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(54) **Joint for an automobile antenna**

(57) Joint, in particular to attach an antenna (50) of an automobile or other type of vehicle. The antenna (50) has an internal core (12) able to support a radio signal acquisition element (26) and an external covering (13). The joint comprises an attachment part (14) able to allow the external covering (13) to be fastened to the joint, a containing part (17) able to contain at least part of the

internal core (12) and of the acquisition element (26) and a connection part (15) able to allow the antenna (50) to be connected to the bodywork of the automobile. Said attachment part comprises a substantially cylindrical central body (16) having a longitudinal axis and peripherally having a plurality of teeth (18) angularly distanced from each other around said longitudinal axis.

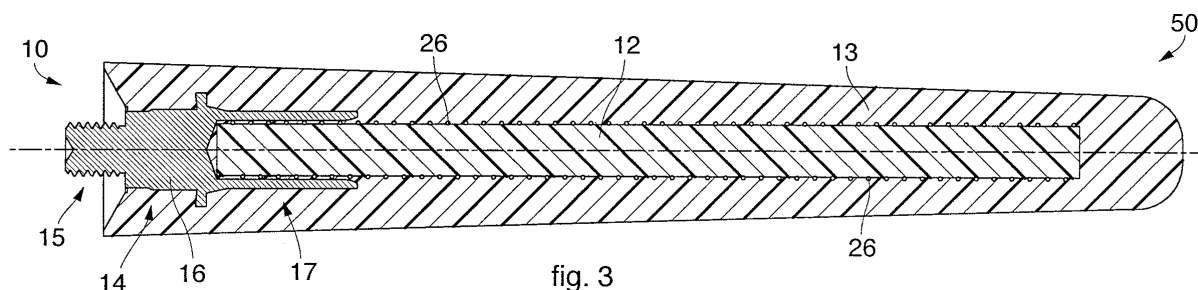


fig. 3

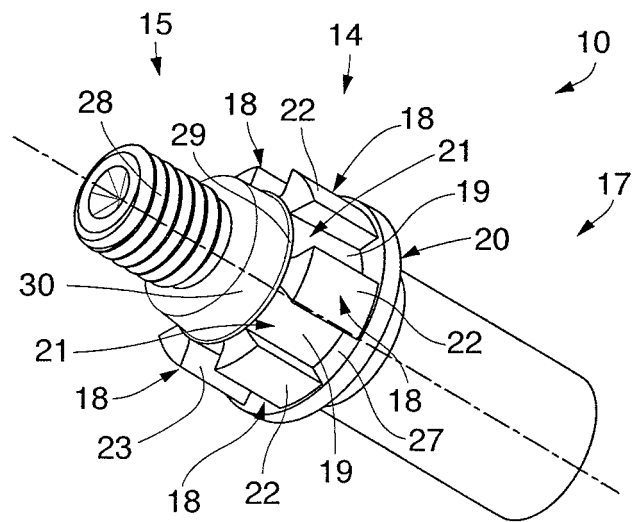


fig. 4

Description

FIELD OF THE INVENTION

[0001] The present invention concerns a joint inserted in an antenna to attach the antenna in particular, but not only, to the bodywork of an automobile or other type of vehicle, for example on the roof.

[0002] The antenna is connected to a car radio, so as to allow radio transmissions to be received and heard inside the automobile.

BACKGROUND OF THE INVENTION

[0003] It is known to apply antennas on the bodywork of an automobile, such as for example on the roof, to capture electromagnetic waves that identify radio frequencies and thus allow the user, when inside the automobile, to listen to radio stations by means of a car radio installed inside the automobile.

[0004] The antenna is therefore a device that makes radiocommunications possible, that is, non-cabled distance communications, also called wireless communications, and which exploits as a transmitter mean the free space through respective telecommunication systems.

[0005] The antenna is able to convert, or rather, transduce, the electromagnetic field that it receives into an electric signal, acting as an interface between the radio channel and the electronic transmission part that connects it to the car radio.

[0006] Normally, an antenna of this type consists of a rod, or internal core, made of fiberglass, with the function of guiding and supporting a spring for the acquisition of the radio signal, and of an external covering made of rubber. The antenna is normally connected to a connection articulation attached to the bodywork of the automobile to allow a certain movement, for example it can be lowered to be completely flush with the roof.

[0007] The connection articulation usually comprises a threaded part able to couple with the corresponding threaded part of a joint solid with the antenna.

[0008] The joint can have a variable geometry depending on the case, such as for example a longitudinal development with a substantially square or hexagonal section. However, in the joint of a known type, although it can have different geometries depending on the case, the external covering made of rubber can easily come unscrewed, and this can compromise the integrity of the antenna in the long term.

[0009] Since it is normally made of steel, another disadvantage of the joint is its weight, which constitutes a large part of the overall weight of the antenna. Furthermore, the joint used in the state of the art has the disadvantage that it is particularly expensive, especially due to the disadvantages deriving from the working processes used to obtain it.

[0010] In fact, the state of the art and the machine tools known in the state of the art currently available allow to

obtain the joint using working processes such as chip removal, thus entailing an excessive use of material.

[0011] Furthermore, although there are different geometries available, the working method using chip-removal limits the range of geometries available, reducing them especially to the two described above.

[0012] One purpose of the present invention is to obtain a joint for an automobile antenna in which the external covering made of rubber does not easily come unscrewed, guaranteeing the integrity of the antenna in all conditions of use and over time.

[0013] Another purpose of the present invention is to obtain a light and economical joint.

[0014] Another purpose is to perfect a method that allows to obtain the joint with the characteristics described above.

[0015] The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

[0016] The present invention is set forth and characterized in the independent claims, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

[0017] In accordance with the above purposes, a joint, which overcomes the limitations of the state of the art and eliminates the defects therein, is used to attach, in particular but not only, an antenna to the bodywork of an automobile, or other type of vehicle, so as to be able to capture the electromagnetic waves of a radio signal.

[0018] The antenna comprises an internal core, for example made of fiberglass, able to support an element for the acquisition of the radio signal, such as for example a spring. The antenna also comprises an external covering to protect it from atmospheric agents.

[0019] The joint is disposed at the end of the antenna and comprises an attachment part able to fasten the external covering to the joint, a containing part able to contain at least part of the internal core and the spring, and a connection part able to allow to connect the antenna to the bodywork of the automobile.

[0020] According to one aspect of the present invention, the attachment part comprises a substantially cylindrical central body on the periphery of which a plurality of teeth are disposed, angularly distanced from each other, to define an attachment cavity between two adjacent teeth.

[0021] The cylindrical body has a longitudinal axis around which the joint is able to rotate when it is screwed into an attachment articulation solid with the bodywork.

[0022] This configuration with peripheral teeth defines a plurality of protuberances which guarantee the external covering is fastened to the joint, so as to prevent it from coming unscrewed under any condition of use.

[0023] Each attachment cavity is delimited at the lower

part by at least one curved surface corresponding with the continuation of the base of the tooth and, laterally, by two lateral surfaces, facing each other, of two adjacent teeth.

[0024] By "at the lower part" we mean the part nearest the longitudinal axis of the cylindrical body, that is, the base of the attachment cavity. All the curved surfaces belong to the same virtual cylindrical surface.

[0025] According to one aspect of the present invention, the central attachment part comprises a flange disposed around and substantially orthogonal to the longitudinal axis of the cylindrical body and in cooperation with at least one of the teeth.

[0026] The flange defines another fastening element for the material that makes up the rubber external covering.

[0027] The antenna is normally made using an injection operation. When the material of the rubber external covering is injected into a mold to make the antenna, it tends to occupy all the spaces or cavities delimited by the profile of the joint which, given their suitable conformation, clamp its position.

[0028] According to one aspect of the present invention, the joint in question is made of aluminum, with a consequent advantage in terms of weight.

[0029] The joint may also comprise a surface covering that guarantees protection from corrosion due to the passage of electric current, even if only a small amount, generated by the radio signal acquisition element.

[0030] The surface covering can be obtained by means of a suitable nanotechnology process, which at the same time guarantees conductivity of the joint and transmission of the radio signal.

[0031] According to one aspect of the present invention, the method to produce the joint according to the present invention provides cold molding operations.

[0032] This allows to obtain advantages in terms of the quantity of material used, since this procedure avoids producing chip, and hence excess material.

[0033] One of the functions of the joint is to contain or support the internal core together with the radio signal acquisition element. The containing part comprises a cavity in which the internal core is able to be inserted.

[0034] The connection part comprises connection means for connection with the attachment articulation.

[0035] An antenna also comes within the spirit of the invention, having a joint comprising a plurality of teeth, disposed peripherally and angularly adjacent to each other around a longitudinal axis, also defining an attachment cavity between two adjacent teeth.

BRIEF DESCRIPTION OF THE DRAWINGS

[0036] These and other characteristics of the present invention will become apparent from the following description of one form of embodiment, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a schematized view of an automobile comprising an antenna attached to the bodywork by means of a joint according to the present invention;
- fig. 2 is a perspective view of the antenna in fig. 1 having a joint according to the present invention;
- fig. 3 is a longitudinal section of the antenna in fig. 2;
- fig. 4 is a perspective view of the joint in fig. 3;
- fig. 5 is a longitudinal section of the joint in fig. 4.

DETAILED DESCRIPTION OF ONE FORM OF EMBODIMENT

[0037] With reference to fig. 1, an antenna 50 is attached to the bodywork of the roof of an automobile 60 by means of an attachment articulation 11.

[0038] The antenna 50 is able to capture the electromagnetic waves to convert them into an electric signal, acting as an interface between the radio channel and the electronic transceiver part.

[0039] The antenna 50 comprises a joint 10 (figs. 2 and 3) able to be connected to the attachment articulation 11, to attach the antenna 50 to the bodywork of the automobile 60.

[0040] The joint 10 has a conformation such as to contain part of an internal core, in this case a fiberglass rod 12, the function of which is to guide a radio signal acquisition element, in this case a spring 26 wound around the fiberglass rod 12.

[0041] An external covering 13 made of rubber surrounds the joint 10 and the fiberglass rod 12, acting as a protection against atmospheric agents, for example.

[0042] The joint 10 comprises a central attachment part 14 which guarantees the attachment of the external covering 13 to the joint 10, a connection part 15 to connect the antenna 50 to the attachment articulation 11, and a containing part 17 to contain part of the fiberglass rod 12.

[0043] The external covering 13 surrounds all the joint 10 except the connection part 15.

[0044] The use of fiberglass for the rod 12 is justified by the fact that it has excellent properties such as for example lightness, solidity and resistance to stress.

[0045] The central attachment part 14 has a cylindrical central body 16 on the periphery of which a plurality of teeth 18 are made, equidistant angularly and each having a longitudinal development parallel to an axis X, which represents the longitudinal axis of the joint 10 which is the axis of rotation when it is screwed into the attachment articulation 11. The teeth 18 have a cross section with a substantially segmented profile and are separated at intervals, at their base, by curved surfaces 19. Furthermore, the teeth 18 cooperate with a central flange 20.

[0046] Each tooth 18 has an external surface 22 which, together with the external surfaces 22 of the other teeth 18 defines a circumference. The conformation of the teeth 18 is such as to create a plurality of attachment cavities 21, each defined between two adjacent teeth 18, angularly equidistant and suitable to contain the material that makes up the rubber external covering 13. The at-

tachment cavities 21 are therefore delimited laterally by two lateral surfaces 23 belonging to two adjacent teeth 18.

[0047] The flange 20 is prepared so as to generate an orthogonal surface 27 with respect to the curved surface and constitutes another fastening element for the rubber external covering 13.

[0048] The central attachment part 14 also comprises a bevel 29 that connects the curved surface 19 to a front cylindrical surface 30.

[0049] The bevel 29 is able to create another attachment condition for the rubber of the external covering 13.

[0050] The presence of the teeth 18, flange 20 and bevel 29 defines protuberances able to create the conditions for an optimum fastening of the rubber that makes up the external covering 13.

[0051] The containing part 17 has a containing hole 33 able to contain one of the ends of the fiberglass rod 12 and part of the spring 26.

[0052] The connection part 15 has a threading 28, able to screw into a threaded hole, not shown in the drawings, belonging to the attachment articulation 11 for attachment to the bodywork of the automobile 60.

[0053] It is clear that modifications and/or additions of parts may be made to the joint 10 as described heretofore, without departing from the field and scope of the present invention. It is also clear that, although the present invention has been described with reference to some specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of joint, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.

Claims

1. Joint, in particular to attach an antenna (50) of an automobile (60) or other type of vehicle, said antenna (50) having an internal core (12) able to support a radio signal acquisition element (26) and an external covering (13), the joint comprising an attachment part (14) able to allow said external covering (13) to be fastened to said joint, a containing part (17) able to contain at least part of said internal core (12) and of said acquisition element (26) and a connection part (15) able to allow the antenna (50) to be connected to the bodywork of said automobile (60), wherein the external covering (13) surrounds all the joint (10) except said connection part (15), **characterized in that** said attachment part (14) comprises a substantially cylindrical central body (16) having a longitudinal axis (X) and peripherally having a plurality of teeth (18) angularly distanced from each other around said longitudinal axis (X), an attachment cavity (21) being defined between lateral surfaces (23) of two adjacent teeth (18), wherein each of said teeth (18) has an external surface (22) which, togeth-

er with the external surfaces (22) of the other teeth (18), defines a circumference.

2. Joint as in claim 1, **characterized in that** said central attachment part (14) comprises a flange (20) disposed around and substantially orthogonal to the longitudinal axis (X).
3. Joint as in claim 1 or 2, **characterized in that** said flange (20) cooperates with at least one of said teeth (18).
4. Joint as in any claim hereinbefore, **characterized in that** each of said teeth (18) has a cross section having a substantially segmented profile.
5. Joint as in any claim hereinbefore, **characterized in that** said teeth (18) are separated at intervals, at their base, by curved surfaces (19) and **in that** said central attachment part (14) comprises a bevel (29) that connects each curved surface (19) with a front cylindrical surface (30).
6. Joint as in any claim hereinbefore, **characterized in that** it is made of aluminum.
7. Joint as in claim 6, **characterized in that** it comprises a surface covering suitable to protect against the effects of corrosion.
8. Joint as in claim 7, **characterized in that** said surface covering is obtained by means of nanotechnology treatment.
9. Antenna comprising a joint as in any claim hereinbefore.

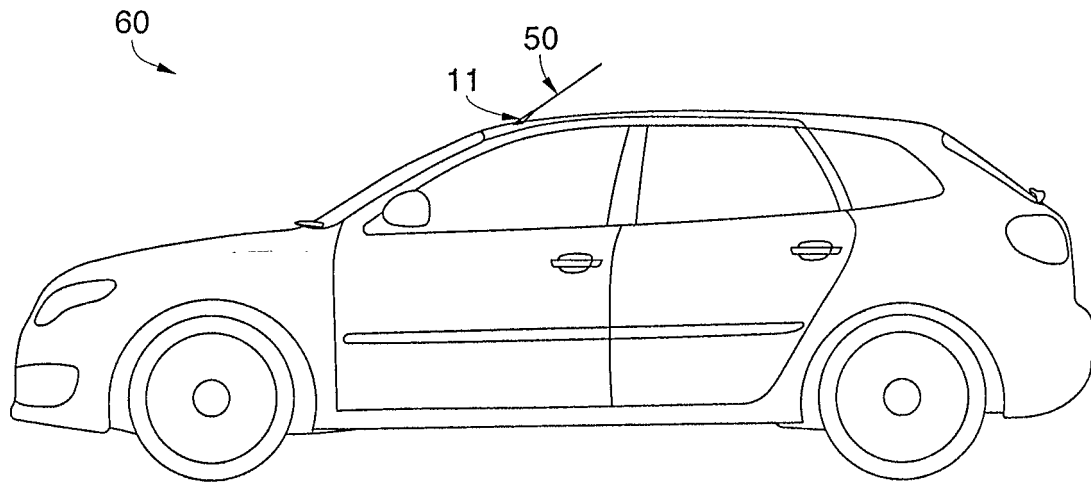


fig. 1

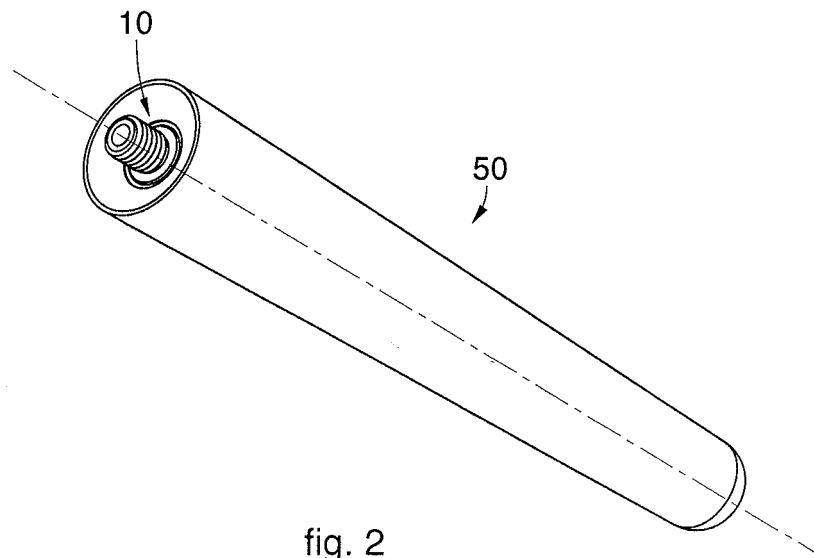


fig. 2

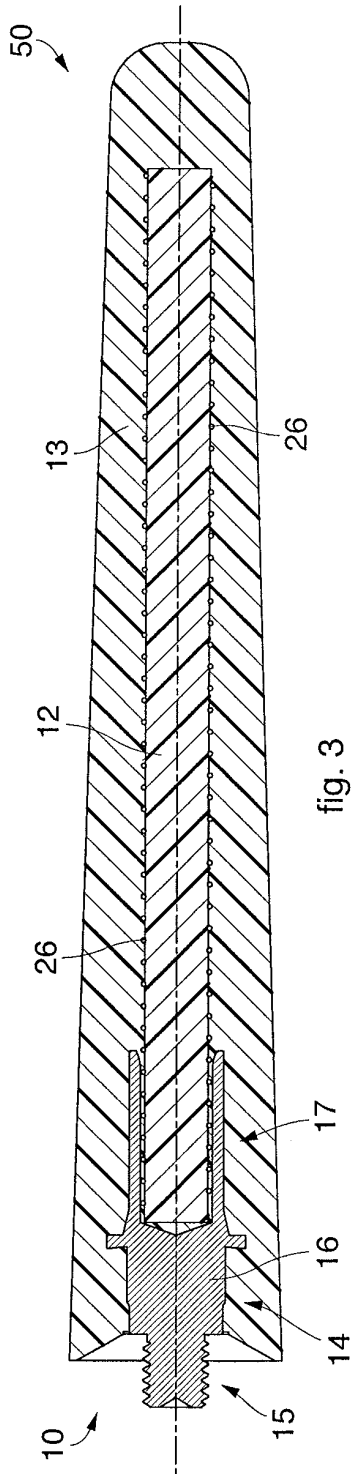


fig. 3

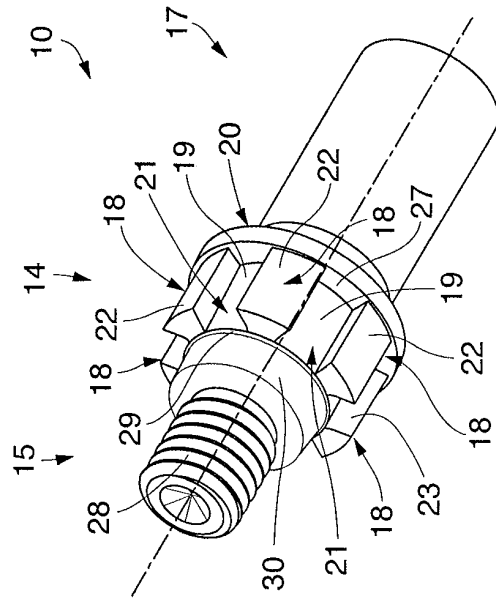


fig. 4

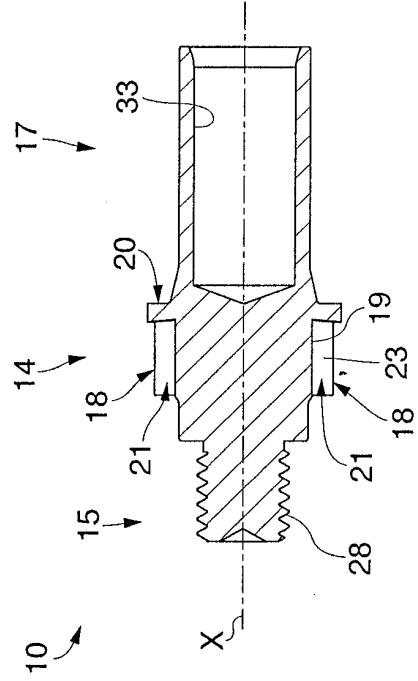


fig. 5



EUROPEAN SEARCH REPORT

Application Number
EP 13 16 9954

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 14 August 2013	Examiner von Walter, Sven-Uwe
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

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EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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14-08-2013

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