Oct. 22, 1940. H. R. ROSE ET AL 2,218,830

COMBINED ANTENNA AND POWER CORD

Filed May 13, 1939

Fig. 1.

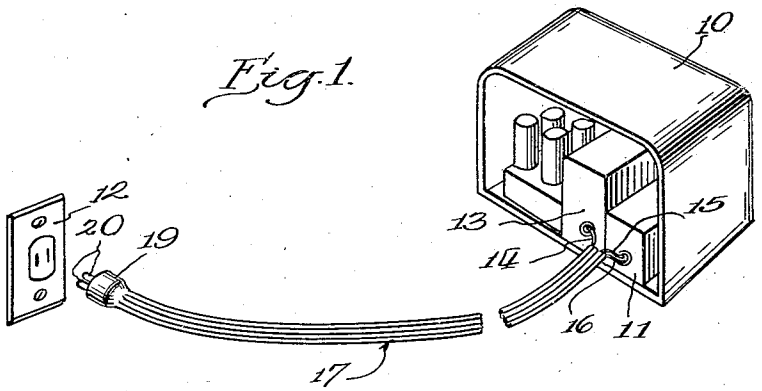


Fig. 2.

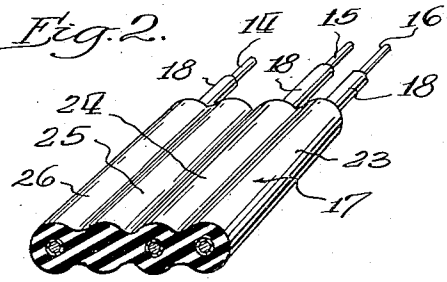


Fig. 3.

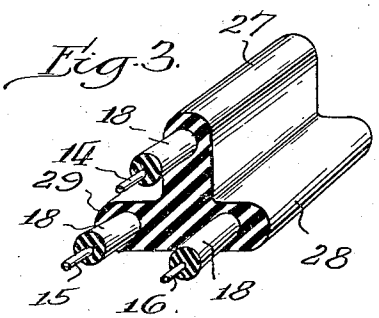


Fig. 4.

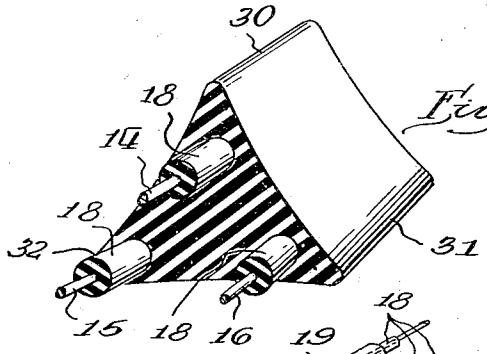
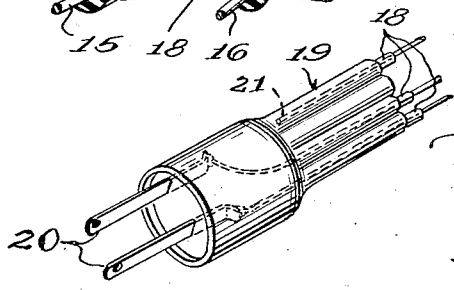


Fig. 5.



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2,218,830

COMBINED ANTENNA AND POWER CORD

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Application May 13, 1939, Serial No. 273,378

1 Claim. (Cl. 250—16)

The present invention relates generally to an antenna for a wireless receiving circuit, such as, for example, radio or television receiver as ordinarily used in homes, offices, etc. More specifically, it has for its primary purpose the combining of an antenna for a radio receiver with the power cord of said receiver, said cord leading to the conventional electrical outlet or other connection for the purpose of supplying electrical energy to the power pack of said receiver.

It is a further object of this invention to provide a power cord for a radio receiver, which will have combined therewith an antenna for said receiver, said antenna being carried by said power cord in such a manner as to minimize stray, inductive or capacitive currents from entering said receiver through said antenna due to association with said power cord.

A further object of the present invention is to provide an electrical power cable for a radio receiver comprising a unitary sheath of insulating material, a pair of power conductors disposed within said sheath and an antenna wire also disposed within said unitary sheath and spaced from said pair of power conductors.

A still further object of the present invention is to provide means whereby an antenna of predetermined characteristics may be permanently associated with a radio receiver.

Still another object of the present invention is to provide a device of the character described, comprising an antenna for a radio receiver in combination with a power cord, said antenna being of predetermined length and characteristics, and said receiver being matched to said antenna.

The necessity for an antenna in modern wireless sets, while not as urgent as formerly, is still of prime importance for good reception and selectivity. As wireless sets are installed in homes and divers kinds of antennae are connected thereto, it is certain that the antenna impedance will rarely, if ever, match the load impedance as determined by the radio frequency input circuit of the wireless set.

If the efficiency of an antenna is high, i. e., if the antenna impedance is largely radiation resistance, the energy that can be abstracted from a passing radio wave tends to be independent of the size of antenna, until the antenna dimensions approach a half wave length as measured by the frequency received. This is because the equivalent lump voltage induced in such an antenna is approximately proportional to length of antenna, while the radiation resistance is proportional to the square of the length. Thus, with perfect matching, i. e., a load impedance equal to the antenna impedance, the abstracted energy will be independent of length of antenna.

The ordinary radio receiver is designed with a load impedance which is approximately equal to that of an average antenna. It is, of course, impossible for the manufacturer to know what kind of an antenna is going to be used with his radio receiver, and it is consequently a hit or miss proposition with respect to matching the load impedance with that of the antenna. As explained above, if this could be done, the length of the antenna would be immaterial.

By means of the present invention, it is possible for the manufacturer to accurately know beforehand what the antenna impedance will be, and in that way he can properly design the radio receiver to match the same. Since the antenna is made by the manufacturer and supplied with the receiver, the manufacturer is enabled to make said antenna as of the maximum efficiency for the particular set with which the same is being used.

The antenna as supplied with the receiver is combined in the same unitary sheath or cable member as that of the power lines to the set, and as such its length may be predetermined. The extraneous and superfluous paraphernalia of outside antenna and the trouble associated with installation of the same and maintenance thereof are thus eliminated. The new antenna will be more efficient than most outside antennae, since it is designedly matched to the radio receiver, whereas it is the exceptional case if the outside one is so matched.

In the preferred embodiment, the length of antenna to be incorporated in the power cable may be approximately seven feet long. This is a convenient length, and also one which will not cause interference with reception at practically all frequencies for which the conventional receiver is designed. Since the half wave length of any of these frequencies is not approached, the independence of induced voltage with respect to length for all frequencies for which the ordinary home receiver is designed, is not affected.

The advantage of short antennae, such as the type which we propose, over the usual long outside type which is installed for the home receivers, is that the inherent directivity of long antennae is eliminated, the short antennae being practically non-directional.

The present invention is an improvement over the so-called "built-in aerials" since it does not serve to increase the size of the receiving cabinet,

which is an important factor in "midget" radio receivers, and it does not interfere in any way with the arrangement of the parts, the circuit, or the portability of the radio receiver.

With the foregoing and other objects in view which will appear as the description proceeds, the invention consists in certain novel features of construction, arrangement and combination of parts hereinafter fully described, illustrated in the accompanying drawing, and particularly pointed out in the appended claim, it being understood that various changes in the form, proportion, size and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

For the purpose of facilitating an understanding of our invention, we have illustrated in the accompanying drawing, a preferred embodiment thereof, from an inspection of which, when considered in connection with the following description, our invention, its mode of construction, assembly and operation, and many of its advantages should be readily understood and appreciated.

Referring to the drawing in which the same characters of reference are employed to indicate corresponding or similar parts throughout the several figures of the drawing:

Fig. 1 is a diagrammatic, perspective view showing the complete installation of a radio receiver utilizing our present invention;

Fig. 2 is a perspective view of a section of a power cable, embodying our present invention;

Figs. 3 and 4 are perspective sections of modifications of our invention;

Fig. 5 is a perspective detail of the male electrical plug of Fig. 1.

The reference character 10 designates generally a radio receiver of conventional type, adapted to be supplied with electrical energy to its power pack 11 from the conventional two-wire electrical outlet 12. Associated with said receiver 10 is a radio frequency input circuit designated by the shielding 13, providing for the attachment thereto of the antenna lead 14, and also, if desired, ground wire (not shown).

In many cases, it is not absolutely essential to satisfactory reception that the framework of the receiver chassis be at ground potential. Hence, same is not shown as a material consideration herein.

The leads from the power pack 11 are designated 15 and 16 and are led to the cable member 17 along with the lead 14. Said cable member 17 is in the nature of an integrally formed sheath of rubber or the like, molded about the leads 15 and 16 and the antenna 14 to procure perfect insulation and ease of attachment and handling. The wires 14, 15 and 16 are not bare within the sheath, but may be further maintained within individual sheaths of insulating material, such as 18, as is ordinarily done with such leads.

The rear of the receiving set 10 is shown open, but it is obvious that the same will be covered by a grille or the like, and said grille or the chassis of the receiver will be provided with means for the permanent attachment of the cable member 17 to remove strain from the leads 15 and 16 and the antenna lead 14, where said leads are connected in the circuit. If desired, the said connections may be made within the chassis with said cable member 17 extending out therefrom through the chassis wall. It is to be understood, however, that the methods referred to above of fixedly attaching said sheath to the radio set form no part of the present invention and are neither shown in the accompanying drawing, nor referred to in the claim.

The said cable member 17 is fixed to a conventional male plug 19, as, for example, by molding same directly thereon. In this manner, the length of the cable 17 may be predetermined and fixed, so that the antenna impedance will be constant, since the antenna 14 has its size limited by the length of the cable 17. The prongs 20 of the male plug member 19 are connected to the leads 15 and 16, while the lead 14 which serves as the antenna, is cut short, as shown at 21, and insulated from the leads 15 and 16.

Thus, it will be seen that the length of the antenna 14 will be constant and will in no way necessitate extra connections, wires and the like, giving rise to the advantages hereinbefore referred to.

The cable member 17 may take any one of a variety of shapes. In the embodiment shown in Fig. 2 the cable takes the form of a substantially flat ribbon having a fluted exterior. Two of the flues, namely, 23 and 24 contain the leads 15 and 16, the flute 26 contains the antenna 14, and the flute 25 serves as a spacer to space the antenna from the power leads sufficiently to prevent any stray, inductive or capacitive currents to enter the radio frequency circuit therefrom.

It is, however, improbable that any interference will occur, since said leads 15 and 16 are supplying 60 cycle current, whereas the antenna supplies a radio frequency voltage to the receiver. The radio frequency input of said receiver is usually provided with means for filtering out any of said 60 cycle current.

The modifications shown in Figs. 3 and 4 provide cables which are adapted to the purposes described. Fig. 3 comprises a cable of substantially inverted T-shaped cross-section, with the antenna 14 being carried by the branch 27, and the power leads 15 and 16 being carried in the arms 28 and 29.

The modification of Fig. 4 is of substantially triangular cross-section and provides for a lead in each of its three corners 30, 31 and 32. It will be seen that we have provided an efficient, simple and economical antenna for radio and wireless receivers, which can be attached to any receiver, but which is especially suited for receivers in which the antenna is of predetermined characteristics to match the input circuit of said receiver.

Since it is believed that the above disclosure of the construction of the preferred embodiments of our invention will obviously set forth the entire and complete operation thereof, further explanation will be dispensed with.

It is believed that our invention, its mode of construction and assembly, and many of its advantages should be readily understood from the foregoing without further description, and it should also be manifest that while a preferred embodiment of the invention has been shown and described for illustrative purposes, the structural details are nevertheless capable of wide variation within the purview of our invention as defined in the appended claim.

What we claim and desire to secure by Letters Patent of the United States is:

In combination with an antenna for a wireless receiving set provided with a pair of electrical power leads, said power leads being electrically connected to said receiving set in the

conventional manner, a flexible resilient cable of molded material for enclosing said power leads and said antenna comprising a single sheath having the said power leads disposed within same in a symmetrical group and in spaced relationship and having the said antenna also disposed within the said cable substantially displaced from said power leads, said cable being of cross sectional shape adapted to hold said leads and antenna in constant predetermined relative positions permitting facile identification of said leads or antenna by referring to said relative positions thereof with respect to the cross sectional shape of the cable, said antenna being disposed asymmetrically with respect to said symmetrical group, said cable having the cross section substantially following said asymmetrical disposition for the purpose of said identification, said cable being provided at the end opposite to said wireless receiving set with a conventional male plug molded thereto, said power leads being connected to said electrical male plug and said antenna terminating short of said plug, the impedance of said antenna being matched with the impedence of the radio frequency input circuit of said wireless receiver.

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