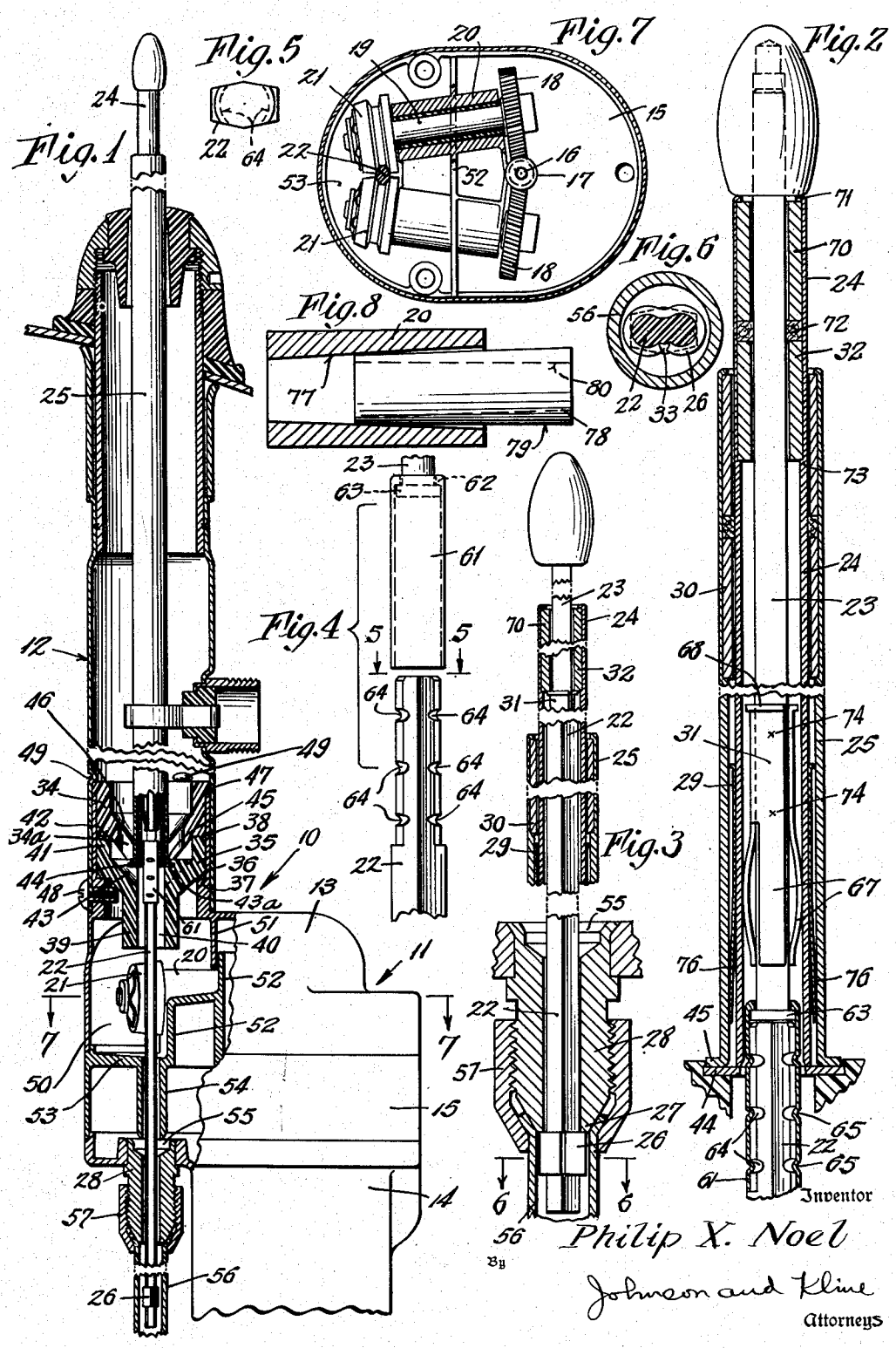
Nov. 11, 1952 P. X. NOEL 2,617,933

AUTOMOBILE ANTENNA

Filed Jan. 21, 1949 2 SHEETS—SHEET 1



Nov. 11, 1952 P. X. NOEL 2,617,933

AUTOMOBILE ANTENNA

Filed Jan. 21, 1949 2 SHEETS—SHEET 2

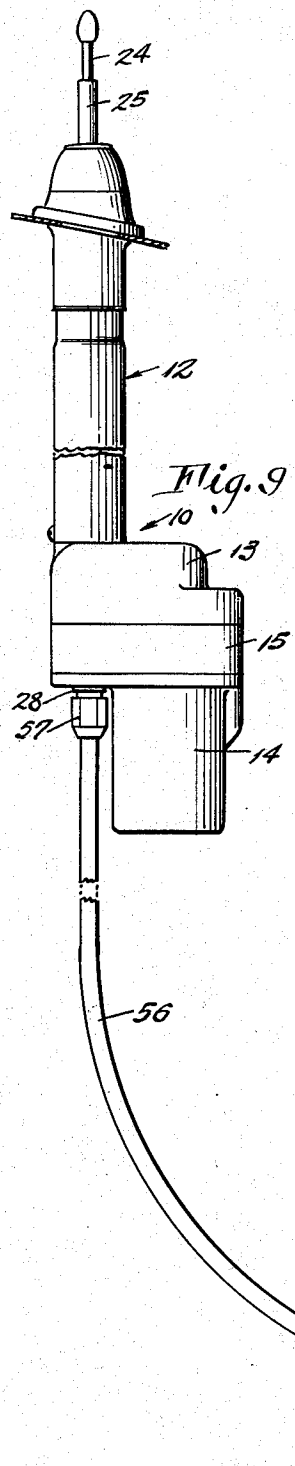
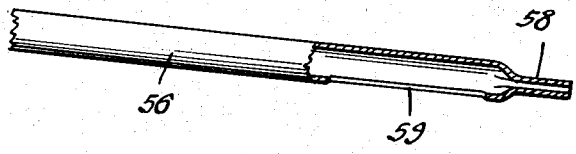
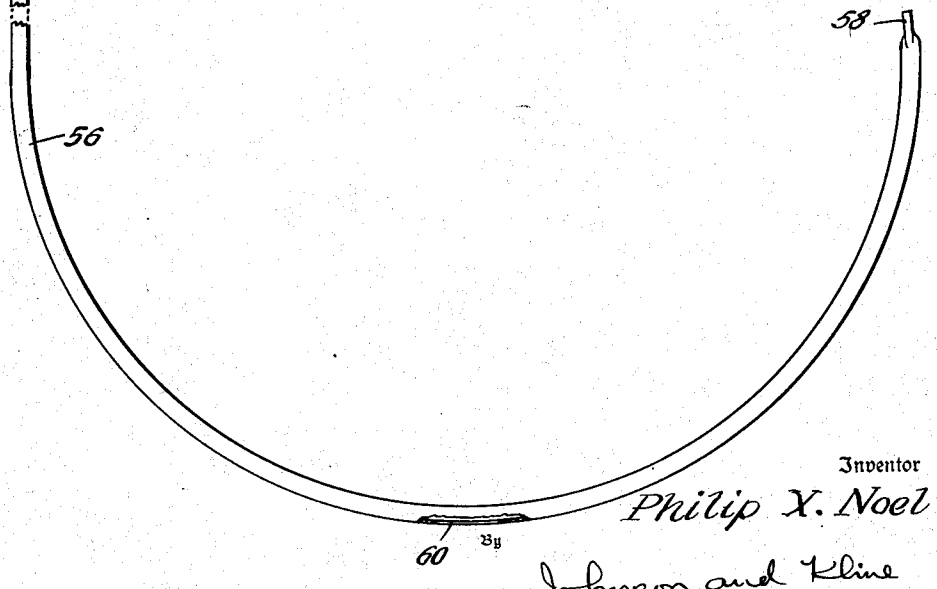


Fig. 9

Fig. 10





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Patented Nov. 11, 1952

2,617,933

UNITED STATES PATENT OFFICE

2,617,933

AUTOMOBILE ANTENNA

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Application January 21, 1949, Serial No. 71,905

7 Claims. (Cl. 250—33)

1

This invention relates to retractable and extendable telescopic radio antennas, as for example those used in automobiles and the like which are operable from within the car, and more particularly to antennas of this type which have actuating means comprising flexible push-pull rods or elements formed of dielectric material, connected to the antenna sections to raise and lower the same.

Antennas of the type mentioned have been very successful when using push-pull elements or strips formed of a synthetic fibre-forming polymeric amide, forms of which are known commercially as nylon. This material has proved to be extremely satisfactory from the electrical standpoint, since it enables the capacity of the antenna to be made advantageously low and to remain substantially uniform for all adjusted positions of the antenna sections. In these prior antennas the nylon driving strip, which was connected to the innermost antenna section, was disposed so as to extend through the other antenna sections when the antenna is extended, and this strip was subjected to considerable axial compression by the driving means therefor when the antenna was fully extended. The reason for this axial compression was that the antenna sections which were provided with stop means, were in combination with said means, arranged to determine the uppermost position or limit of the nylon push-pull strip by halting the upper extremity of the strip; the halting of the strip caused the latter in turn to halt or stall the power means driving the strip. This placed the strip in compression, and caused it to assume a wavelike shape having reverse bends, even though the strip was relatively closely confined by the outer tubular antenna sections which carry the innermost, driven section.

I had found that if the nylon push-pull or driving strip is allowed to remain in such a condition of axial compression, with reverse bends throughout its length, it will after a period tend to retain the bends formed therein, and this will adversely affect the operation of the antenna, especially where the driving strip is engaged and driven by oppositely-disposed friction wheels.

In accordance with the present invention, this difficulty is obviated. In accomplishing this, I provide an improved and novel stop means associated with the nylon push-pull strip itself and with the casing for the power means of the antenna; preferably this stop means comprises a collar fixedly carried by the free portion of the nylon driving strip adjacent the lower end thereof, cooperable and engageable with a stop or abutment on the antenna casing, the arrangement being such that the stop means comes into play just prior to the antenna sections attaining their uppermost extended positions. This feature is claimed in divisional application Serial No. 271,887 filed Feb. 16, 1953. By this organization the stop means and a relatively short portion of the nylon push-pull strip is made to assume practically all of the force resulting from halting or stalling of the power means, and the said force is one of tension rather than compression. The major portion of the driving strip, disposed within the outer, tubular antenna sections, is subjected to only a relatively small axial, compressive force which is insufficient to heavily load the strip and cause it to take a permanent set whereby reverse bends are made permanent and interfere with the driving of the strip.

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In prior antennas of the type mentioned the nylon driving strip when retracted was encased in a tubular metal sheath which was formed of soft aluminum and was hand bendable in various shapes to fit space requirements of different types of cars. This sheath acts as a cover and a guide for the nylon driving strip, and serves to protect it from dirt, etc.

A further object of the present invention is to provide a telescopic antenna of the above type, which has improved means for minimizing seepage of water into it, and for draining off water which might collect in the casing or antenna sections, or in the sheath in which the nylon driving strip is housed when the antenna is retracted, the said means operating to minimize the likelihood of dirt or other foreign matter entering the casing or sheath and interfering with the operation of the antenna.

In accomplishing this I provide a novel insulating means between the lower ends of the upright antenna casing and the stationary antenna section carried therein, which means holds the antenna section against lateral and longitudinal movement and at the same time provides for effective drainage of water out of the casing past the lower portion of the antenna section and into the protecting sheath for the nylon driving strip.

In the specific embodiment of the invention illustrated herein this means comprises bushings of electrical-grade plastic, securing between them a collar fixed to the lower end of the antenna section. The bushings and collar have passages to enable water within the casing to flow out and into the sheath for the driving ele-

ment. This organization is extremely economical to fabricate, has few parts, and may be easily and quickly assembled.

The tubular sheath for the nylon element is made long enough so that its remote end extends a substantial distance beyond the remote end of the nylon driving strip when the latter is retracted, and the remote end portion of the tubular sheath is provided with a series of apertures each of which is substantially smaller than the bore of the sheath. The openings are located beyond the end of the driving strip, and therefore any dust or dirt particles which might enter the openings would not be immediately deposited on the strip to interfere with its operation. The sheath has a downward pitch or slope, and water deposited in the sheath from the casing will flow out at its lower end, carrying any loose particles of dirt which might be present.

Where the sheath, in order to accommodate it to the space available in a particular installation, has to be bent so that a portion of it extends upright, it may be provided with openings at the lowermost point, to provide for drainage of water deposited in the sheath from the casing.

Another object of the invention is to provide an improved, mast-type automobile antenna arranged to be exposed to the weather, having actuating mechanism which, except for a portion thereof not greatly adversely affected by water, is effectively shielded and protected from seeping rain water which might enter the antenna casing past the mast sections.

In accomplishing this object I provide, in the specific embodiment of the invention illustrated herein, a casing having a body and an upright extension on the body, the mast sections of the antenna being slidable in said extension between lowered retracted and raised extended positions. The body of the casing carries means, including a mechanical power transmission having friction wheels, engaging the nylon driving strip for actuating the same. The body also has a liquid-tight partition forming compartments therein, and the friction driving wheels and nylon strip, which are not greatly adversely affected by water, are disposed in one of said compartments, said one compartment communicating with the upright extension of the body whereby rain water entering the extension past the mast sections may pass into said compartment. The compartment also has a drain whereby the said rain water is carried out of the compartment, the liquid tight partition in the casing preventing the water from entering the remainder of the casing body and contacting gear and motive means for the friction wheels, located in said remainder.

By this organization I have minimized the adverse effect which weather will have on the antenna, and therefore the operativeness and usefulness of the antenna will not be impaired by extended use or protracted exposure to the weather.

A further object of the present invention is to provide, for an antenna of the above type or for other mechanical devices or machines, improved bearings for shafts and the like, which may be very economically fabricated from cast and molded parts, and which requires a minimum of machining or finishing operations.

In the present antenna the improved bearings carry the shafts on which the friction driving wheels are mounted, and each bearing comprises a bearing block having a tapered bore, the said block being preferably formed of a die casting. Pressfitted in the tapered bore of the bearing block is a sleeve of deformable bearing material, preferably a synthetic fiber-forming polymeric amide such as nylon, the bore of the sleeve being substantially cylindrical or of uniform diameter throughout its length. The nylon sleeve is preferably molded, and when so formed has a tapered bore and a frustro-conical outside surface provided with an opposite taper, whereby the sleeve may be readily withdrawn from simple mold cavities. The tapers of the sleeve and of the bearing block are related to each other in such a manner that when the sleeve is pressfitted into the block with the large end of the bore in the sleeve foremost, the said foremost portion of the sleeve will be compressed and reduced in diameter to such an extent as to make the bore of the sleeve substantially cylindrical. As a consequence of this construction and method, I have found that it is not necessary to resort to subsequent machining and reaming operations in order to provide for a bore with a diameter sufficiently uniform to constitute a bearing for a shaft. Thus no machining is required in forming my improved bearing, but instead the bearing is merely fabricated from a die cast block and a molded sleeve which are pressfitted together.

A still further object of the invention is to provide, in an antenna as characterized above, an improved connecting means between the nylon driving strip and the antenna section which it actuates, whereby these two parts are securely held together in proper alignment and prevented from parting or separating during operation of the device.

Yet another object of the invention is to provide an antenna as above, having improved friction and stop means between the pairs of relatively movable antenna sections, whereby effective electrical contact is established at all times, whereby friction is maintained at a uniform value and whereby the likelihood of the sections binding or sticking one to the other is practically eliminated.

Other features and advantages will hereinafter appear.

In the accompanying drawings:

Figure 1 is a vertical sectional view through the improved telescoping antenna of the invention, part of the casing body being shown in elevation.

Fig. 2 is an enlarged fragmentary vertical section through the mast sections and upper portion or extension of the casing, showing the friction means between the mast sections and the connector between the innermost section and the nylon driving strip.

Fig. 3 is a fragmentary vertical section showing the parts of the antenna in fully extended position, the stop means carried by the nylon strip being shown abutting a portion of the casing and assuming most of the force exerted on the nylon strip by the power means.

Fig. 4 is a detail in elevation, of the adjacent portions of the nylon driving strip and the innermost antenna section, and of the connector sleeve for said portions prior to assembly of these parts.

Fig. 5 is a view taken on line 5—5 of Fig. 4.

Fig. 6 is a transverse sectional view taken on line 6—6 of Fig. 3.

Fig. 7 is a view partly in section and partly in plan, taken on line 7—7 of Fig. 1.

Fig. 8 is an enlarged plan view of a nylon bearing sleeve for a shaft on which a friction wheel is mounted; shown in section is a portion of the

bearing block for the sleeve, prior to the latter being press-fitted in the block.

Fig. 9 is an elevational view of the antenna, showing the sheath for the nylon driving strip arranged to have a low water-drainage portion intermediate its ends, and

Fig. 10 is a detail of the remote end of the sheath for the driving strip, said end being located lower than the remainder of the sheath.

Referring to Figs. 1 and 2 the improved antenna of the present invention comprises a casing 10 having a body portion 11 and, projecting upwardly from the portion 11, an upright extension 12.

The body portion 11 of the casing is preferably formed of die cast parts and consists of an upper part 13, a lower part 14, and an intermediate part 15 which is disposed between the upper and lower parts 13 and 14 respectively.

The lower part 14 of the casing may carry an electric motor (not shown) disposed on its end, the motor shaft 16 extending upward through the intermediate part 15 of the casing as shown in Fig. 7.

In order to actuate the mast sections of the antenna (to be described later) in response to movement of the motor shaft 16, the shaft carries a worm 17 engaging worm wheels 18 carried on shafts 19 passing through bearing blocks 20 formed integral with the intermediate casing part 15. The shafts 19 extend angularly to each other as shown in Fig. 7 and at their proximal ends mount friction wheels 21 engaging a nylon driving strip 22 which passes between the wheels, as pictured in Figs. 1 and 7.

Referring to Figs. 1 and 2, the upper end of the nylon driving strip 22 is connected with the lower end of the innermost antenna or mast section 23 of the antenna, to actuate this section. The mast section 23, which is preferably a solid rod, is slidably carried in a tubular mast section 24 which is in turn slidably carried in an outer mast section 25 rigidly mounted in the casing extension 12.

When the motive means which powers the shaft 16 is energized, rotation of the shaft 16 will cause the friction wheels 21 to turn, thereby raising or lowering the nylon driving strip 22 and in turn raising or lowering the antenna mast comprising the inner mast section 23 and intermediate mast section 24.

In accordance with the present invention an improved means is provided for limiting the upward movement of the mast sections whereby operation-interfering permanent deformation of the nylon driving strip is prevented. Heretofore, when the mast sections of prior antennas were raised by rotation of friction wheels engaging a nylon driving strip, all of the stops carried by the mast sections became engaged and halted the movement of the sections at their extended positions. Upon this occurring the friction wheels would slip and continue to rotate until the motive power was shut off, and this would cause the nylon driving strip to be held under susbtantial axial compression, and would result in the strip becoming bent within the confines of the mast sections 24 and 25, with slight reverse bends. Even after the motive power was deenergized, the nylon strip would remain under considerable compression and continue to stay bent, and I have found that this ultimately resulted in the strip being permanently deformed, adversely affecting the operation of the driving mechanism.

According to the present invention, however, I provide a stop collar 26 on the lower portion of the nylon driving strip 22, the said collar being adapted to engage and abut the lower end portion 27 of a tubular fitting 28 which is secured to the lower part 14 of the antenna casing 11 (through which casing the nylon strip 22 extends) just prior to all the mast sections becoming fully extended. In other words, as shown in Fig. 3, when the antenna mast sections are raised, the stop collar 26 engages the fitting 28 just prior to stops on the mast sections becoming all operative. In Fig. 3 it will be seen that the intermediate antenna section 24 carries on its lower end a stop collar 29 which may abut a cooperable bushing 30 provided in the upper portion of the outer mast section 25. Also, the inner mast section 23 carries a stop collar 31 which may engage a cooperable bushing 32 carried in the upper portion of the intermediate mast section 24. It will be seen that when the antenna mast sections approach their fully raised positions, the stop collar 31 of the section 23 may engage the cooperable bushing 32 of the mast section 24, or the collar 29 may engage the bushing 30, but under no circumstances could both collars be made to respectively engage both bushings at one time, since the stop collar 26 on the nylon driving strip 22 will always first engage the lower end portion 27 of the fitting 28. Thus the major portion of the force exerted on the nylon driving strip 22 as the friction wheels 21 continue to rotate subsequent to halting of the antenna sections is a tensile stress and is carried by that portion of the nylon driving strip disposed between the friction wheels 21 and the stop collar 26; this stress tends to straighten the said portion of the strip, and to not cause any bends to be formed. The portion of the nylon driving strip extending between the friction wheels 21 and the lower end of the inner mast section 23 is of course under a certain amount of compressive stress. However, this stress is considerably less than that heretofore encountered in driving strips of prior antenna constructions, and is due mainly to the weight and friction of the mast sections, and not to engagement of all of the cooperable stops of said sections. Therefore, there will be much less tendency for the nylon driving strip 22 to be permanently deformed with reverse bends, as was heretofore found to occur.

Referring to Fig. 6, the collar 26 is preferably formed from a straight strip of metal bent into a shape somewhat like an open figure 8, the collar being disposed in a transverse groove 33 provided in the lower portion of the nylon driving strip 22. The construction of the stop collar 26 and its application to the nylon driving strip 22 may thus be economically accomplished.

In accordance with the present invention improved means are provided for confining and draining off rain water which might seep into the casing 10 past the mast sections 23 and 24, so that such rain water can not accumulate or adversely affect the operation of the driving mechanism or other parts of the antenna. In accomplishing this result, the casing 10 is provided with a pair of electrically insulating bushings 34 and 35, preferably of thermoplastic resin such as polythene, electrical grade, carried in the lower portion of the casing extension 12. The bushing 35, which is the lowermost of the two, has a downwardly facing shoulder 36 engaging an internal annular shoulder 37 in an upright tubular extension 38 projecting upward from and form-

ing an integral part of the uppermost casing part 13. The bushing 35 has a downwardly extending skirt 39 which projects into the casing part 13, and has a central bore 40 through the skirt, through which bore the nylon driving strip 22 passes. The upper portion of the bushing 35 is formed like a cup, having a circular flange or lip 41 engaged by a downwardly facing shoulder 42 on the bushing 34 whereby the latter is supported and positioned by the lower bushing. Within the flange 41 the bushing 35 has a plurality of alternately arranged slots 43 and ribs 43a the latter carrying a metal washer 44 on which the lower end of the mast section 25 of the antenna rests.

As shown in Fig. 1 the mast section 25 at its lower end has an outturned flange 45 engaging the washer 44; the upper surface of the flange 45 is engaged by a conical center portion 46 of the bushing 34 whereby the mast section 25 is rigidly retained in the position shown. The bushing 34 has a circular flange 47 engaging the top edge of the extension 38 of the casing part 13, to further provide for accurately positioning the bushing.

The extension 12 of the casing 10 comprises a metal tube the lower portion of which surrounds the upright portion 38 of the casing part 13 and is secured thereto by screws 48 as shown. Nibs 49 are formed in the metal tube comprising the extension 12, to engage the upper edge of the bushing 34 and securely lock the bushing against axial movement.

Rain water which may enter or seep into the top of the casing extension 12 past the mast section 25 will fall to the bushing 34 and flow into the bore and conical portion 46 thereof, said portion having openings 34a whereby the water will pass downwardly through the bushing and into the cup-like portion of the lower bushing 35. The water will then flow through the slots 43 and bore 40 of the lower bushing 35, and drop into a chamber or compartment 50 in the casing 10. The chamber 50 is formed by a depending partition 51 in the upper casing part 13, and by an upwardly extending partition 52 in the intermediate casing part 15, the lower and upper edges of the partitions respectively being juxtaposed and overlapping as shown in Fig. 1. The casing part 15 has a horizontal wall 53 joined to the partition 52, and has a tubular depending portion or duct 54 supported by the wall 53, said duct extending close to a cup-shaped top portion 55 of the fitting 28 secured in the casing part 14. It will be seen that by this construction moisture or rain water which is deposited in the cavity 50 of the casing 10 may flow downward through the duct 54 and be deposited in the cup-like portion 55 of the fitting 28. From here the rain water may pass through the bore of the fitting 28 into a sheath 56 which is secured to the fitting by a nut 57 and which houses or encloses the nylon driving strip 22 almost in its entirety when the strip is in its lowermost position.

From Figs. 1 and 2 it will be noted that rain water which seeps into the intermediate mast section 24 past the inner mast section 23, may pass downward through the mast sections 24 and 25 past the nylon strip 22 and be discharged from the bore 40 of the bushing 35 into the cavity 50 of the antenna casing.

The sheath 56 is preferably formed of soft aluminum tubing which may be readily bent by hand to accommodate it to various space requirements of a particular installation, see Fig. 9.

Referring to Fig. 10 the remote end or extremity 58 of the sheath 56 is flattened to constrict the opening thereof, and a slot 59 is provided in the sheath adjacent the end 58. The slot 59 and the flattened end 58 function as drain openings, and enable rain water which passes into the sheath to readily drain out.

The sheath construction shown in Fig. 10 is employed where the remote end or extremity 58 of the sheath is lower than the remainder; where an intermediate portion of the sheath is lower than the extremity 58 or than other portions of the sheath, as shown in Fig. 9, a slot 60 may be provided in said intermediate portion for drainage purposes.

In accordance with the present invention an improved, economical yet extremely effective connector means is provided between the nylon driving strip 22 and the innermost antenna mast section 23. This means comprises a metal sleeve 61 having an inturned flange 62 at its upper end engaging a shoulder 63 provided on the lower extremity of the mast section 23. The sleeve 61 extends over the upper end of the driving strip 22, which end is of reduced cross section as shown in Fig. 4 and has a plurality of opposite disposed notches 64, and the sleeve 61 is dimpled to provide nibs 65 extending into the notches 64 whereby the sleeve is securely locked to the upper extremity of the strip 22. Preferably the sleeve 61 is formed of a drawn shell, the bottom of which is blanked out, and I found that a connector so formed is economical to fabricate, and provides an extremely sturdy and satisfactory connection between the strip 22 and rod 23.

By the present invention improved friction and stop means are provided on the mast sections 23 and 24 whereby a uniform friction is maintained between the various sections of the antenna and whereby effective electrical contact is established while at the same time the sections are prevented from separation, one from the other, when extended.

Referring to Fig. 2 this improved friction and stop means comprises the sleeve 31 encircling the lower portion of the innermost mast section 23, the said sleeve having a plurality of bowed spring fingers 67 engaging the inner surface of the intermediate mast section 24. At its top edge the sleeve 31 has an oututnred flange 68 adapted to act as an abutment for engagement with the bushing 32 carried within the upper portion of the mast section 24. The said upper portion of the mast section 24 also carries a second bushing 70 which is retained in place by turning in a flange 71 at the top extremity of the mast section. Between the bushings 32 and 70 a felt packing washer 72 is provided. As shown in Fig. 2, the lower bushing 32 rests against an internal annular shoulder 73 formed in the upper portion of the mast section 24 by reaming out the inside of said section to a slightly larger diameter.

Preferably the stop sleeve 31 is formed from sheet metal, being first blanked out to proper outline and then rolled into cylindrical shape. The sleeve 31 after being applied to the mast section 23 is welded thereto at a plurality of points 74, as indicated in Fig. 2. The sleeve 29 of the intermediate mast section 24 has friction fingers 76 and is generally similar to the sleeve 31 with the exception that the fingers 76 are now bowed, but are merely biased outward.

According to the present invention an improved economical-to-fabricate bearing means is provided for the shafts 19 which carry the friction wheels 21. Referring to Figs. 7 and 8, the bearing block 20 in which the shafts 19 are car-

ried is provided with a tapered bore 77, and a bushing 78 having a tapered outside surface 79 and a substantially tapered bore 80 is pressfitted in the bearing block 20. The bushing 78 is formed of a deformable bearing material such as a fibre-forming polymeric amide commonly known as nylon, and the bushing is so proportioned and shaped, with respect to the bearing block, that when it is forced into the block with the large end of the bore 80 foremost, the foremost end of the bushing will be compressed and reduced in diameter to such an extent that the conical bore 80 will be made substantially cylindrical.

I have found that the bore 77 of the bearing block 20 may advantageously have a taper, measured with respect to the axis of the block, on the order of .0015" per inch of length, and that the bushing 78 may advantageously have a taper of .002" per inch of length on its outside, measured with respect to the axis of the bushing, and a taper of .005" per inch of length in its bore, measured with respect to the axis, the wall thickness of the bushing being approximately 3/64 of an inch. The bearing block 20 may be economically fabricated from a die casting, and the bearing bushing 78 economically fabricated as a molded part, said block and bushing not required machining or finishing operations. After the molding of the bushing 78 and the casting of the block 20, the bushing may be readily pressfitted into the block, whereuon the tapered bore of the bushing will become substantially cylindrical and provide a satisfactory bearing surface for the shaft 19.

Variations and modifications may be made within the scope of this invention and portions of the improvements may be used without others.

I claim:

1. In an automobile antenna arranged to be exposed to the weather, an elongate upright tubular casing; a tubular upright stationary antenna section disposed axially in the casing; a mast section axially slidable in said stationary section between lowered retracted and raised extended positions; insulating means at the top of the casing, holding the stationary antenna section in spaced relation to the casing; a second insulating means at the bottom of the casing, holding the stationary antenna section in spaced relation in the casing against lateral movement, said second means having a passage to enable liquid within the casing to flow past the lower portion of the stationary antenna section; a flexible push-pull driving strip connected to said mast section to actuate the same, said strip projecting downward away from the casing when the mast section is retracted; driving means carried by the casing, operable to axially advance and retract the strip to raise and lower said mast section; and a tubular sheath extending downward from said casing and communicating with the interior thereof below the second insulating means, said sheath housing the projecting portion of the strip and at its remote end extending appreciably beyond the remote end of the strip when the later fully retracts the mast section, said sheath having an opening adjacent its remote end, located beyond the remote end of the strip whereby drainage of liquid from the sheath is provided for, and whereby the likelihood of dirt from outside the sheath reaching the said strip is minimized.

2. In an automobile antenna arranged to be exposed to the weather, an elongate upright tubular casing; a tubular upright stationary antenna section disposed axially in the casing; a mast section axially slidable in said stationary section between lowered retracted and raised extended positions; insulating means at the top of the casing, holding the stationary antenna section in spaced relation to the casing; a second insulating means at the bottom of the casing, holding the stationary antenna section in spaced relation in the casing against lateral movement, said second means having a passage to enable liquid within the casing to flow past the lower portion of the stationary antenna section; a flexible push-pull driving strip connected to said mast section to actuate the same, said strip projecting downward away from the casing when the mast section is retracted; driving means carried by the casing, operable to axially advance and retract the strip to raise and lower said mast section; and a tubular sheath extending downward from said casing and communicating with the interior thereof below the second insulating means, said sheath housing the projecting portion of the strip and at its remote end extending appreciably beyond the remote end of the strip when the latter fully retracts the mast section, said sheath having an opening beyond the remote end of the strip, and having an open end, said opening and end having a smaller dimension than the bore of the sheath whereby drainage of liquid from the sheath is provided for, and whereby the likelihood of dirt from outside the sheath entering the latter and reaching the said driving strip is minimized.

3. In an automobile antenna having an elongate upright tubular casing, a tubular upright stationary antenna section disposed axially in the casing; a mast section axially slidable in said stationary section between lowered retracted and raised extended positions; insulating means at the top of the casing, holding the stationary antenna section in spaced relation to the casing; and insulating means at the bottom of the casing, holding the stationary antenna section in spaced relation in the casing against lateral and longitudinal movement, said last-named means comprising a flange on the lower end of the antenna section, and comprising a pair of bushings in the lower end of the casing, engaging opposite faces of said flange, said bushings having passages to enable liquid within the casing to flow past the lower portion of the stationary antenna section, and said casing having an opening in its bottom to enable said liquid to be discharged therefrom.

4. In an automobile antenna arranged to be exposed to the weather, a casing; an antenna section slidable in the casing between lowered retracted and raised extended positions, said section having a sliding fit in the casing susceptible of admitting rain water into the casing in small quantities; a push-pull driving strip connected to said section to actuate the same, said strip projecting downward from the casing when the antenna section is retracted; a driving motor; driving means connected thereto and having a portion not greatly adversely affected by water, engageable with the driving strip for actuating the same to lower and raise the antenna section; a housing for said driving means, connected with said casing; partition means forming a compartment in said housing, containing said portion of the driving means, said casing having means providing for passage of rain water into said compartment, and the latter having means for

draining off said rain water whereby the remainder of said driving means is shielded from contact with said water.

5. In an automobile antenna arranged to be exposed to the weather, a casing having a body and an upright extension on said body; an antenna section slidable in said extension between lowered retracted and raised extended positions; a push-pull driving strip connected to said section to actuate the same; means including a mechanical power transmission having friction drive wheels, carried in the body of the casing, said wheels engaging the push-pull driving strip to actuate the same, said casing body having a liquid-tight partition forming compartments therein, and said wheels being disposed in one of said compartments and being not greatly adversely affected by water; means providing for passage of rain water from the casing extension into said one compartment, said means including a bushing at the bottom of the extension, having an apertured tapered center portion through which said driving strip extends, said center portion extending downward whereby rain water passing through the bushing flows along the underside thereof towards its center and towards said driving strips; and means providing for drainage of said rain water from said one compartment, the liquid-tight partition of the casing preventing said rain water from entering the remainder of the casing body and contacting the remainder of said transmission.

6. In an automobile antenna arranged to be exposed to the weather, an upright casing; a mast section projecting upward from the casing and slidable therein between lowered retracted and raised extending positions, said section having a sliding fit in the casing susceptible of admitting rain water into the casing in small quantities; a flexible push-pull driving strip connected to the bottom of the mast section to actuate the same, said strip passing through a funnel-like portion and projecting downward away from the casing when the mast section is retracted; driving means carried within the casing, operable to axially advance and retract the strip to raise and lower the mast section; a hand-bendable tubular sheath extending downward from the bottom of the casing; means connecting said sheath to the casing to communicate with the casing interior, said sheath housing the projecting portion of the strip, said casing having a downwardly sloping portion leading to the tubular sheath, the remote end of the sheath extending appreciably beyond the remote end of the strip when the latter fully retracts the antenna mast section, and said sheath having an opening in its lowermost portion, said opening having a smaller dimension than the bore of the sheath whereby drainage of rain water from the sheath is provided for, and whereby the likelihood of dirt from outside the sheath entering the latter and reaching the said driving strip is minimized.

7. In an automobile antenna arranged to be exposed to the weather, an elongate, upright casing; an antenna section slidable in the casing between lowered retracted and raised extended positions, said section having a sliding fit in the casing susceptible of admitting rain water into the casing in small quantities; means including a mechanical power transmission having driving gears and antenna drive members actuated thereby, connected with the antenna section for actuating the same; a housing connected with the lower part of the casing and enclosing said transmission, said housing having a dividing partition forming compartments therein separating the gears and drive members, and said antenna drive members being not greatly adversely affected by water, extending into one of said compartments; means providing for passage of rain water from the casing into the said one compartment of the housing; and means providing for drainage of said rain water from said one compartment, the driving partition of the housing preventing said rain water from entering the remainder of the housing and contacting the remainder of said transmission.

PHILIP X. NOEL.

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2,509,563	Grashow	May 30, 1950