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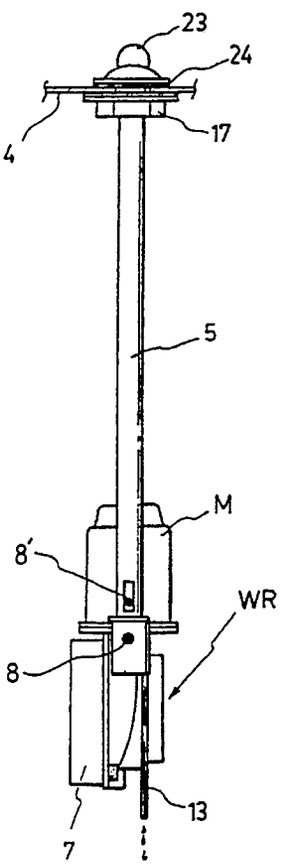
(54) Automobile antenna.

(57) An automobile antenna is disclosed which includes: a radio antenna rod for receiving the radio signals; a car phone antenna for transmitting and receiving the car phone signals; and an antenna storing tube for storing said radio antenna rod and said car phone antenna. The combination of the above three components forms a single antenna unit, and this antenna unit is extendable to the outside of the car body during a use, while it is hidable during a non-use. Further, there is provided a wire winding unit which is installed on the lower end portion of the antenna storing tube. Owing to this wire winding unit, the antenna unit can be extended and contracted, and the single antenna unit serves for both the car radio and the car phone.

FIG. 1



EP 0 436 406 A2

AUTOMOBILE ANTENNA

Field of the invention

The present invention relates to a structure of car phone antenna for use in automobiles.

Background of the invention

Conventionally, in installing antennas on automobiles, a radio antenna and a car phone antenna are separately provided, and although the radio antenna can be installed in a hidable form, the car phone antenna has to be installed in such a fixed form that the antenna should be fixedly exposed to the outside of the automobile. Accordingly, even when the car phone is not used, the car phone antenna is exposed to the outside of the automobile in an elongate form, with the result that the aesthetic appearance of the automobile is aggravated, and that the antenna can not be protected from various external forces.

Coming recently, there has been appeared a device in which the antenna can be folded in the lateral direction, but this device gives only the effect that the uprightly stood thing is laterally laid down. Therefore this device is also incapable of protecting the antenna from various external forces such as snow, rain, hands of people and the like.

Summary of the invention

The present invention is intended to overcome the above described disadvantages of the conventional devices.

Therefore it is the object of the present invention to provide an automobile antenna in which a single antenna can serve for both the car radio and the car phone, and in which the single antenna is provided in a hidable form without giving any adverse effect to the transmitting and receiving functions thereof.

In achieving the above object, the device of the present invention is constituted such that a wire is wound on a rotary body of a wire winding unit, the wire can be wound or unwound by a motor, and consequently, a car phone antenna stored in an antenna storing tube can be extended to the outside or can be contracted into the antenna storing tube. Thus, the car phone antenna is let to be extended to the outside only when the car phone is used, and further, this antenna can also be used for the car radio, thereby making the antenna serve for both the car phone and the car radio, i.e., two functions with a single antenna. Further, the antenna is so constituted as to transfer the signals directly from the antenna, and the antenna has various other advantages such as an extension of the life expectancy of the antenna without hurting the aesthetic appearance of the automobile, a high sensitivity functions of the car radio and the car phone, and the like.

Brief description of the drawings

The above object and other advantages of the present invention will become more apparent by describing in detail the preferred embodiment of the present invention with reference to the attached drawings in which :

Figure 1 is a side view of the wire winding unit of the present invention, with the car phone antenna contracted off ;

Figure 2 is a plan view of the wire winding unit of Figure 1, showing also a freeze preventing device installed around and enclosing the antenna storing tube ;

Figure 3 is an enlarged plan view of the wire winding unit, with the wire winding rotary body removed ;

Figure 4 is a sectional view of the rotary body which is coupled with the wire winding unit of the present invention ;

Figure 5 is a sectional view of a part of the car phone antenna structure according to the present invention ;

Figure 6 is a partly cut-out perspective view showing the connection between the radio antenna rod and the antenna storing tube according to the present invention ;

Figure 7 is a sectional view taken along the line A-A of Figure 6 ;

Figure 8 is an enlarged sectional view showing the connecting portion between the antenna storing tube and the wire winding unit according to the present invention ;

Figure 9 illustrates an example of the use of the device according to the present invention ;

Figure 10 illustrates another embodiment of the present invention, in which a conductive plate is installed on the top of the rotary body so as for the signals to be transferable through a terminal attached thereto ;

Figure 11 is a plan view of the rotary body with the conductive plate of Figure 10 attached thereto ; and

Figure 12 is a sectional view of the car phone antenna structure in which the signals are transferred through the conductive plate according to the present invention.

Description of the preferred embodiment

As shown in Figure 1, the automobile antenna according to the present invention is installed within

the body 4 of the automobile, in such a manner that an antenna storing tube storing a car phone antenna 9 is fixedly installed within the car body 4, and near the lower end of the antenna storing tube 5, there is installed a wire winding unit WR which is also attached to the car body 4 and which is also connected to a motor M.

The antenna storing tube 5 is fixedly attached to the car body and within the car trunk by means of a fastening nut 17 and the like, and a rubber cap 24 is installed under an antenna top 23 so that the intrusions of rain drops and moisture should be prevented, and that impacts should be absorbed during the descending of the antenna.

As shown in Figure 2, a freeze preventing device D is installed around and enclosing the antenna storing tube 5, and the freeze preventing device comprises a temperature detecting sensor S, a coil C and a power terminal T. If the temperature of the antenna storing tube 5 drops below 0°C, the freeze preventing device is activated by the temperature detecting sensor S, so that the antenna storing tube 5 should be maintained at a constant temperature, thereby keeping the radio antenna rod 10 of the antenna storing tube 5 from being frozen.

As shown in Figures 3 and 4, the wire winding unit WR which is for actuating the car phone antenna 9 and the radio antenna rod 10 includes a wire winding body 1, a rotary body 2 and a covering cap 7, and the rotary body 2 with a wire 3 wound thereon is installed within the wire winding body 1. A worm gear 21 which is concentrically installed to a revolution shaft 22 of the rotary body 2 is meshed with a worm 20 which is connected to the shaft of the motor M, so that the rotary body 2 should be able to revolve forwardly or reversely in accordance with the revolution direction of the motor M.

As shown in Figures 5 and 8, the other end of the wire 3 which is wound on the rotary body 2 is connected through a connecting tube 1b of the wire winding body 1 to the leading end of a telescopically extendable car phone antena rod 6 which is connected to a plug 11 of the car phone antenna 9, so that the wire 3 should be able to lift and lower the car phone antenna 9 in accordance with the revolution direction of the rotary body 2. As shown in Figures 5 to 7, the radio antenna rod 10 and the car phone antenna 9 are stored within the antenna storing tube 5 in the cited order, and the car phone antenna 9 is insulatingly supported by a sliding rod 12, while the sliding rod 12 also moves up and down within the radio antenna rod 10 in order to lift or lower the radio antenna rod 10. Further, the radio antenna rod 10 is provided with teflon rings 30, 31 on which water channels 30a, 31a are formed in order to facilitate the draining of water from the antenna storing tube 5. Further, between the teflon rings 30, 31, there is installed a conductive spring ring 32 which has a discontinuous opening, so that the radio antenna rod 10 and the antenna storing tube 5 should be electrically interconnected.

Meanwhile, according to the present invention, the signals are directly transferred from the car phone antenna 9, and an actuating member is used in order to extend and contract the car phone antenna 9. That is, as shown in Figure 8, on the lower portion of the antenna storing tube 5 which is secured to the connecting tube 1b, there is installed a telescopically extendable rod 6 the lower end of which is connected to a car phone terminal CT which is in turn for transferring the signals to and form the car phone antenna 9. Here, the telescopically extendable rod 6 is insulated from the antenna storing tube 5 by means of a cylindrical insulator R', the radio signals being transferred through the antenna storing tube 5. The electrical insulation between the connecting tube 1b and the car phone terminal CT is carried out by means of a bottom insulator R, and a radio signal line 8' is connected directly to the antenna storing tube 5, while a car phone signal line 8 is connected directly to the car phone terminal CT which is connected to the telescopically extendable rod 6.

Meanwhile, in making a single antenna serve for both the car radio and car phone according to the present invention, a separate conductive plate 66 is installed on the top of the rotary body 2 so as for the car phone audio signals to be transferred through a wire 3'.

In the drawings, reference code 14 indicates a non-conductive supporting rod for supporting a coil 15 which connects the upper and lower car phone antenna lines. Reference code 16 indicates a molded product for enclosing the coil 15, reference codes 25, 26 indicate rubber caps, and reference code 1a indicates a guide hole formed on the top of the wire winding body 1, the wires 3,3' being connected through this guide hole 1a to the connecting tube 1b.

The device of the present invention constituted as above will now be described as to its function and effect.

In a state with the car phone antenna 9 and the radio antenna rod 10 stored within the antenna storing tube 5, i.e., in the normal state as shown in Figures 1 and 2, if the user turns on a separately installed key in order to use the car phone or the car radio, then the power source is automatically connected to the motor M which is attached to the wire winding unit WR, thereby letting the motor M revolve in the forward direction.

As the motor M revovles in the forward direction, the worm 20 which is connected to the shaft of the motor M is let to revolve, and the worm gear 21 of the rotary body 2, which is meshed with the worm 20, is also let to revolve at a reduced speed. As a result, the rotary body 2 which is concentrically installed to the shaft 22 of the worm gear 21 is also let to revolve, and therefore, the wire 3 which is wound within the rotary

body 2 is unwound.

That is, as the wire 3 which is made of a non-conductive material is unwound, a pushing force is acted on the rod which is attached on the first leading end of the telescopically extendable rod 6 which is connected through the connecting tube 1b and the guide hole 1a of the wire winding body 1 of the wire winding unit WR of Figure 3. Thus, the car phone antenna 9 which is connected to the above mentioned rod begins to ascend, and, in the process of the ascending of the car phone antenna 9, the radio antenna rod 10 is also lifted along the sliding rod 12, until the car phone antenna 9 and the radio antenna rod 10 are simultaneously extended to the outside of the car body 4 as shown in Figure 9. (Here, the motor M is automatically stopped upon completion of the extension of the antenna.)

Thus, upon completion of the extension of the antenna, the transmission and receiving of the car phone signals and the receiving of the radio signals are made possible, and particularly, the process of receiving the radio signals will be described below.

That is, the radio signals which are received through the upwardly extended radio antenna rod 10 are transferred to the conductive spring ring 32 which is elastically installed between the two teflon rings 30, 31 as illustrated in detail in Figures 6 and 7.

Then, the signals are transferred to the antenna storing tube 5, and then, the signals are further transferred into the radio set after passing through the radio signal line 8' which is directly attached to the antena storing tube 5 as shown in Figure 8, the signals being converted to audio waves after being introduced into the radio set. Meanwhile, the receiving of the car phone signals is done in the manner described below.

The signals are received first through the top 23 of the outwardly extended car phone antenna 9, and then, the signals are transferred to the plug 11 which connects the car phone antenna 9 and the telescopically extendable rod 6. Then the signals are further transferred through the telescopically extendable rod 6 to the car phone terminal CT which is connected to the lower end of the rod 6, and the signals are further transferred through the car phone signal line 8 uitimately to the car phone receiver, while the transmission of the signals is none based on a process which is reverse to the above described receiving process.

Thereafter, if the separately installed switch is turned off, the motor M is reversely revolved to wind up the wire 3 which has been pulling up the telescopically extendable rod 6, and therefore, the car phone antenna 9 and the radio antenna rod 10 are successively withdrawn into the antenna storing tube 5 to ultimately form the state of Figures 1 and 2. That is, as the wire 3 is wound up, the telescopically extendable multistep rod 6 which is connected to the car phone antenna 9 is telescopically contracted as shown in Figure 8, so that the car phone antenna 9 should be lowered to hide into the car body, while the radio antenna rod 10 is also withdrawn into the antenna storing tube 5 which is disposed within the car body 4. (Here, the motor M is automatically stopped upon completion of the withdrawing of the antenna).

Meanwhile, as shown in Figure 2, the device of the precsent invention is provided with a freeze preventing device D which is installed around and enclosing the antenna storing tube 5. This freeze preventing device D is operated in such a manner that, if the ambient temperanture drops below 0° C, the freeze preventing device D is activated in such a manner as to keep the antenna storing tube 5 at a constant temperature, so that the freezing of the radio antenna rod 10 should be prevented in advance, and that the antenna should be smoothly operated even in winter seasons. Here, the power source which is supplied to the power terminal T is same as the automobile power source DC12V.

Meanwhile, according to the present invention, water channels 30a,31a are formed on the teflon rings 30,31 which are fitted to the radio antenna rod 10 in order to facilitate the draining of water from the antenna storing tube 5. Further, the conductive spring ring 32 which is installed between the teflon rigns 30,31 is also cut at a position to form a discontinuity, so that the rain drops which are intruded into between the antenna storing tube 5 and the radio antenna rod 10 should be easily discharged through the water channels 30a,31a to a drain tube 13.

Now another embodiment of the present invention will be described.

As illustrated in Figure 10, the rotary body 2 is provided with a concentrical annular groove 2a, and a wire 3' is wound on the rotary body 2. A circular conductive plate 66 on which a conductor 66a is coated is fitted to the annular groove 2a, and the wire 3' which is clad with an insulating synthetic resin so as for the signals to be transmitted is connected to the conductive plate 66 as shown in figure 11. Further, a common terminal 88c of a switch box 88 which is installed on the covering cap 7 is slidably contacted to the conductor 66a of the conductive plate 66, and the other end of the wire 3' is connected to the car phone antenna 9 as shown in Figure 12, so that the transmission of the singals for the car phone should be transferred through the wire 3', the conductive plate 66, the common terminal 88c and the car phone terminal 88a.

Meanwhile, the receiving of radio signals is done through the radio antenna rod 10-- the spring ring 32-- the antenna storing tube 5 -- the wire winding body 1 -- the covering cap 7 -- the switch box 88-- the radio terminal 8b.

According to the present invention as described above, a single hidable antenna serves for both the car radio and car phone, thereby simplifying the structure, and forming an effective antenna without hurting the aesthetic appearance of the automobile.

Further, owing to the provision of the freeze preventing device, any mal-operation of the antenna can be prevented, and the draining of rain drops intruding into between the antenna storing tube and the radio antenna rod is facilitated, while the transmission and the receiving of the signals of the car phone and the car radio are carried out directly through the antenna. As a result, a high sensitivity car radio and car phone are realized because the operating noise and the signal noise can be removed.

Claims

1. An automobile antenna comprising : a radio antenna rod for receiving radio signals ; a car phone antenna for transmitting and receiving car phone signals ; and an antena storing tube for storing said radio antenna rod and said car phone antenna, the combination of the above three components forming a single antenna unit, said antenna unit being extendable to the outside during a use, and said antenna unit being hidable into the car body during a non-use.

2. The automobile antenna as claimed in claim 1, wherein a wire winding unit is installed on the lower end portion of said antenna storing tube storing said radio antenna rod and said car phone antenna, in such a manner that said antenna unit can be extended to the outside of the car body or hided into the car body in accordance with the winding or unwinding of a wire of a rotary body through the function of a motor.

3. The autombile antenna as claimed in claim 1, wherein said single antenna unit carries out the function of a car radio antenna and the function of a car phone antenna.

4. The automobile antenna as claimed in any one of claims 1 and 2, wherein a bottom insulator is installed on a connecting tube which is provided on one side of a wire winding body of said wire winding unit ; thereupon, a car phone terminal is installed in such a manner as to be connected to a car phone signal line ; and said antenna storing tube also storing a telescopically extendable multistep rod for said car phone antenna is threadably secured to said connecting tube.

5. The automobile antenna as claimed in any one of claims 1 and 3, wherein a radio signal line is connected to the external surface of said antenna storing tube, so that the receiving of the radio signals can be done directly through said antenna unit.

6. The automobile antenna as claimed in claim 4, wherein an insulator is disposed between said antenna storing tube and said telescopically extendable rod, so that separate transfer of the car phone siganals and the car radio signals should be possible.

7. The automobile antenna as claimed in claim 1, wherein a freeze preventing device consisting of a temperature detecting sensor, a coil and a power source terminal is installed around and enclosing said antenna storing tube for storing said car phone antenna and said radio antenna rod.

8. The automobile antenna as claimed in claim 1, wherein a sliding rod is disposed between said radio antenna rod and said car phone antenna, and said radio antenna rod is insulated from a conductive plug which interconnects said wire and said car phone antenna.

9. The automobile antenna as claimed in claim 1, wherein said radio antenna rod is slidably inserted into said antenna storing tube ; two teflon rings respectively having water channels are installed on said radio antenna rod ; and a conductive spring ring which is broken at a position thereof and exerts an outwardly deflecting force is elastically installed between said teflon rings so as for a fixed connection to be established between said radio antenna rod and said antenna storing tube ; and so as for the draining from said antenna storing tube to be facilitated.

10. The automobile antenna as claimed in claim 1, wherein said antenna storing tube which is fixedly installed within the car body is connected to said wire winding unit which winds or unwinds said wire upon transmission of a revolving power of said motor to said rotary body of said wire winding body ; a circular conductive plate coated with a conductive material is lifted to an annular groove of said rotary body which winds said wire ; one end of said wire is connected to said conductive plate ; and a common terminal of a switch box which is installed on a covering cap of said wire winding unit is slidably connected to said conductive plate, so as for the transmission and receiving of the car phone signals to be done through the antenna, said wire and said conductive plate.

FIG. 1

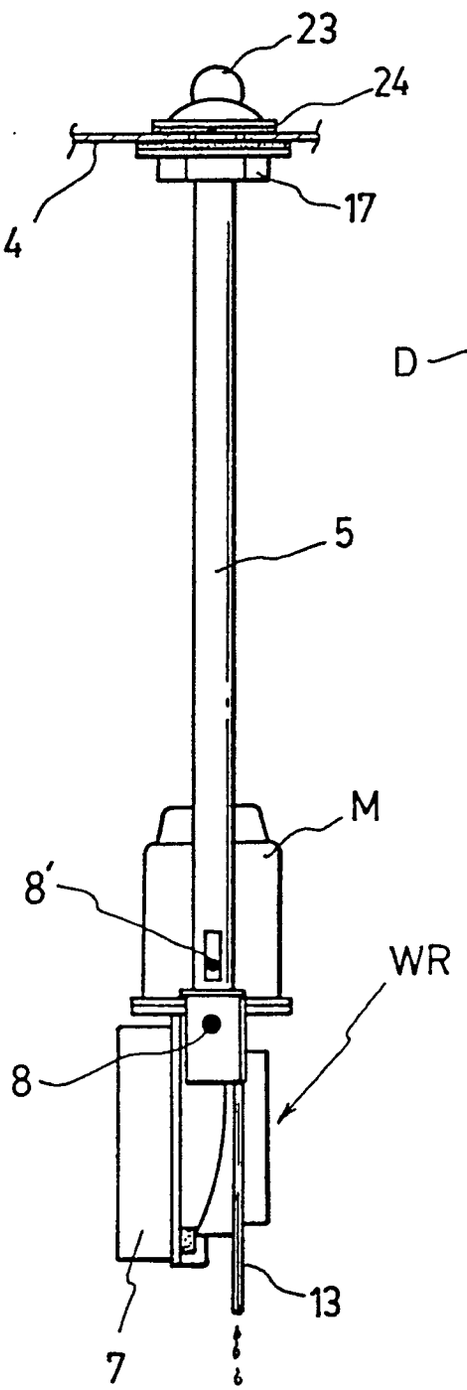


FIG. 2

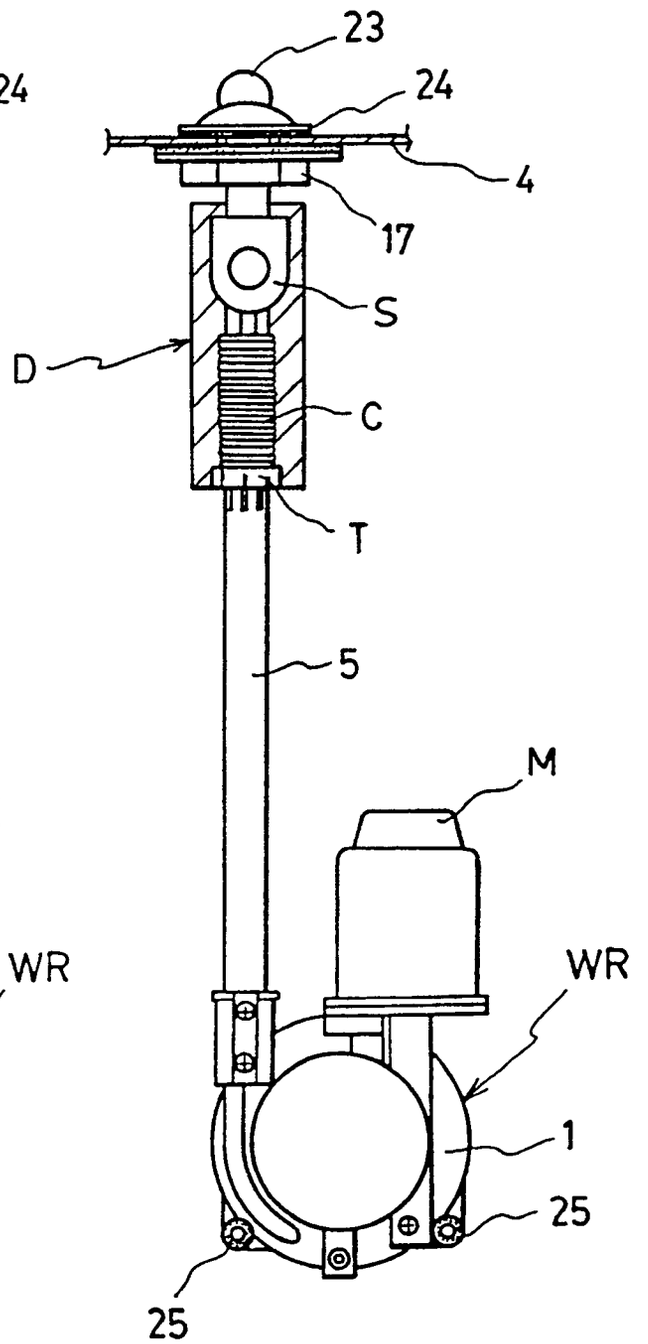


FIG. 3

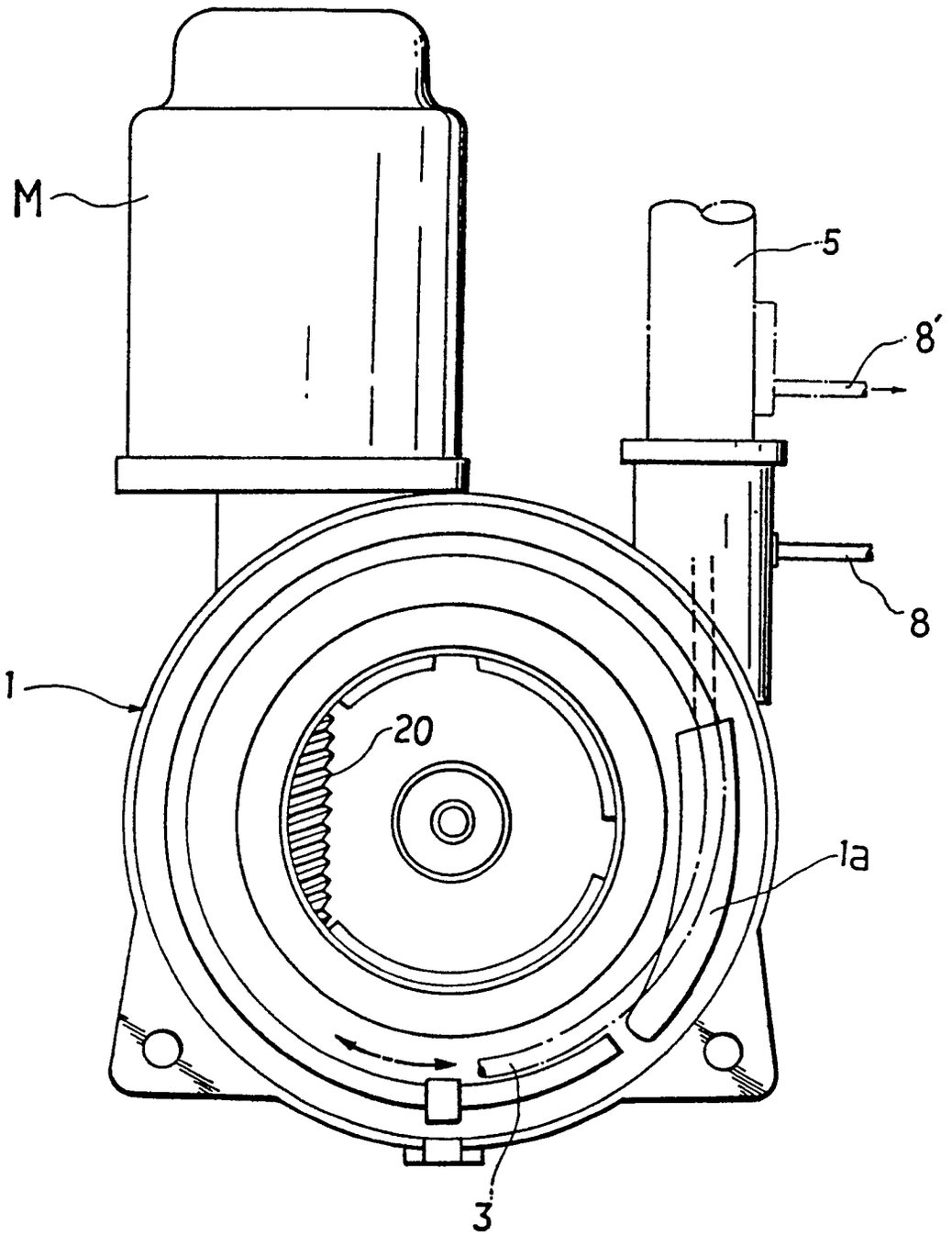


FIG. 4

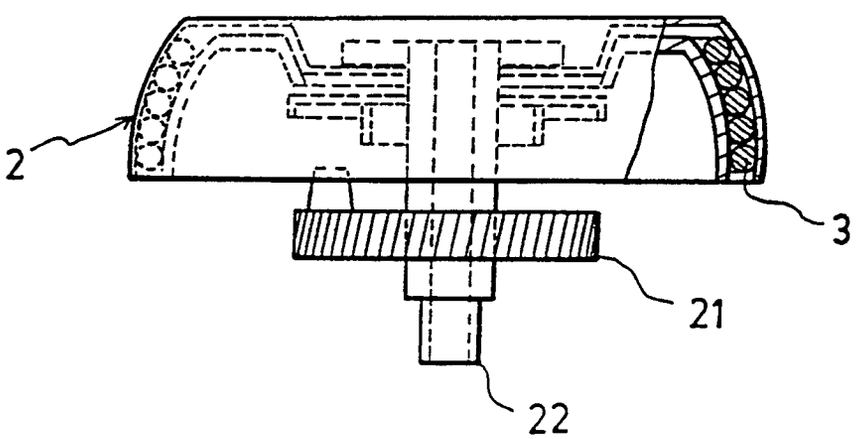


FIG. 5

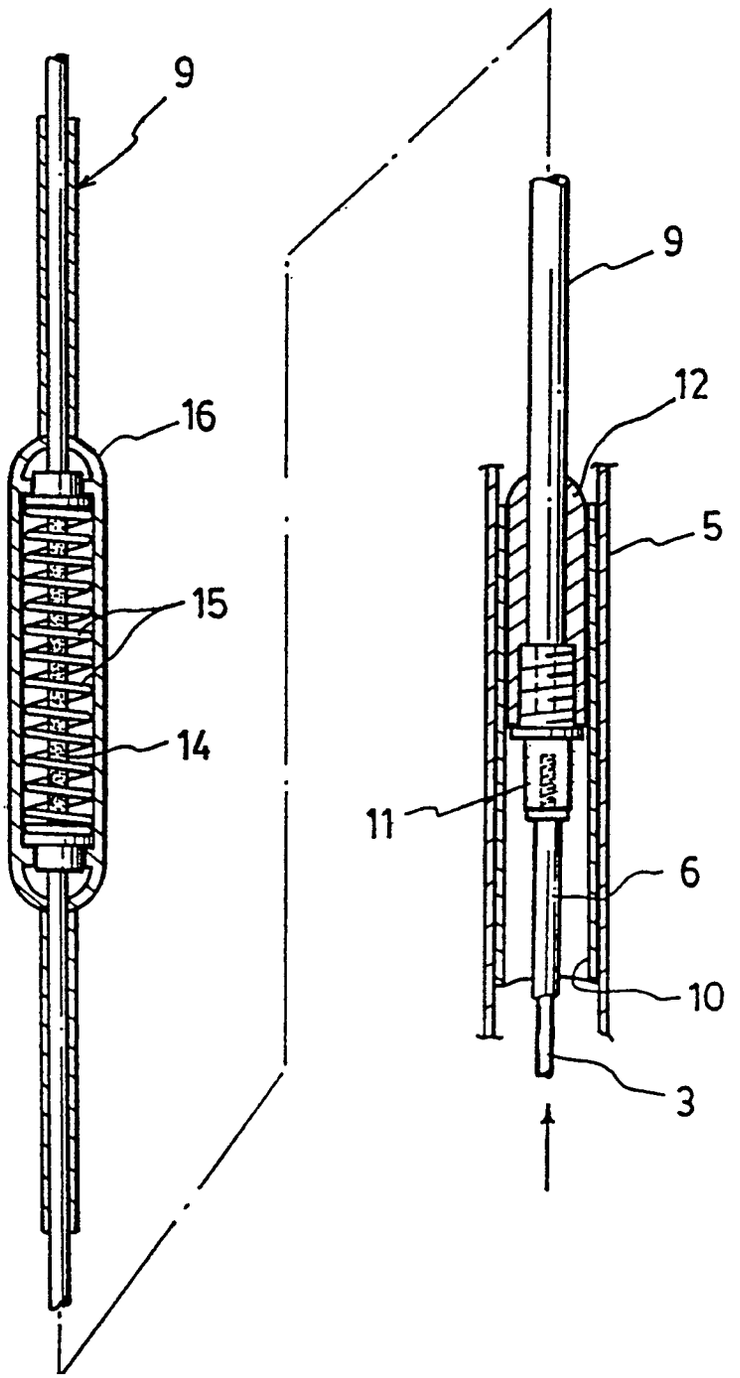


FIG. 6

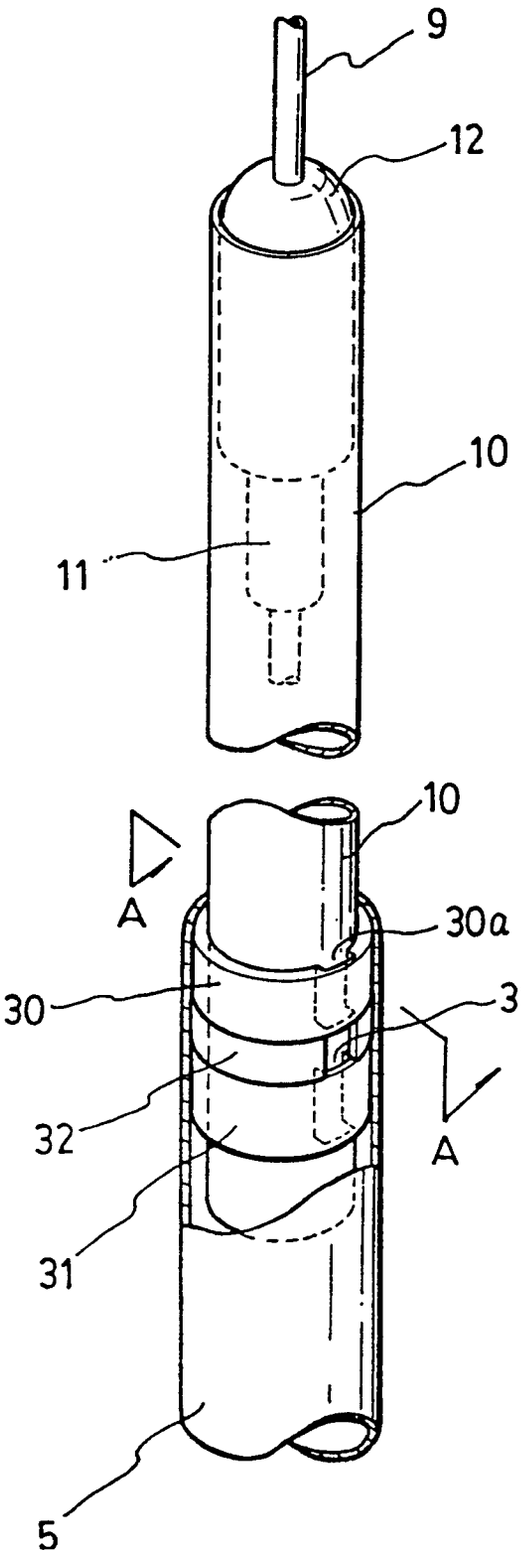


FIG. 7

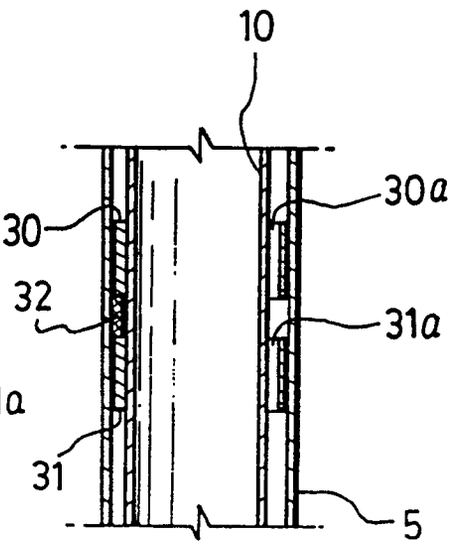


FIG. 8

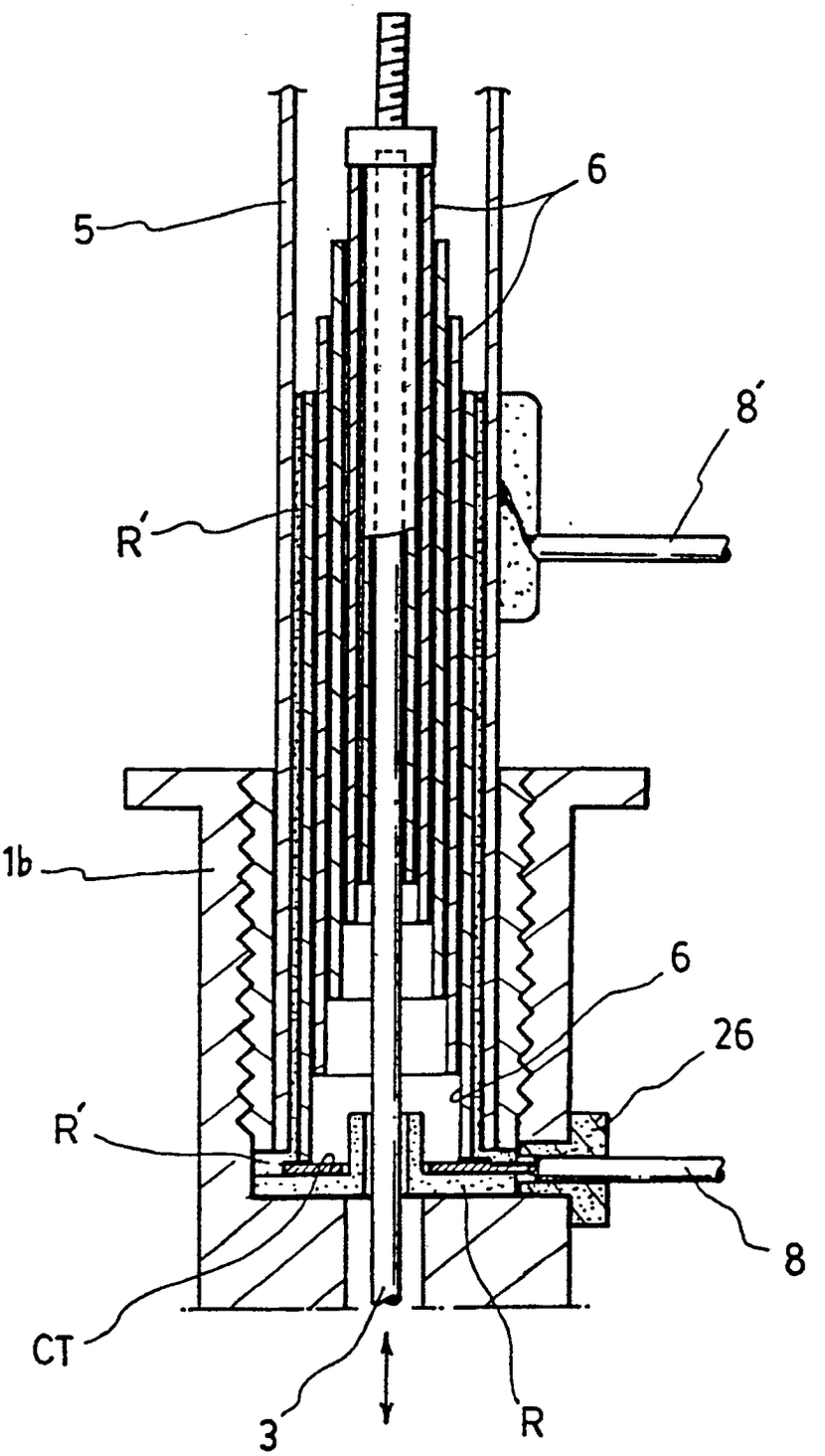


FIG. 9

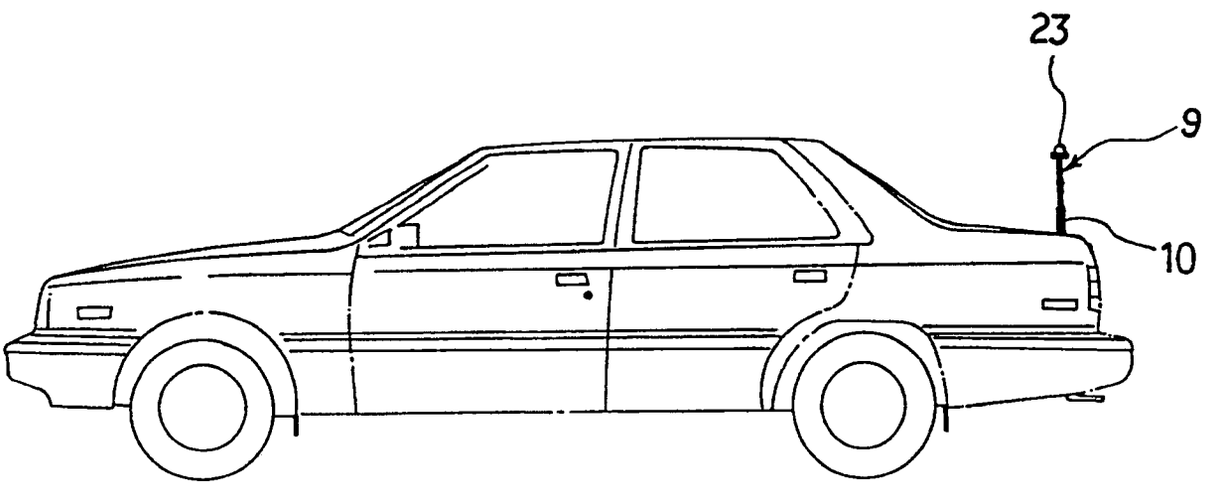


FIG.10

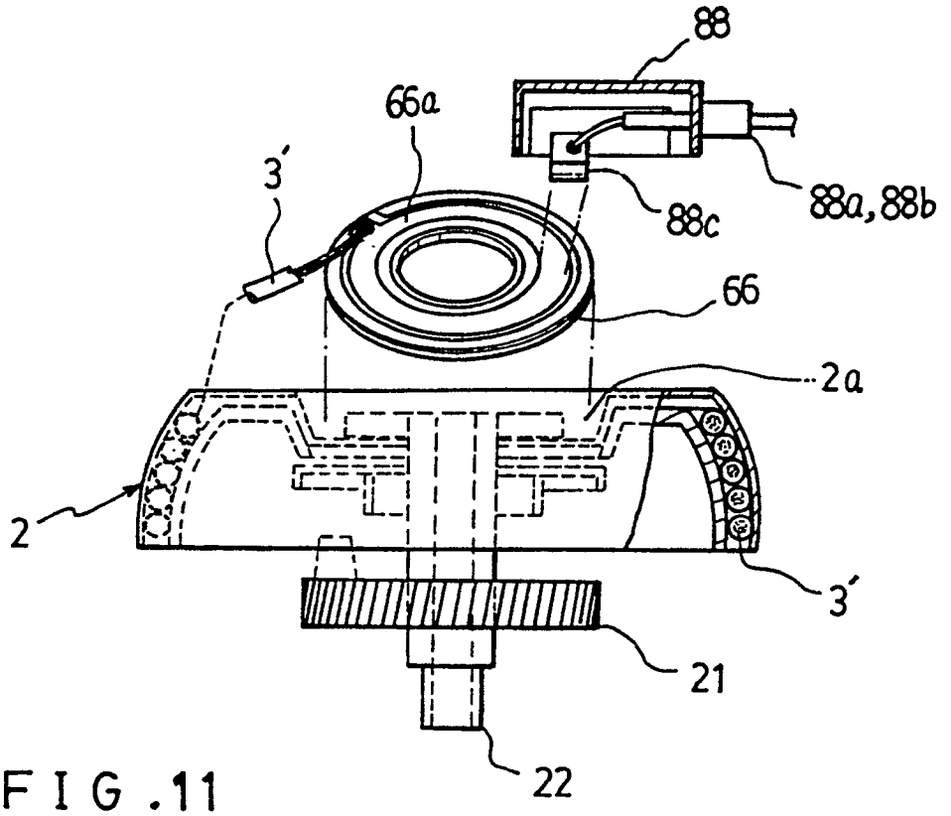


FIG.11

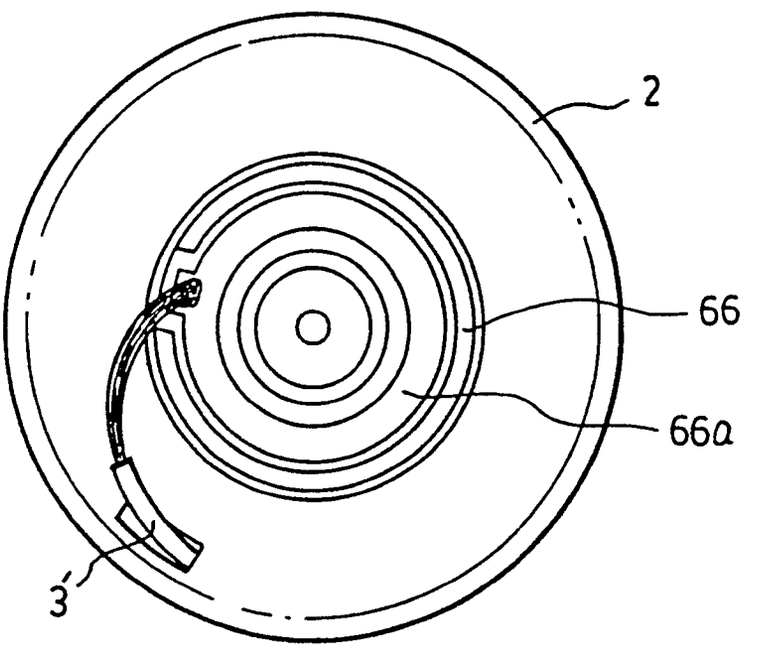


FIG. 12