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- [33] **Japan**
- [31] **46,715/1969**
- [54] **AUTOMOBILE ANTENNA MOUNTED ON TRUNK LID**
6 Claims, 2 Drawing Figs.
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343/722, 343/729, 343/873
- [51] Int. Cl. **H01q 1/32**

- [50] Field of Search..... **343/711,**
712, 713, 725, 729, 722, 873
- [56] **References Cited**
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ABSTRACT: The disclosed antenna comprises a circular metallic film centrally disposed on a plastic over for a motor-car's trunk, another metallic film disposed on its remaining portion, and a coil interconnecting them. The coil exhibits a high impedance for the FM broadcasting band and a negligibly low impedance for the medium wave AM broadcasting band. Both films are effective for medium wave band while only the circular film is effective for the FM band.

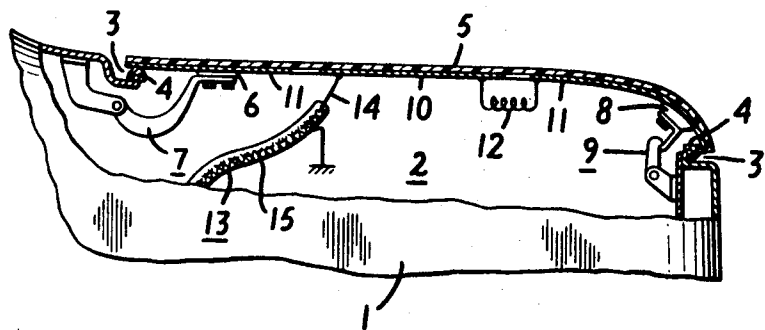


FIG. 1

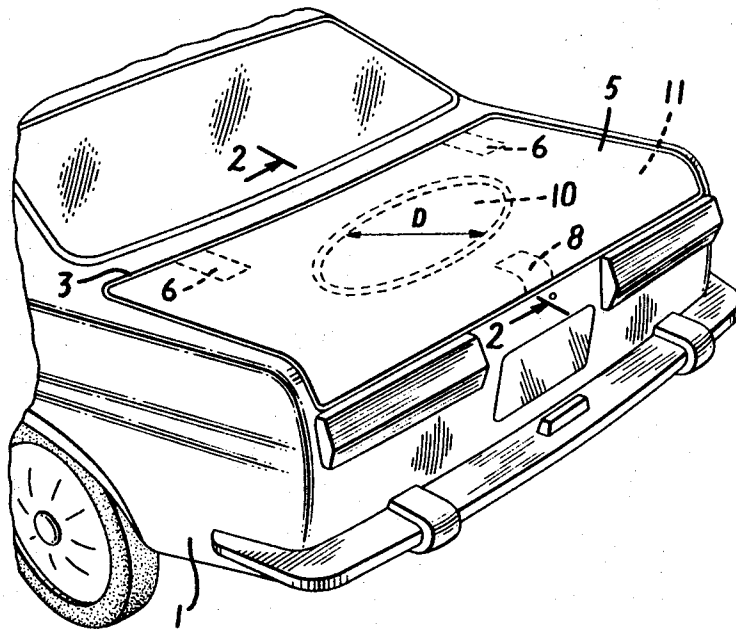
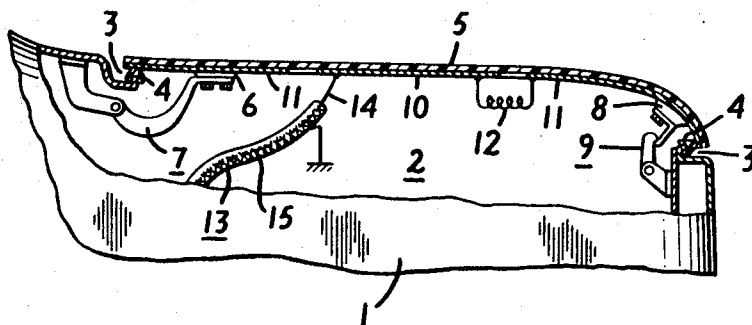


FIG. 2



AUTOMOBILE ANTENNA MOUNTED ON TRUNK LID

BACKGROUND OF THE INVENTION

This invention relates to an antenna for a radio set equipped on a motorcar and particularly to such an antenna utilizing a trunk's cover on a motorcar.

The conventional type of antenna as referred to has comprised the trunk's cover formed of a sheet metal and electrically insulated from the body thereof through mountings for hinge and locking devices and the periphery of the opening adapted to be closed by the trunk's cover. If it is desired to receive any radio wave having, for example, a long wavelength such as a medium wave AM (amplitude modulated) broadcasting whose wavelength is very longer than a dimension of a trunk's cover involved then the entire area of the trunk's cover has been more effectively used as an antenna because the area of the antenna is required to increase as wide as possible in order to increase the gain of the antenna. On the other hand, if the dimension of the trunk's cover is equal to or smaller than a quarter a wavelength of a radio wave to be received as in the reception of FM (frequency modulated) broadcasting then the entire area of the trunk's cover has become unfitted for use as an antenna for use with a motorcar. This is because the impedance of such an antenna has greatly varied with respect to the frequency of the radio wave in accordance with the shape and dimension of the cover resulting in a increase in loss due to mismatch between the antenna and the associated radio set. Alternatively the antenna has increased in directivity. It is highly desirable to provide an antenna for use with a motor car utilizing through the trunk's cover thereof to be selectively used for at least one pair of different frequency bands.

SUMMARY OF THE INVENTION

Accordingly it is a general object of the invention to provide an improved antenna for use with a radio transmitter, a radio receiver or the like equipped on a motorcar utilizing the trunk's cover thereon.

It is another object of the invention to provide an improved antenna utilizing a plastic cover for a trunk on a motorcar to be fitted for a pair of different frequency bands such as the medium wave AM and FM broadcasting bands.

It is still another object of the invention to provide an improved antenna for use with a motorcar not required to be switched even for use with a pair of different frequency bands.

The invention accomplishes the aforesaid objects by the provision of an antenna on a motorcar selectively used for at least one pair of different frequency bands, comprising a plastic cover disposed so as to normally close an upper opening of a trunk on the motorcar, a pair of metallic films in the form of foils or gauzes disposed on the trunk's cover, an electromagnetic coil disposed on the cover between the metallic films to interconnect them, and an electric cable connected to one of the metallic films.

Preferably, the electromagnetic coil may have its inductance the exhibits a high impedance for the higher frequency band and a negligibly low impedance for the lower frequency band.

One of the metallic films may advantageously be in the form of a circle having a diameter substantially equal to a quarter a wavelength of the FM broadcasting band.

BRIEF DESCRIPTION OF THE DRAWING

The invention will become more readily apparent from the following detailed description taken in conjunction with the accompanying drawing in which:

FIG. 1 is a fragmental perspective view of a motorcar embodying the principles of the invention as viewed from the tail end thereof with some parts illustrated in phantom; and

FIG. 2 is a vertical sectional view taken along the line II-II of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawing, it is seen that an arrangement disclosed herein comprises a body 1 of a motorcar, a trunk 2 (see FIG. 2) disposed on the rear portion of the body 1 and having an opening on the upper side, an electric insulation 4 fixedly secured to the entire peripheral edge of the opening 3, and a cover 5 disposed on the opening 3 of the trunk 2 to normally close the latter through the peripheral insulation 4. The trunk's cover 5 is formed of any suitable electrically insulating plastic such as an epoxide resin and supported to appropriate portions of the body 1 through hinge devices 6 fixed at both ends to those trunk portions and amounting 7 disposed on the internal surface of the cover 5 as best shown in FIG. 2. The cover 5 is normally locked to the body 1 through a locking device 8 fixed at both ends to a suitable portion of the body 1 and another mounting 9 disposed on the internal surface of the cover 5 as shown in FIG. 2. Both mountings 7 and 9 are preferably of a suitable electrically insulating material.

The cover 5 has fixedly secured on the central portion of the internal surface a film 10 of any suitable electrically conductive material such as copper in the form of a circular foil or gauze having a diameter of D. The cover 5 is also provided on that portion of the internal surface other than those portions thereof on which the metallic film 10 and the mountings 7 and 9 are fixed with a second metallic film 11 in the form of a foil or a gauze to form a suitable gap between the same and the metallic film 10. The second metallic film 11 is preferably formed of the same electrically conductive material as the film 10 and electrically insulated from the body 1 through the mountings 7 and 9 on the cover 5 and the insulation 4 disposed on the peripheral edge of the opening 3.

As best shown in FIG. 2, an electromagnetic coil 12 is disposed on the internal surface of the cover 5 between the metallic films 10 and 11 to be electrically connected at both ends to appropriate portions in this case the opposite portions of both films. Then an antenna cable 13 is electrically coupled to the metallic film 10 and a radio set (not shown) equipped on the body by having its inner conductor 14 connected at both ends to the film 10 and an input to that radio set and its outer conductor 15 connected to the body 1 as shown by the symbol "GROUND."

In order to use the metallic films 10 and 11 as an antenna for selectively receiving a pair of different frequency bands, in the illustrated example, the medium wave AM broadcasting band and the FM broadcasting band, the dimension or diameter D of the metallic film 10 can be substantially equal to a quarter the wavelength of the FM broadcasting band or about 90 centimeters while the coil 12 is selected to have its inductance exhibiting a high impedance for the FM band and a negligibly small impedance for the medium wave band. For example, the inductance may be of a few microhenries. Under these circumstances, the reception of the medium wave AM band is accomplished with antenna formed of both metallic films 10 and 11 interconnected through a low impedance provided by the coil 12. Therefore the antenna will have its effective area equal to the sum of the available areas of both films 10 and 11. In other words, the antenna has its effective area substantially equal to the area of the trunk's cover as used as an antenna.

On the contrary, upon receiving the FM band, the metallic film 10 is electrically isolated from the metallic film 11 through a high impedance exhibited by the coil 12 with the result that only the metallic film 10 is effective for operating as an antenna. Since the metallic film 11 is in the form of a simple circle, that antenna formed of the film 11 alone exhibits the impedance characteristic small in variation over the FM broadcasting band while it is substantially of nondirectional type leading to a very effective antenna. It is noted that for the FM broadcasting band, there is present a high capacitance between the metallic film 11 and that portion of the body 1 forming the peripheral edge of the trunk's opening 3. This

results in the formation of a low impedance electrically connecting the metallic film 11 to the body 1. That is the film 11 can be regarded to be an electrical extension of the body 1 or the ground side.

From the foregoing it will be appreciated that the invention provides an antenna for use with a motorcar selectively usable for a pair of different frequency bands without switching the antenna. Further it resembles in behavior the prior art type of antennas for lower frequencies and it is still fitted for the higher frequencies resulting in a great utility. In addition, the metallic films serve to mechanically reinforce the plastic trunk's cover.

While the invention has been illustrated and described in conjunction with a single preferred embodiment thereof it is to be understood that various changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and scope of the invention. For example the trunk's cover may be of a structure in which the metallic films are sandwiched between a pair of plastic laminations.

What is claimed is:

1. An antenna on a motorcar selectively used for at least one pair of different frequency bands, comprising a plastic

cover disposed so as to normally close an upper opening of a trunk on the motorcar, a pair of metallic films disposed on the said trunk's cover, an electromagnetic coil disposed on said cover between said metallic films to interconnect them, and an electric conductor connected to only one of said metallic films.

2. An antenna as claimed in claim 1 wherein said metallic films are in the form of foils.

3. An antenna as claimed in claim 1 wherein said metallic films are in the form of gauzes.

4. An antenna as claimed in claim 1 wherein said electromagnetic coil has an inductance exhibiting a high impedance for the higher frequency band and a substantially negligibly low impedance for the lower frequency band.

5. An antenna as claimed in claim 1 wherein one of said metallic films is in the form of a circle having a diameter substantially equal to a quarter the wavelength of the FM broadcasting band providing the higher frequency band.

6. An antenna as claimed in claim 1 wherein said cover is formed of a pair of plastic laminations having said metallic foils sandwiched therebetween.

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