to the spacing therebetween that the impedance thereof is equal to the geometric mean between the impedance of the feeder line and the impedance of the loop and means for varying the effective length of said parallel conductors.
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10. A device for coupling together a concentric conductor feeder line having an outer sheath and

an inner conductor and a symmetrical load comprising an auxiliary conductor having one end placed adjacent the end of the feeder line and connected to said inner conductor and having the other end connected to the outer sheath of said
5 feeder line and forming an elongated loop, the length of said conductor being greater than a quarter of the length of the longest wave with which the device is to be operated and an adjustable short-circuiting slide connecting said auxiliary conductor and said sheath whereby the
10 length of said auxiliary conductor between said slide and said inner conductor may be adjusted to one-quarter of the length of the operating wave, the outer sheath of said feeder line and said auxiliary conductor being extended as a pair of parallel conductors beyond the end of said
15 feeder line a distance at least as great as one-quarter of the length of the longest wave with which the device is to be operated, said symmetrical load being connected to the ends of said parallel conductors, the diameter of said parallel
20 conductors being so related to the spacing therebetween that the impedance thereof is equal to the geometric mean between the impedance of the feeder line and the impedance of the loop and adjustable slides slidable over said sheath and said auxiliary conductor and in contact with said
25 parallel conductors whereby the effective length of said conductors may be varied.
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