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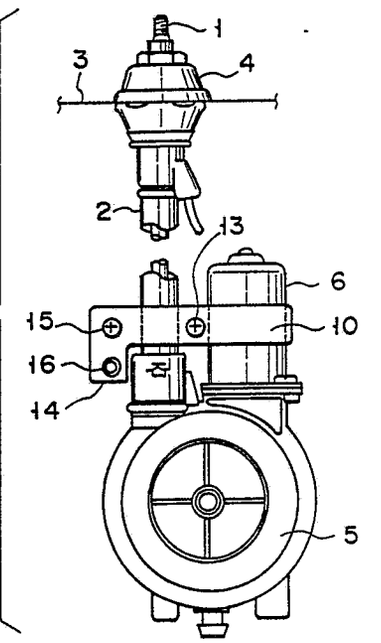
(54) An electrically driven telescopic antenna for automobiles.

(57) A motor driven automobile antenna including a conductive tube for shielding therein a telescopic antenna element (1) and another conductive tube for shielding therein a motor (6) which extends and retracts the antenna element wherein the two conductive tubes are connected to each other by a fastening bracket (10) which is made of conductive materials and shaped in figure eight having two round openings into which the conductive tubes are inserted and a part of the fastening bracket is electrically connected to the automobile body for grounding purpose.

F I G. 2



EP 0 361 878 A2

An electrically driven telescopic antenna for automobiles

The present invention relates to an electrically driven telescopic antenna for use in automobiles and more particularly to an improved grounding means for a telescopic antenna which eliminates noise generated by noise-generating sources.

One type of conventional electrically driven telescopic antennas for use in automobiles is constructed as follows:

When the power supply switch of a radio receiver is switched "on", a relay operates and causes forward rotation of a motor so that a rod antenna element driven by the motor is raised and extended. When the switch is turned "off", the relay is reset so that the motor rotates in the reverse direction, lowering the rod antenna element so that it is retracted.

In antennas of this type, the antenna is extended while the radio receiver is in operation. Thus, motor noise generated by the rotation of the motor and rubbing noise from the rubbing of the antenna element, etc., may occur. Such noise is transitory and differs from external noise from other vehicles, etc. Since the level of such noise is high and fairly irritating, it is desirable to eliminate as much noise of this kind as possible.

Several different types of devices have been proposed as means to eliminate such problems. One type uses a shielding case. The motor and antenna element housing tube I which are considered to be "noise generating sources") are covered by a shielding case, and the shielding case is electrically connected to the vehicle body so that noise is eliminated by grounding.

Currently, an ordinary antenna grounding element is used as means to electrically connect the shielding case to the vehicle body. A grounding element is installed in a mount assembly for fastening the upper end of the antenna element housing tube to a fastening hole of the vehicle body wall so that the ground side conductor of the antenna is grounded via this grounding element. The shielding case is connected to the ground side conductor of the antenna by some means, so that the shielding case is also grounded via a grounding element.

However, in these type of grounding means, the ground point is located at the upper end of the antenna element housing tube, which is distant from noise-generating sources such as the motor, etc. Thus, in some cases, noise elimination cannot be fully accomplished. In recent years, the strength of paint coating on the undersurface of the automobile hood, which is where the antenna is fastened, has been increased. Accordingly, when an antenna is fastened to a hood with strengthened or thickened paint coating, conductivity is hindered by the paint coating; therefore, a reliable ground cannot be obtained. Recently, however, a new approach has been taken, that is, a fastening bracket used to fasten a portion of the electrically driven telescopic antenna to the vehicle body wall is utilized as a grounding conductor. In this case, at least grounding for the purpose of noise elimination is accomplished via the antenna fastening bracket.

Fig. 1 shows a prior art telescopic antenna for automobiles. The antenna is equipped with a ground means that uses an antenna fastening bracket as a grounding conductor. A multi-stage telescopic antenna element 1 consisting of a multiple number of conductive pipes which are connected to each other so as to freely slide relative to each other is provided inside an antenna element housing tube 2 so that the antenna element 1 can be freely inserted into and withdrawn from the housing tube 2. The upper end of the antenna element housing tube 2 is fastened in place in a fastening hole of the hood 3 of an automobile by means of a fastener 4. An antenna element drive mechanism 5 is connected to the lower end of the antenna element housing tube 2, and the drive mechanism 5 uses a motor 6 as a source of driving power. By means of a drive rope (not shown), the drive mechanism 5 drives the antenna element 1 up and down so that the antenna element 1 is extended and retracted.

An antenna fastening bracket 7 is mounted on the antenna element drive mechanism 5. This antenna fastening bracket 7 is used primarily to fasten the base of the antenna to the vehicle body wall by fastening means such as screws, etc. At the same time, however, the bracket 7 also acts as a grounding conductor. Specifically, a conductive outer tube for shielding the antenna element housing tube 2 and another conductive outer tube for shielding the motor 6 are connected to the antenna fastening bracket 7 via grounding conductors 8 and 9 which consist of grounding elements or wires. Thus, noise generated by the antenna element housing tube 2 and motor noise generated by the motor 6 are grounded out.

When the grounding means which uses the grounding element and the grounding means which uses the bracket, grounding in the latter is accomplished in a position that is relatively close to noise sources. Also, this system provides reliable grounding to portions of the vehicle body wall that are not covered with paint. However, this system has problems as described below:

It requires a multiple number of grounding conductors 8 and 9 which consist of wires with dif-

ferent shapes and structures. Furthermore, connecting screws are required in order to connect the grounding conductors 8 and 9 to the respective conductive outer tubes for the housing tube 2 and motor 6 and in order to connect the grounding conductors 8 and 9 to the antenna fastening bracket 7. Accordingly, a large number of parts are required, making structure complicated and the manufacturing cost high. Furthermore, since the grounding path is relatively long, noise elimination tends to be insufficient.

Accordingly, the object of the present invention is to provide an electrically driven telescopic antenna for automobiles which is equipped with a novel grounding means. The grounding means requires only a small number of parts, has a simple structure, can be manufactured at a low cost, and has a short grounding path, so that reliable grounding can be accomplished in the vicinity of noise-generating sources, thus providing extremely good noise elimination.

The above mentioned objects are accomplished via a unique structure of the present invention. A conductive outer tube for shielding an antenna element housing tube which is installed in an automobile body and another conductive outer tube for shielding a motor which is provided alongside the antenna element housing tube and drives the extension and retraction of the antenna element are integrally connected to each other via a fastening bracket which consists of a band-form conductive part. Furthermore, a grounding means is provided which electrically connects a portion of the fastening bracket to the vehicle body wall.

Since the conductive outer tube used for shielding the antenna element housing tube and the conductive outer tube used for shielding the motor are integrally connected to each other and grounded by means of a single band-form conductive bracket the number of parts required is reduced. Thus, the resulting structure is simple, and the device can be manufactured at a low cost. Furthermore, since the respective conductive outer tubes, which shield the antenna element housing tube and the motor which are installed adjacent to each other, are connected in a straight line by the bracket, and since a portion of the bracket is grounded by a direct connection to the vehicle body wall, the grounding path is relatively short. Thus, grounding can be accomplished in the vicinity of the noise-generating sources.

This invention can be more fully understood from the following detailed description when taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a side view of the structure of a conventional antenna;

Fig. 2 is a side view of one embodiment of the present invention;

Fig. 3 is a plan view illustrating the shape of an antenna fastening bracket used in the embodiment of Fig. 2.

Fig. 2 shows the structure of an electrically driven telescopic antenna for automobiles, and Fig. 3 shows an antenna fastening bracket 10. Elements in Fig. 2 which are the same as those of Fig. 1 are labeled with the same numbers and will not be described in detail here.

The antenna fastening bracket 10 is formed by bending a band-form conductive piece or member into the shape of a "bottle gourd" or a figure eight (8) when viewed from above as shown in Fig. 3. Thus, the bracket 10 includes a small-diameter part 11 and a large-diameter part 12 which are integrally connected to each other. The small-diameter part 11 of the bracket 10 is designed to fit the external circumference of the conductive outer tube which is used for shielding the antenna element housing tube 2. The large-diameter part 12 of the bracket 10 is designed to fit the external circumference of the conductive outer tube used for shielding the motor 6.

A tightening adjustment screw 13 is fastened to the bracket 10 at a point between the housing tube 2 and motor 6. The tightness of the bracket 10 against housing tube 2 and motor 6 can be thus adjusted by adjusting the tightness of the tightening adjustment screw 13.

An end portion 14 of the antenna fastening bracket 10 extends perpendicularly with relative to the direction of length of the bracket 10, and two screw holes 15 and 16 open in this end portion 14. These screw holes 15 and 16 are used for inserting screws (not shown) which electrically connect the antenna fastening bracket 10 to the vehicle body wall. The end portion 14 of the antenna fastening bracket 10 may be bent into an L-shape as indicated by the broken lines 14′ in Fig. 3 or bent into some other shape so that it can be easily and smoothly connected to the vehicle body wall.

The effect of the above described embodiment will be explained below:

The conductive outer tube used for shielding the antenna element housing tube 2 and the conductive outer tube used for shielding the motor 6 are integrally connected to each other and grounded via the band-form conductive bracket 10. In this case, only one bracket 10 is necessary to connect them. Accordingly, only a small number of parts is required, and the structure of the device is so simple that the device can be manufactured at a low cost.

Furthermore, the respective conductive outer tubes of the antenna element housing tube 2 and the motor 6, which are provided adjacent to each other, are connected in a straight line by the brack-

et 10, and a portion of the bracket 10 is grounded by being directly connected to the vehicle body wall. Accordingly, the grounding pach is relatively short, and grounding can be accomplished in the vicinity of the noise-generating sources.

The present invention is not limited to the embodiment described above. It goes without saying that various modifications are possible within the scope and spirit of the present invention.

As described above in detail, the present invention provides an electrically driven telescopic antenna used in automobiles which is equipped with a novel grounding means which has the following advantages: Since the conductive outer tube used for shielding the antenna element tube and the conductive outer tube used for shielding the motor which are installed adjacent to each other are integrally connected to each other in a straight line and grounded via a single band-form conductive bracket, the number of parts required is small, the structure of the device is simple and the device can be manufactured at a low cost. Furthermore, since the grounding path is short, reliable grounding can be accomplished in the vicinity of the noise-generating sources. Accordingly, extremely favorable noise elimination is accomplished.

Claims

1. An electrically driven telescopic antenna for use in automobiles characterized in that a conductive outer tube used for shielding an antenna element housing tube (2) which is installed inside a vehicle body and a conductive outer tube used for shielding a motor (6) which is installed alongside said antenna element housing tube and used to drive an antenna element (1) to be extended and retracted are integrally connected to each other by means of an antenna fastening bracket (10) which consists of a band-form conductive part, and a grounding means is provided which electrically connects a portion of said antenna fastening bracket to the vehicle body.

2. A motor driven telescopic automobile antenna characterized by comprising a conductive tube for shielding therein an antenna element housing tube (2) and another conductive tube for shielding therein a motor (6) which extends and retracts an antenna element (1), wherein said two conductive tubes are connected to each other by a fastening bracket (10) made of conductive materials and a part of said fastening bracket is electrically connected to the automobile body for securing grounding.

3. A motor driven telescopic automobile antenna according to claim 2, characterized in that said fastening bracket is substantially in a shape of figure 8 having two round openings into which said conductive tubes are inserted.

FIG. 1

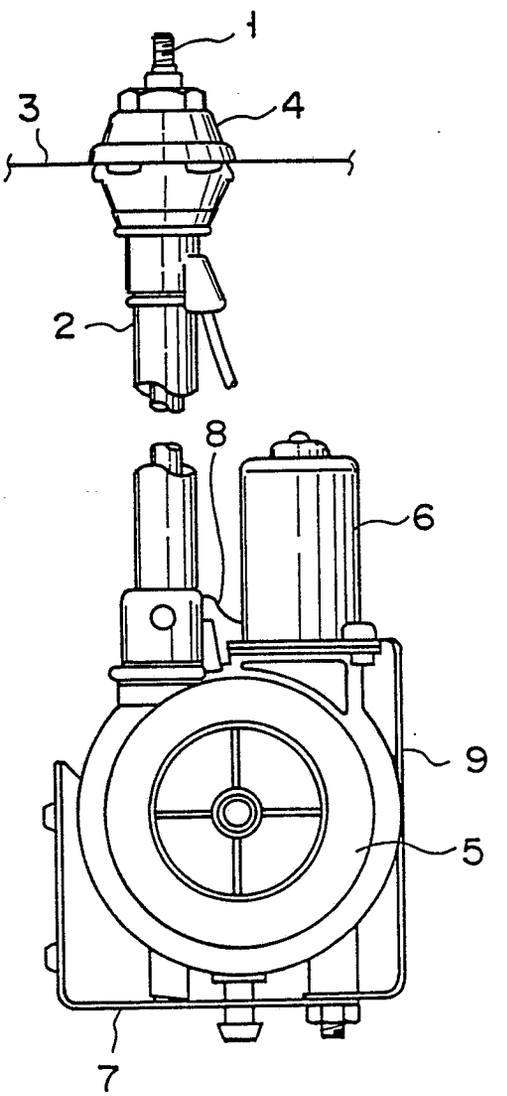
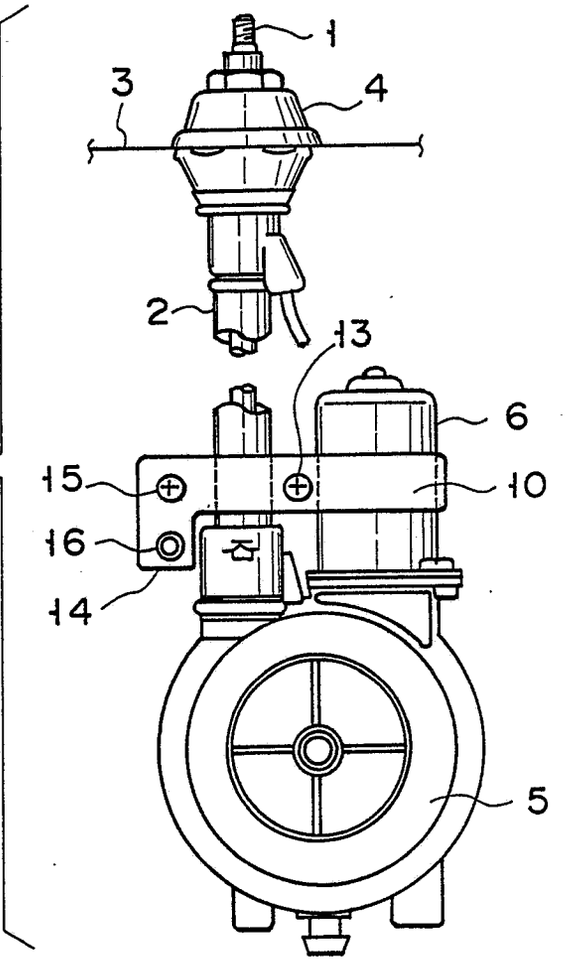


FIG. 2



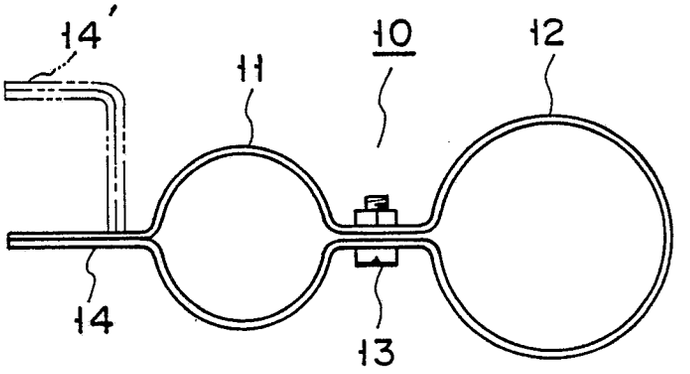


FIG. 3