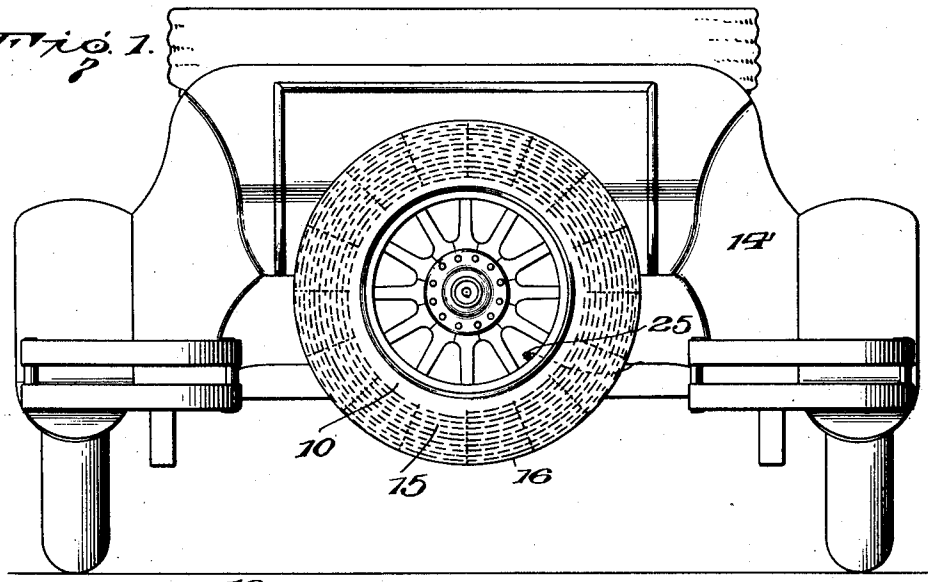
Oct. 18, 1932. H. G. BARTSCH 1,883,476

RADIO ANTENNA

Filed July 22, 1931 2 Sheets-Sheet 1

Fig. 1.



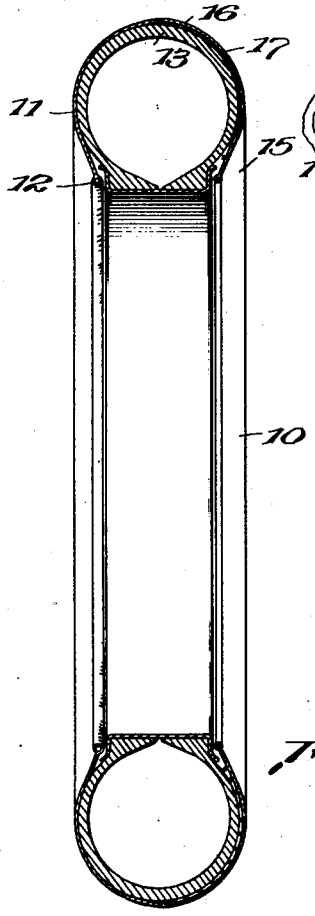


Fig. 2.

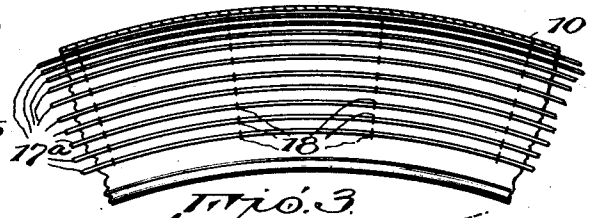


Fig. 3.

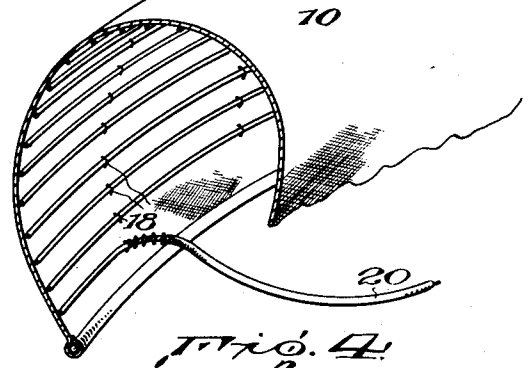


Fig. 4.

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Fig. 5.

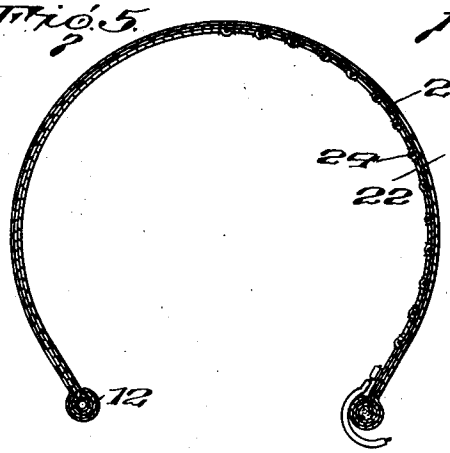


Fig. 7.

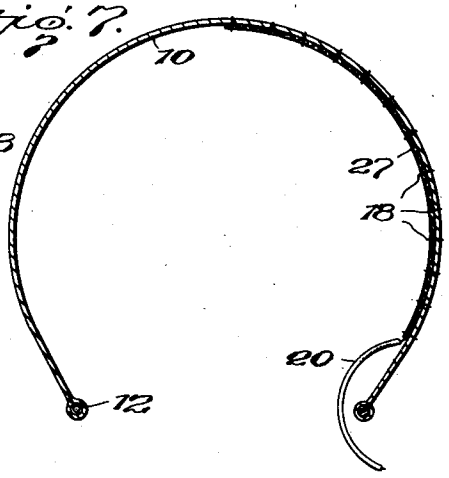
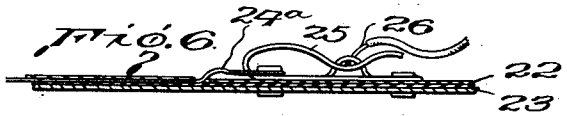


Fig. 6.



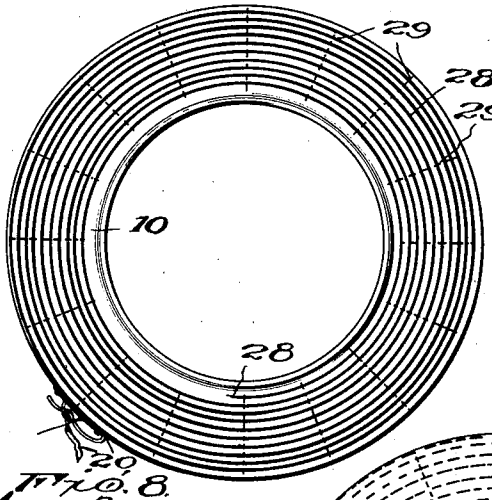


Fig. 8.

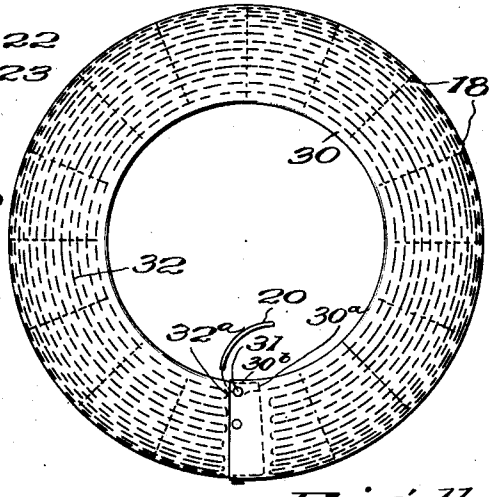


Fig. 11.

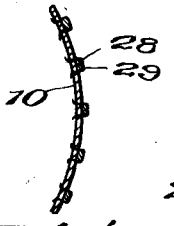


Fig. 9.

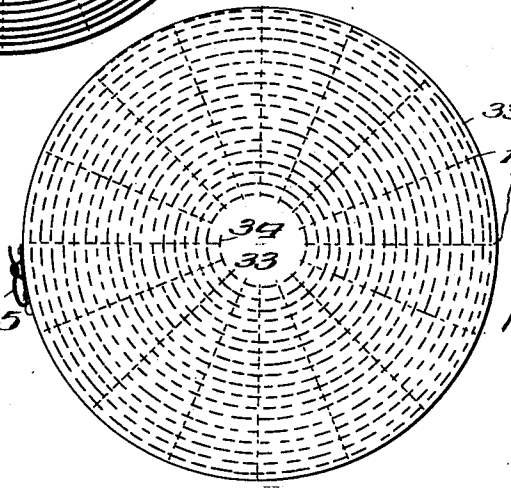


Fig. 10.

Inventor

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Patented Oct. 18, 1932 1,883,476

UNITED STATES PATENT OFFICE

HENRY G. BARTSCH, OF WASHINGTON, DISTRICT OF COLUMBIA

RADIO ANTENNA

Application filed July 22, 1931. Serial No. 552,479.

My invention relates to improvements in radio antennæ and has to do, more particularly, with antennæ for use with radio receivers installed in automobiles.

Radio equipment for police cars, taxicabs, and busses, as well as personal vehicles, has come into great demand during the last two years. Great strides have been made in the development of compact, powerful, and highly sensitive receivers especially adapted to this use. Despite the great advance made in the mechanical and electrical construction of these instruments, the installation of a satisfactory antenna or pick-up element for radio energy still remains a serious problem from the standpoint of efficiency, appearance, cost and serviceability. The most common expedient, in vehicles of the closed type, is the fastening of a plurality of turns of wire or a sheet of wire mesh adjacent the roof of the car body. Some of the more progressive automobile manufacturers are selling cars with antennæ built into the body between the inner and outer layers of the roof. To so install an antenna in a closed car not originally so equipped is very expensive. For this reason it is usual to tack the wire to the inside of the body directly adjacent the roof, which installation is unsightly, as well as inefficient, due to the shielding effect of the metallic body parts.

Another arrangement for closed cars involves the use of "stick-tape" or adhesive plaster to which is secured a conductive layer of material such as metal foil. This "stick-tape" is generally applied in the form of a spiral of several rectangular turns pressed into adherence with the outer covering of the vehicle roof. Not only is it difficult to maintain electrical continuity of the several turns due to weathering and abrasion from overhanging branches of trees etc., but further, when it rains, excessive leakage occurs between the several turns of the conductive layer as well as the metal parts of the body, to great loss of signal strength.

Still another arrangement, and one which is becoming increasingly popular, because it is the only one, prior to this invention, which may be installed upon cars having collapsible tops, is the "board antenna", or fabric covered frame in which a number of turns of wire are contained. This form of antenna is mounted upon the underside of one running board, or transversely of the vehicle between both running boards, and spaced therebelow a distance of several inches. This device has the advantage of easy installation, but is subject to injury by stumps, stones, and roadway irregularities as well as subject to continuous wetting and coating with mud, oil and general débris. Furthermore, the restricted size of such an antenna, its subjection to water, oil, etc., and the shielding effect of the car as a whole, seriously restrict and impair its efficiency.

With these prior art devices and attendant problems in mind, my invention has for its purpose several well defined objects. The primary object of my invention is to provide an antenna unit for automobile radio equipment which unit is more efficient than devices heretofore known and in use.

Another object of my invention is to provide an automobile radio antenna which may be easily installed in open type or closed type cars without the use of tools.

Another object of my invention is to provide an automobile antenna which is less subject to interference from strays radiating from the automobile ignition and charging circuits.

A further object of my invention is to provide an automobile radio antenna which is not subject to leakage in wet weather, which is not subject to injury by road objects, and which is not subject to the accumulation of deposits of dirt and grease.

A further object of my invention is to provide an automobile antenna which is absolutely inconspicuous.

A further object of my invention is to provide an automobile radio antenna unit which serves also the full purpose of a spare tire cover and which may be ornamented or inscribed with advertising.

A further object of my invention is to provide an automobile radio antenna unit which may be made at extremely low cost.

Further objects, and objects relating to de-

tails and economies of construction and use will definitely appear from the detailed description to follow. In one instance, I accomplish the objects of my invention by the means set forth in the following specification. My invention is clearly defined in the appended claims. Structures constituting preferred embodiments of my invention are illustrated in the accompanying drawings forming a part of this specification, in which:

Figure 1 is a plan view of the rear of an automobile of the roadster type having a spare tire upon which is installed a radio antenna constituting a preferred embodiment of my invention;

Fig. 2 is a cross sectional view through a tire rim, tire casing and the antenna unit illustrated in Fig. 1;

Fig. 3 is a fragmentary longitudinal sectional view through the antenna unit shown in Figs. 1 and 2;

Fig. 4 is a detail view of a portion of the same antenna unit, showing the method of securing the pick-up winding to the inner surface of the annular supporting member;

Fig. 5 is a view in cross section of a modified form of antenna unit embodying my invention, in which the pick-up winding is entirely enclosed between two plies of waterproofed fabric;

Fig. 6 is a detail sectional view through the lead-in connecting means;

Fig. 7 is a view in cross section of a modified form of antenna unit embodying my invention and in which the pick-up element consists of a section of wire mesh secured to the inner surface of the annular supporting member;

Fig. 8 is a plan view of a modified form of my invention in which the pick-up winding is secured to the outside surface of the supporting member.

Fig. 9 is a detail sectional view of the form of my invention shown in Fig. 8;

Fig. 10 is a plan view of a modified form of my invention in which the supporting member for the pick-up winding is cap-like and extends completely across the tire; and

Fig. 11 is a plan view of a modified form of my invention in which the annular supporting member is transversely divided, and in which the pick-up winding is not convoluted but has turns reversed upon one another.

Similar reference numerals refer to similar parts throughout the several views.

In general, my invention consists in providing an annular member of such size and configuration as to be capable of snug and concentric disposition against the spare tire of an automobile. Upon this annular member is secured, by stitching, adhesive, or other means, a pick-up element for radio energy, and a terminal or other means whereby such energy may be transferred to radio equipment carried by the automobile. Lastly, means are provided for detachably mounting the unit snugly and concentrically upon the spare tire of the automobile, in such fashion as not to interfere with the removal of the tire for use when needed.

More specifically, and with reference to Figs. 1 to 4 of the drawings, my preferred form of antenna unit comprises an annular member 10 similar in configuration, size and apperance to the conventional tire cover, and adapted, by reason of an extensible portion 11 having an elastic or spring 12, to be pulled over and mounted upon the spare tire casing 13 of an automobile 14. On the inner surface of the side wall portion 15 of the annular member 10 and the adjacent half of the tread covering portion 16, is secured a spiral winding 17 of copper or similarly conductive wire, the several turns 17*a* of which are evenly spaced from each other and held to such spacing by stitches 18 extending into the member 10. One end of the winding 17 is preferably left as a dead end, while the other end is anchored by a course of stitches 19 and thence extended as an insulation-covered lead-in wire 20 which may be connected to radio equipment (not shown) carried in the automobile. The insulation of the lead-in wire may or may not be protected by a metallic covering.

In the form of my invention shown in Figs. 5 and 6, the annular member 21 is composed of several plies 22, 23, of waterproof material such as duck, or rubberized fabric as illustrated, and the pick-up winding 24 is disposed between said plies 22, 23, the whole unit being bonded together by stitching, cement, vulcanized rubber or other means. The pick-up winding 24 is therefore entirely isolated from the weather, and one end thereof 24*a* is extended outwardly into soldered connection with a Fahnestock connector 25 to which the lead-in wire 26 of the automobile carried radio (not shown) may be connected as shown in Fig. 6. The average tire size is about 30 inches, which means a tire circumference of approximately 8 feet. I have found that from 15 to 20 turns of #18 wire are ample from the standpoint of efficiency as well as effective wave length for present day broadcast reception.

When installed upon a spare tire disposed at the rear of an automobile, not only is my antenna at a point most remote and shielded from disturbances set up by the ignition and charging circuits, but further, the turns of the pick-up element are disposed at right angles to the wave front of such radiation, so that few if any of such disturbing waves actually cut the field of the loop. There is a minimum of signal shielding effect by the metal of the vehicle due to the fact that the pick-up winding is remote therefrom. The waterproof and non-conductive character of the annular supporting member and the tire

casing insure against leakage between turns of the winding and between the winding and vehicle. The pick-up element is inconspicuous, yet not subject to fouling by mud and oil, nor subject to snagging by objects along the road. The installation of my antenna unit requires no tools or special skill. Should the spare tire be required, my antenna unit, like a simple tire cover, may be removed in an instant and reinstalled upon the tire replaced by the spare. My antenna may be made for a few cents more than the cost of the conventional tire cover, and since spare tire covers are in almost universal use, the cost of the antenna itself is extremely low. The usual ornamentation and advertising matter common to tire covers is equally applicable to my construction.

Certain modifications of my invention are illustrated in Figs. 7 to 11. The form shown in Fig. 7 is similar to that shown in Figs. 1 to 4, except for the fact that in place of the pick-up winding 17, there is employed a wire mesh pick-up element 27. Suitable loading inductance (not shown) may be provided in the receiving instrument itself if desired to increase the wavelength of the primary circuit far beyond its normal period. In the form of my invention illustrated in Figs. 8 and 9, the pick-up winding 28 is of larger wire than that used in the form illustrated in Fig. 1, and is plated with chromium or other lustrous metal. The winding 28 is disposed upon the outside of the annular member 10 or tire cover and serves as a brilliant trim for the car as a whole. Staple-like elements 29 of metal, similarly plated, serve to properly space the several turns and secure them to the annular supporting member 10. While I have shown the wire of which winding 28 is made to be of flattened or elongate cross section, it is obvious that for the purposes of beautification, it might be twisted or simply round in form.

In Fig. 9 I have illustrated my invention as applied to a tire cover-like element 30 which is provided with lapping ends 30*a* and 30*b* and snap fasteners 31 or the like for securing the ends together to form an annulus.

In this form the pick-up winding 32 is not truly spiral, but consists of turns 32*a* doubled back upon themselves adjacent the ends of the supporting element. As in the other forms of my invention which I have illustrated, one end of the winding 32 is left free or "dead" while the other end is extended and covered with insulation to serve as the lead-in 20. As is obvious, in detaching my antenna unit to permit changing of a tire, the lead-in 20 need not be disconnected from the radio instrument or the pick-up element, but the antenna unit may be laid upon a fender or other body part until the tire change has been made, during which the use of the antenna unit and radio need not be interrupted.

Fig. 10 illustrates an amplication of my principle characterized by the fact that the central portion of the antenna supporting element 33 is not cut away but extends entirely across the spare tire casing and its support. In external appearance as well as accessory utility, it is a "drum type tire cover." The pick-up winding 34 is shown as secured to and extending over substantially the entire inner surface of the element 33. A Fahnestock connector 25 or attached lead-in is provided for connecting the antenna to the radio equipment of the vehicle.

It will thus be seen that I have provided an antenna unit for automobile radio equipment which is efficient, inconspicuous, which serves the additional protective and ornamental functions of a tire cover, which is not subject to fouling or injury in use, which is free from interference by ignition and other circuits of an automobile, which is easy to install, and which is low in cost.

I am aware that considerable change may be made in the constructions herein disclosed without departing from the spirit of my invention. For example, the pick-up element and its annular supporting element need not be made in one piece with the means by which they are detachably supported upon the spare tire. Likewise, the invention is applicable to vehicles having a spare tire, or tires, mounted at the side of the cowl instead of at the rear of the body. In the case of vehicles carrying two spare tires improved results may be obtained by the use of two such antenna units connected in parallel or in series. Likewise, lead-in wires may be attached to both ends of the pick-up winding to constitute a true loop antenna. While I have referred to the antenna as associated with receiving equipment, it is not limited to such use, being applicable to use for transmission purposes as well. By forming the pick-up winding of flat metal braid, stitches may be passed directly through the braid and into the supporting member thereby even further simplifying the construction. Other changes will suggest themselves to one skilled in the art and familiar with my invention. I, therefore, claim my invention broadly as indicated by the appended claims.

What I claim is:

1. An antenna uit for use with automobile radio equipment comprising an annular member of substantially tire size and shape formed of flexible, electrically non-conductive material and having means associated therewith for snugly and concentrically detachably securing said member against the spare tire casing of an automobile, a pick-up element for radio energy substantially coextensive with said annular member, means securing said pick-up element to said annular member, and means whereby said pick-up

element may be electrically connected to radio equipment carried by said automobile.

2. An antenna unit for use with automobile radio equipment comprising an annular member of approximately tire size and shape consisting of two plies of electrically non-conductive sheet material, a spiral winding of wire disposed between said plies and substantially coextensive therewith, means for spacing the turns of said winding and for securing said plies and winding together, means for snugly and concentrically detachably securing said annular member against the spare tire casing of an automobile, and means whereby one end of said winding may be electrically connected to radio equipment carried by said automobile.

3. An antenna unit for use with automobile radio equipment comprising a fabric member having an annular portion adapted to concentrically and snugly overlie the outboard side wall of the spare tire casing of an automobile, a band portion adapted to encircle the tread portion of said tire casing, and an expansible portion adapted to be pulled over the tread portion and tightly overlie the inboard side wall of said tire casing, a pick-up element for radio energy, means securing said pick-up element to the band portion of said fabric member, and means whereby said pick-up element may be electrically connected to radio equipment carried by said automobile.

4. An antenna unit for use with automobile radio equipment comprising a fabric member having an annular portion adapted to concentrically and snugly overlie the outboard side wall of the spare tire casing of an automobile, a band portion adapted to encircle the tread portion of said tire casing, and an expansible portion adapted to be pulled over the tread portion and tightly overlie the inboard side wall of said tire casing, a winding of wire rigidly secured to the external surface of said fabric member, said wire having a corrosion-resistant light-reflecting plating thereon, and means whereby one end of said winding may be connected to radio equipment carried by said automobile.

5. An antenna unit for use with automobile radio equipment comprising an annular member of two ply waterproof fabric having means associated therewith for snugly and concentrically detachably securing said member against the spare tire casing of an automobile, a pick-up element for radio energy comprising a plurality of turns of wire disposed between said plies, and means whereby said element may be electrically connected to radio equipment carried by said automobile.

6. An antenna unit for use with automobile radio equipment comprising an annular fabric member conforming in size and shape to an automobile tire casing, means associated with said member for detachably snugly securing said member upon and around the spare tire casing of an automobile, a helical winding of wire disposed against said fabric member and conforming to the size and shape of one side wall of the tire casing and the adjacent half of its tread wall, means securing said helical winding to said fabric member and an extension on one end of said winding adapted for connection to radio equipment carried by said automobile.

HENRY G. BARTSCH.