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(54) Title: PLUG CONNECTOR FOR A CAMERA OF A MOTOR VEHICLE COMPRISING BAR-LIKE, AXIALLY ORIENTATED STICTION ELEMENTS ON A HOUSING WALL OF A PLUG PART, CAMERA, AS WELL AS MOTOR VEHICLE

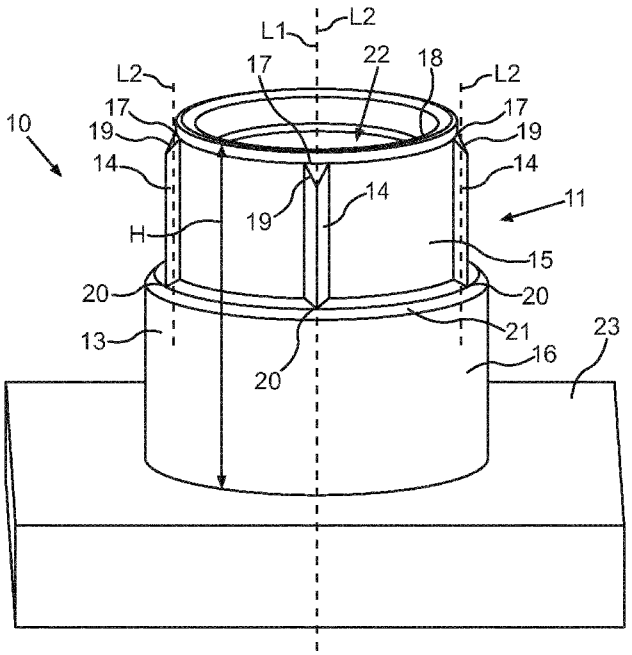


Fig.2

(57) Abstract: Plug connector (10) for a camera (4) of a motor vehicle (1), comprising a first plug part (11) and a second plug part (12), wherein the first plug part (11) is capable of being connected with the second plug part (12) by a plugging into each other and the two plug parts (11, 12) in the state in which they are plugged into each other are held by means of stiction, wherein for effecting the stiction a multitude of bar-like friction elements (14) are configured to be integrated on a housing wall (13) of the first plug part (11), wherein the friction elements (14) extend in the direction of a longitudinal axis (L1) of the first plug part (11).

[Continued on next page]

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Plug connector for a camera of a motor vehicle comprising bar-like, axially orientated stiction elements on a housing wall of a plug part, camera, as well as motor vehicle

The invention relates to a plug connector for a camera of a motor vehicle with a first and a second plug part. The first plug part is capable of being connected with the second plug part by way of plugging into each other. The two plug parts in the state in which they are plugged into each other are held by way of stiction.

From the prior art already plug connectors for coaxial cables, for instance FAKRA plugs specific for automotive applications, are known, which in particular comprise a simple or a fast way of connecting. In particular a corresponding connecting device is arranged on one of the plug parts of the plug connector.

It is the task of the present invention to provide a plug connector, a camera, as well as a motor vehicle, by means of which a simple and fast connecting of the two plug parts is facilitated by way of plugging into each other of the two plug parts.

This task is solved by a plug connector, a camera, as well as a motor vehicle according to the independent claims.

One aspect of the invention relates to a plug connector for a camera of a motor vehicle. The plug connector comprises a first and a second plug part, wherein the first plug part is connectable with the second plug part by way of plugging into each other. The two plug parts in the state in which they are plugged into each other are held by means of stiction. For establishing stiction a multitude of bar-like stiction elements are configured to be integrated on a housing wall of the first plug part. The stiction elements extend in the direction of a longitudinal axis of the first plug part.

In particular thereby stiction between the first plug part and the second plug part can be established in an enhanced way and the two plug parts can be plugged into each other easily and fast. Moreover it is thereby facilitated that the stiction elements are easily arranged on the first plug part. Thereby a simplified manufacture of the plug connector is

facilitated. In particular at least one housing of the camera and the first plug part are formed from aluminium. In particular thereby it is facilitated that in the manufacture of the plug connector no guidelines are formed on the housing of the camera in order to guide the manufacturing tool for manufacture of the stiction elements on the first plug part accordingly. Thereby it is in particular facilitated that an improved connection between the first plug part and the second plug part can be realized. In particular thereby a higher tightness between the first plug part and the second plug part can be realized. In particular, the plug part can be protected by the improved tightness against environmental influences, such as for instance dust and/or water. Moreover, by the raised tightness an improved functional check, in particular an improved tightness check of the camera is facilitated, since a check tool of the functional check can rest improved on the housing, in particular due to the missing guidelines for the manufacture tool. Thereby an improved functional check of the camera with the first plug part is facilitated. Moreover, by the plugging into each other a fast and simple connection between the first plug part and the second plug part can be realized, wherein at the same time an improved tightness of the plug connector is realized.

Preferably, it is envisaged that the second plug part need not be brought into any predetermined position, viewed radially relative to the longitudinal axis, relative to the first plug part in order to plug same together with the first plug part. In other words the second plug part can be arranged in 360° on the first plug part both during the plugging operation as well as in the plugged-together state.

The two plug parts in the state in which they are plugged into each other are only held by means of stiction. In particular the stiction elements with their longitudinal axes extend in the direction of a longitudinal axis of the first plug part. The stiction elements are configured as a straight, axially orientated bar and the stiction elements are in particular configured to be narrowing, in particular to be tapering, viewed in the radial direction to the longitudinal axis of the first plug part. In particular, the first plug part can be released non-destructively from the second plug part. Thereby it is in particular possible that for instance in the case of failure of a component of the plug connector or the camera same can simply be exchanged.

According to an advantageous embodiment the plug connector can comprise more than two stiction elements, in particular five stiction elements on the housing wall of the first plug part. In particular by the at least three stiction elements thus a raised stiction between the first plug part and the second plug part can be realized. Thereby an

improved grip in the plugged-together state between the first plug part and the second plug part is realized. In particular thereby a more reliable operation of the camera with the plugged-together plug connector can be realized. Moreover thus the grip force between the two plug parts can be raised so that an improved operation of the camera is facilitated. Equally by the at least three stiction elements a tilting of the second plug part relative to the first plug part in the plugged-together state is minimized.

It is equally advantageous if at least one stiction element of the multitude of the stiction elements extends maximally over 70 %, in particular between 30 % and 60 % of the height of the first plug part measured in the direction of the longitudinal axis. In particular thereby a guidance through the at least one stiction element is realized. In particular thereby the second plug part can be guided during plugging together upon the first plug part. In particular thereby the maximum expansion of 70 % a wall area on the first plug part can be realized, which viewed in particular in the plugging direction, is situated at the end of the plugging operation so that at the end of the first plug part the second plug part can be directly brought into contact with the housing wall. In particular thereby a raised tightness of the plug connector can be provided.

Further, it has turned out to be advantageous if at least one stiction element of the multitude of stiction elements ends with a first end of the stiction element at a top edge of the first plug part. It is thereby facilitated that the second plug part can fully enclose the first plug part so that an interior of the second plug part can fully receive the first plug part. In particular the plug connector can thereby be configured to save on construction space so that the plug connector can be arranged in a construction-space-saving way on the camera. Thereby a construction-space-saving plug connector for the camera can be realized.

In particular it is envisaged that a first end of at least one stiction element of the multitude of the stiction elements is configured with a slope as entry slope. In particular the plugging operation can thereby be simplified as the stiction elements serve as guidance for the second plug part in the plugging operation. In particular by the slope at the beginning of the plugging operation an inaccuracy in the plugging operation of the two plug parts can be compensated for. By the entry slope it is then facilitated that the second plug part can be guided or plugged precisely fitting upon the first plug part.

Further it is advantageous if the slope has a triangular shape. In particular thereby a simple possibility is provided to configure a guidance for the second plug part in the

plugging operation on the first plug part. The free first end of the stiction element facing away from the wall area is thereby configured in particular as edge or line. This edge over its entire length has an equal radial distance from the wall area, on which the stiction element is formed. The distance, however, can also vary.

According to a further advantageous embodiment at least one of the multitude of stiction elements viewed in a plane perpendicular to the longitudinal axis of the first plug part can be configured to be narrowing. This means that viewed from the housing wall radially outward the stiction element becomes more narrow. In particular can this shape be configured to be triangular. In particular by means of this embodiment a simple manufacturing process of the stiction elements is realized. In particular by means of the manufacturing tool the triangular shape can be realized particularly reliably and precisely on the housing of the first plug part, the housing in particular formed from aluminium. Moreover, in this connection in particular in a material-saving way at least one of the multitude of the stiction elements can be formed. Thereby the plug connector can be manufactured in a manner reduced in weight. In particular by the embodiment a reliable retention force between the first plug part and the second plug part can be realized.

It is equally advantageous if a second end of at least one stiction element of the multitude of stiction elements ends at a radial step between a first wall area and a second wall area of the first plug part. In particular the second end is situated at the opposite end of the stiction element, at which the stiction element ends at the top edge of the first plug part. In particular then the second wall area can have a larger radius than the first wall area so that the second wall area then in particular at least essentially has the same radius of the outer side as an inner radius of the second plug part. In particular thus in the second wall area in the plugged-together state a further contacting between the first plug part and the second plug part can be realized so that the plug connector has a raised tightness. In particular by this embodiment a simple and fast connecting of the first plug part with the second plug part is facilitated.

It is further advantageous if the multitude of the stiction elements is arranged in the circumferential direction around the longitudinal axis of the first plug part equidistant relative to each other on the housing wall. In particular thereby a reliable holding together of the two plug parts in the plugged-together state can be realized. In particular it can for instance be envisaged if the first plug connector for instance comprises five stiction elements, the stiction elements have an angle of 72° relative to each other. By the equidistant arrangement relative to each other upon plugging-together an advantageous

guidance of the two plug parts relative to each other can be realized. Moreover, thereby a high retention force between the two plug parts can be realized. In particular by the equidistant embodiment a tilting of the two plug parts during the plugging operation and in the plugged-together state is minimized. Moreover, by this embodiment a rotation of the second plug part by 360° relative to the first plug part, in particular in the plugged-together state, can be advantageously realized.

According to a further advantageous embodiment the first plug part can be configured to be tube-shaped. In particular for instance then in an interior of the first plug part for instance a connection part of the camera can be arranged. In particular the connection part of the camera can correspond with a connector part on the second plug part so that in the plugged-together state the connector part of the camera is electrically contacted with the connection part of the second plug part. For instance this can here be a coaxial connection.

It is equally advantageous if the second plug part is configured to be sleeve-shaped and receives the first plug part in the plugged-together state. In particular the second plug part in the plugged-together state can grip around the first plug part and in particular fully cover it. In particular the second plug part in the plugged-together state with one end of the second plug part can rest on one of the housing walls of the camera. Thereby towards the first plug part and towards the housing wall of the camera a high tightness can be generated, whereby the plug connector and in particular the camera are protected against environmental influences, such as for instance dust and/or water. Moreover by the sleeve-like shape of the second plug part the plug connector can be configured to be reduced in construction space since the second plug part can fully receive the first plug part and thereby requires less construction space.

According to a further advantageous embodiment a wall area of the first plug part can have a conical shape. In particular by the conical shape a further guidance for the second plug part can be provided. In particular thus during a plugging operation, in particular at the beginning of the plugging operation, an imprecision in plugging together of the two plug parts can be compensated for. By the conical shape of the first plug part then the second plug part can be automatically guided into the correct end position. Moreover, by the conical shape material can be saved so that the plug connector thereby is reduced in weight. Further a simple and fast mounting of the plug connector is realized.

It is equally advantageous if the first plug part is a single-piece component of a housing for the camera. In particular thereby the first plug part can be considered already in the manufacture of the housing of the camera so that an additional manufacturing step for the first plug part is prevented. In particular then by the manufacturing tool further the at least one stiction element can be easily configured on the first plug part without a corresponding guide line being formed on the housing of the camera for the manufacturing tool. In particular thereby the manufacturing process can be reduced in time. In particular thereby a simple and fast plugging-together of the plug connector with the camera for instance also in the automated plugging process, can be realized, since an additional arrangement of the first plug part as processing step is not necessary.

A further aspect of the invention relates to a camera for a motor vehicle with a plug connector according to an afore-mentioned embodiment. The camera can for example be a camera of an electronic side or rear view mirror.

A still further aspect of the invention relates to a motor vehicle with a camera. The motor vehicle is in particular configured as passenger car.

Advantageous embodiments of the plug connector are to be considered as advantageous embodiments of the camera and the motor vehicle.

Further features of the invention are apparent from the claims, the figures and the description of figures. The features and feature combinations mentioned above in the description as well as the features and feature combinations mentioned below in the description of figures and/or shown in the figures alone are usable not only in the respectively specified combination, but also in other combinations or alone without departing from the scope of the invention. Thus, implementations are also to be considered as encompassed and disclosed by the invention, which are not explicitly shown in the figures and explained, but arise from and can be generated by separated feature combinations from the explained implementations. Implementations and feature combinations are also to be considered as disclosed, which thus do not have all of the features of an originally formulated independent claim. Moreover, implementations and feature combinations are to be considered as disclosed, in particular by the implementations set out above, which extend beyond or deviate from the feature combinations set out in the relations of the claims.

In the following, the invention is explained in more detail based on preferred embodiments as well as with reference to the attached drawings.

These show in:

Fig. 1 a motor vehicle comprising at least one camera according to an embodiment of the present invention;

Fig. 2 a schematic perspective view of an embodiment of a plug part of a plug connector;

Fig. 3 a schematic plan view of an embodiment of a plug part of the plug connector according to Fig. 2; and

Fig. 4 a schematic sectional view of the embodiment of a plug connector.

In the figures identical and functionally identical elements are equipped with the same reference signs.

Fig. 1 shows a motor vehicle 1 according to one embodiment of the present invention in a plan view. The motor vehicle 1 in the present case is configured as passenger car. The motor vehicle 1 comprises a camera system 2. The camera system 2 in turn comprises an image processing device 3, which can for instance be configured by an electronic control device of the motor vehicle 1. Moreover the camera system 2 comprises at least one camera 4. In the present embodiment the camera system 2 for instance comprises four cameras 4, which are arranged distributed on the motor vehicle 1. However, equally as well for instance only two cameras 4 or three cameras 4 or even more than four cameras 4 can be envisaged. In the present case one of the cameras 4 is arranged in a rear portion 5, one of the cameras 4 is arranged in a front portion 7 of the motor vehicle 1 and the remaining two cameras 4 are arranged in a respective side portion 6, in particular in an area of the side mirrors. The number and arrangement of the cameras 4 of the camera system 2 is presently to be understood merely as an example.

With the cameras 4 an object 9 in an environment 8 of the motor vehicle 1 can be captured. The four cameras 4 preferably are configured to be of the same construction design. In particular a sequence of images can be provided with the cameras 4, which describe the environment 8. These images can be transferred from the cameras 4 to the

image processing device 3. The camera system 2 thus serves for assisting a driver of the motor vehicle 1 in guiding the motor vehicle 1. The camera system 2 can for instance be a so-called electronic rear view mirror (then it comprises preferably two cameras 4 on the side areas 6) or an ACC system (Adaptive Cruise Control System) or a parking assistance system or such a system. It may also be configured in the motor vehicle interior for capturing a person, in particular a vehicle driver. The camera 4 is here configured to be wired. For this purpose it is connected with the plug connector 10 (Fig. 2), which facilitates the cable supply to the camera 4.

Fig. 2 shows a schematic perspective view of an embodiment of a plug part 11 of the plug connector 10. The plug connector 10 has a first plug part 11. Further, the plug connector 10 comprises a second plug part 12 (Fig. 4). The plug parts 11, 12 are in particular connectable by axial plugging-into-each other and are held in the plugged-together state only by means of stiction.

For establishing the stiction the first plug part 11 on a housing wall 13 of the first plug part 11, in particular on an outer face of the housing wall 13, comprises a multitude of bar-like stiction elements 14. In particular the bar-like stiction elements 14 are integrally formed on the housing wall 13. The stiction elements 14 are configured as straight, axially orientated bar. Further the first plug part 11 has a longitudinal axis L1 of the first plug part 11. In particular each of the stiction elements 14 has a longitudinal axis L2. In particular the stiction elements 14 with their longitudinal axes L2 extend in the direction of the longitudinal axis L1 of the first plug part 11. The stiction elements 14 viewed in the radial direction relative to the longitudinal axis L1 are configured to be narrowed and in particular tapering.

In particular the stiction elements 14 extend over maximally 70 %, in particular between 30 % and 60 % of the height H of the first plug part 11 measured in the direction of the longitudinal axis L1. In particular the first plug part 11 has a first wall area 15 and a second wall area 16. The wall areas15 and 16 here are ring areas, which have different radii relative to the longitudinal axis L1. In the present example the multitude of stiction elements 14 extend on the housing wall 13 of the first wall part 15, in particular on the outer face of the housing wall 13.

It is envisaged that the stiction elements 14 comprise respective first ends 17, which in particular end in a top edge 18 of the first plug part 11. It is further envisaged that the first

ends 17 of the stiction elements 14 with a slope 19 are configured as entry slope. The slope 19 is tilted outward and oriented downward. Thereby a simplified plugging-together of the first plug part 11 with the second plug part 12 can be realized. In particular the slope 19 can serve as guidance. The slope 19 is configured in particular as triangular shape.

In Fig. 2 it can be seen that the stiction elements 14 are configured to be in particular triangular. Thereby the free end of the stiction elements 14 facing away from the housing wall 13 can be configured in particular as an edge K. This edge K over its entire length has an equal radial distance from the housing wall 13. The distance, however, can also vary.

Moreover it is envisaged that a second end 20 of the stiction elements 14 ends at a radial step 21, which is formed between the first wall area 15 and the second wall area 16. In particular the stiction elements 14 can be configured offset backwards relative to the second wall area 16 so that a radial distance of the edge K relative to the longitudinal axis L1 is smaller than a radial distance of the second wall area 16 relative to the longitudinal axis L1.

It is shown in Fig. 2 that the first plug part 11 is configured to be in particular tube-shaped and comprises an opening 22, into which in particular a connecting contact 27 (Fig. 4) of the second plug part 12 can plunge. Moreover Fig. 2 shows that the first plug part 11 in particular has a conical shape so that by the conical shape a simplified mounting of the first plug part 11 with the second plug part 12 due to the shape is realized. In particular by the conical shape an imprecision when plugging the second plug part 11 into the first plug part 12 can be compensated for. The stiction elements 14 can then have correspondingly a larger height expansion on the first end 17 than on the second end 20 so that the edge K has the radially equal distance relative to the longitudinal axis L1 even in the case of the conical shape.

Moreover Fig. 2 shows that the first plug part 11 is formed in particular on a housing 23 of the camera 4. In particular the first plug part 11 and the housing 23 are formed from aluminium, in particular as a single piece.

Fig. 3 shows a schematic plan view of an embodiment of the first plug part 11 according to Fig. 2 of the plug connector 10. In Fig. 3 it is shown that the plug connector 10, in particular the first plug part 11, comprises more than two stiction elements 14, presently

five stiction elements 14 on the housing wall 13 of the first plug part 11. It is equally possible that only three, four, or more than five stiction elements 14 are formed on the housing wall 13. The present embodiment is to be considered to be merely exemplary and by no means concluding.

In Fig. 3 it can be seen that the stiction elements 14 viewed along a plane perpendicular to the longitudinal axis L1 of the first plug part 11 are configured to be triangular. Moreover Fig. 3 shows that the stiction elements 14 viewed in the circumferential direction about the longitudinal axis L1 of the first plug part are arranged equidistant relative to each other on the housing wall 13. In the present example with five stiction elements 14 the stiction elements 14 form an angle α relative to each other, which in the present case is 72°. Thus, an advantageous guidance for the second plug part 12 can be realized. Thereby equally a tilting of the second plug part 12 relative to the first plug part 11, in particular during the plugging operation and in the plugged-together state, is minimized. Moreover thereby a high retention force between the two plug parts 11, 12 can be realized.

Fig. 4 shows a schematic cross-sectional view of the plug connector 10. The first plug part 11 is in particular a single-piece component of the housing 23 of the camera 4. In particular the camera 4 comprises a printed circuit board 24 of the camera 4. On the printed circuit board 24 in particular a connecting contact 25 can be formed, which protrudes in particular into an interior 26 of the first plug part 11. On the second plug part 12 a further connecting contact 27 may be formed, which in the plugged-together state of the plug connector 10 plunges into the connecting contact 25 so that an electrical contact between the connecting contacts 25, 27 is established. The connecting contacts 25, 27 can be coaxial cable connections. The second plug part 12 in the present case is coupled with a coaxial cable 28, which for instance is coupled with a control device of the motor vehicle 1, for instance with the camera system 2 of the motor vehicle 1.

In particular it is envisaged that the second plug part 12 is configured to be sleeve-shaped and in particular receives the first plug part 11 in the plugged-together state, in particular grips around it and covers it. It can be seen that the first plug part 11 is entirely received within the second plug part 12. In particular by the stiction elements 14 a high retention force between the first plug part 11 and the second plug part 12 can be realized. In particular the plug connector 10 in the plugged-together state has a high tightness since the second plug part 12 at an end 29 of the second plug part 12 rests directly on the housing 23. Thereby the plug connector 10 and the camera 4 is protected against

environmental influences, such as for instance dust and/or water. In particular the sleeve-shaped plug part 12 is configured without guideways so that a rotation of the plug part 12 by 360° relative to the longitudinal axis L1 of the first plug part both during the plugging operation as well as in the plugged-together state is possible. In particular thereby a simple mounting in any position of the second plug part 12 relative to the first plug part 11 can be realized. Moreover, in particular it is envisaged that the second plug part 12 is non-destructively releasable from the first plug part 11.

By the raised tightness an improved functional check, in particular an improved tightness check of the camera 4 is facilitated, since a check tool of the functional check can rest in an improved way on the housing 23, in particular due to the missing guidelines for the manufacturing tool. Thereby an improved functional check of the camera 4 with the first plug part 11 is facilitated.

Claims

1. Plug connector (10) for a camera (4) of a motor vehicle (1), comprising a first plug part (11) and a second plug part (12), wherein the first plug part (11) is capable of being connected with a second plug part (12) by a plugging into each other and the two plug parts (11, 12) in the state in which they are plugged into each other are held by means of stiction, wherein for effecting the stiction a multitude of bar-like stiction elements (14) are configured to be integrated at a housing wall (13) of the first plug part (11), wherein the stiction elements (14) extend in the direction of a longitudinal axis (L1) of the first plug part (11).

2. Plug connector (10) according to claim 1,
characterized in that
the plug connector (10) comprises more than two stiction elements (14), in particular five stiction elements (14) on the housing wall (13) of the first plug part (11).

3. Plug connector (10) according to any one of the preceding claims,
characterized in that
at least one stiction element (14) of the multitude of the stiction elements (14) extends maximally over 70%, in particular between 30% and 60% of the height (H) of the first plug part (11) measured in the direction of the longitudinal axis (L1).

4. Plug connector (10) according to any one of the preceding claims,
characterized in that
at least one stiction element (14) of the multitude of the stiction elements (14) with a first end (17) of the stiction element (14) ending at a top edge (18) of the first plug part (11).

5. Plug connector (10) according to any one of the preceding claims,
characterized in that

a first end (17) of at least one stiction element (14) of the multitude of the stiction elements (14) with a slope (19) is configured as entry slope.

6. Plug connector (10) according to claim 5,
characterized in that
the slope (19) has a triangular shape.

7. Plug connector (10) according to any one of the preceding claims,
characterized in that
at least one stiction element (14) of the multitude of stiction elements (14) in a plane perpendicular to the longitudinal axis (L1) of the first plug part (11) viewed from the housing wall (13) radially outward is configured to be narrowing, in particular triangular.

8. Plug connector (10) according to any one of the preceding claims,
characterized in that
a second end (20) of at least one stiction element (14) of the multitude stiction elements (14) ends at a radial step (21) between a first wall area (15) and a second wall area (16) of the first plug part (11).

9. Plug connector (10) according to any one of the preceding claims,
characterized in that
the multitude of stiction elements (14) in circumferential direction around the longitudinal axis (L1) of the first plug part (11) is arranged equidistantly relative to each other on the housing wall (13).

10. Plug connector (10) according to any one of the preceding claims,
characterized in that
the first plug part (11) is configured to be tube-shaped.

11. Plug connector (10) according to any one of the preceding claims,
characterized in that
the second plug part (12) is configured to be sleeve-shaped and receives the first plug part (11) in the plugged-together state.

12. Plug connector (10) according to any one of the preceding claims, characterized in that
a wall area (15, 16) of the first plug part (11) has a conical shape.

13. Plug connector (10) according to any one of the preceding claims, characterized in that
the first plug part (11) is a single-piece component of a housing (23) for the camera (4).

14. Camera (4) for a motor vehicle (1), comprising a plug connector (10) according to any one of claims 1 to 13.

15. Motor vehicle (1) comprising a camera (4) according to claim 14.

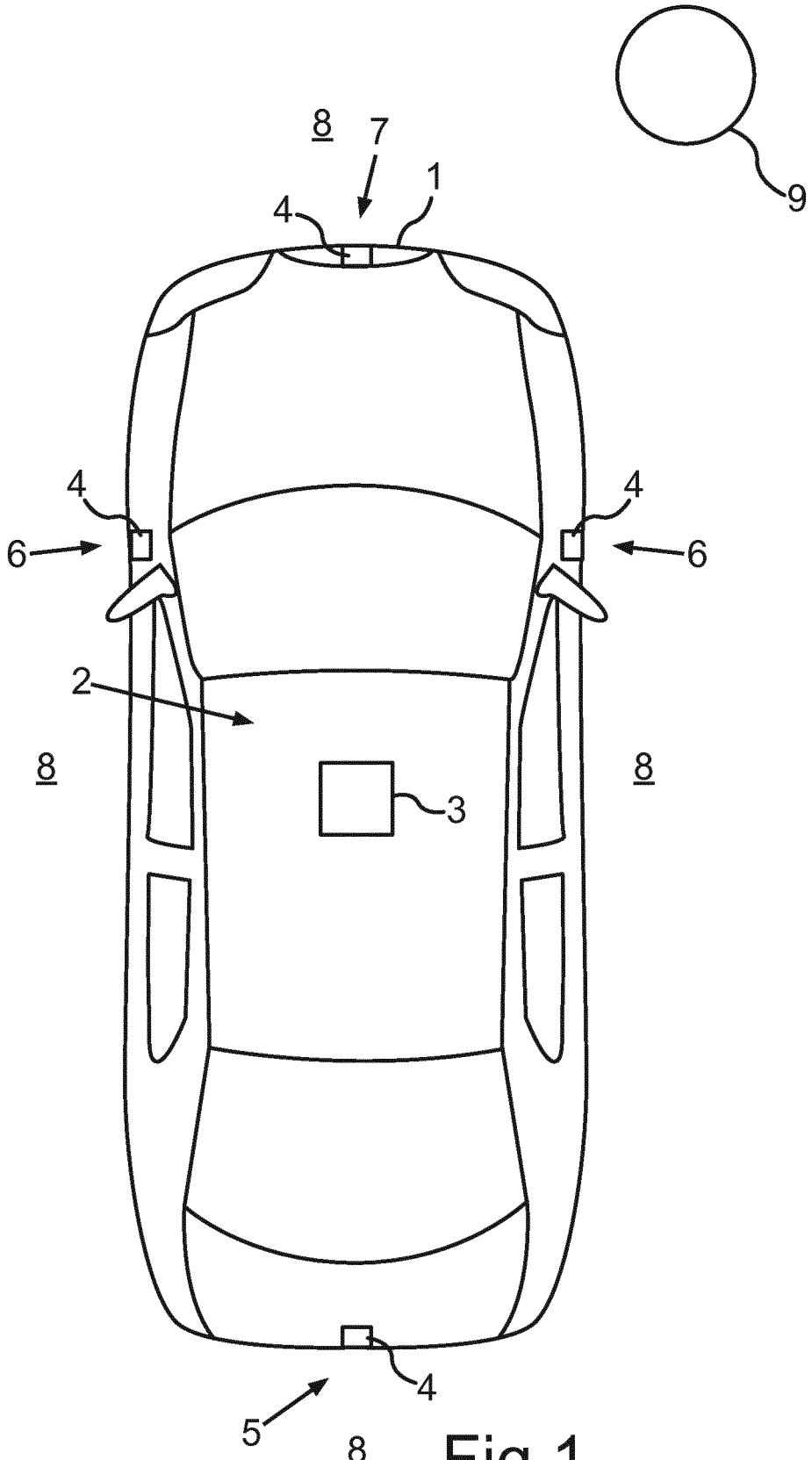


Fig.1

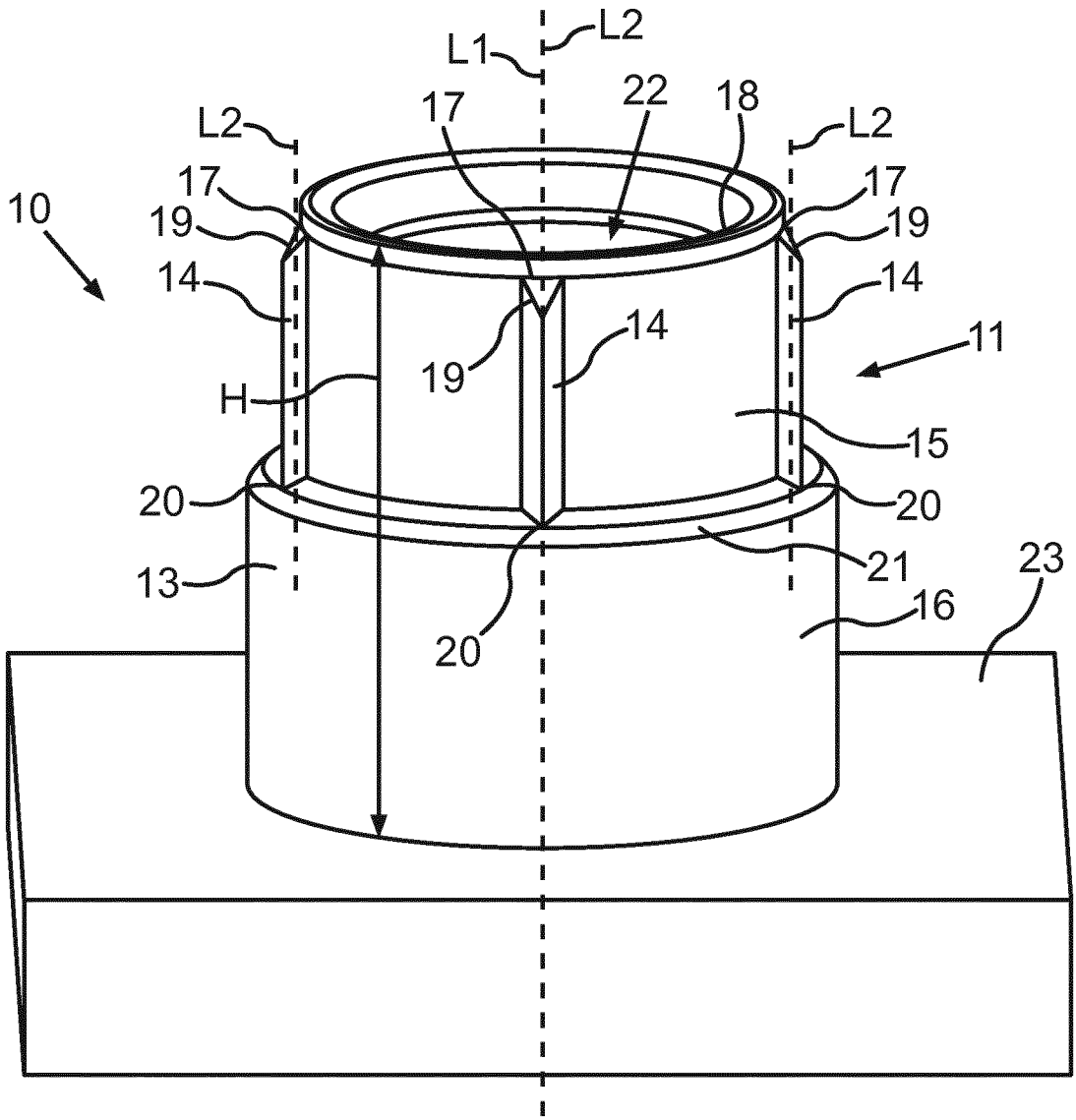

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Fig.2

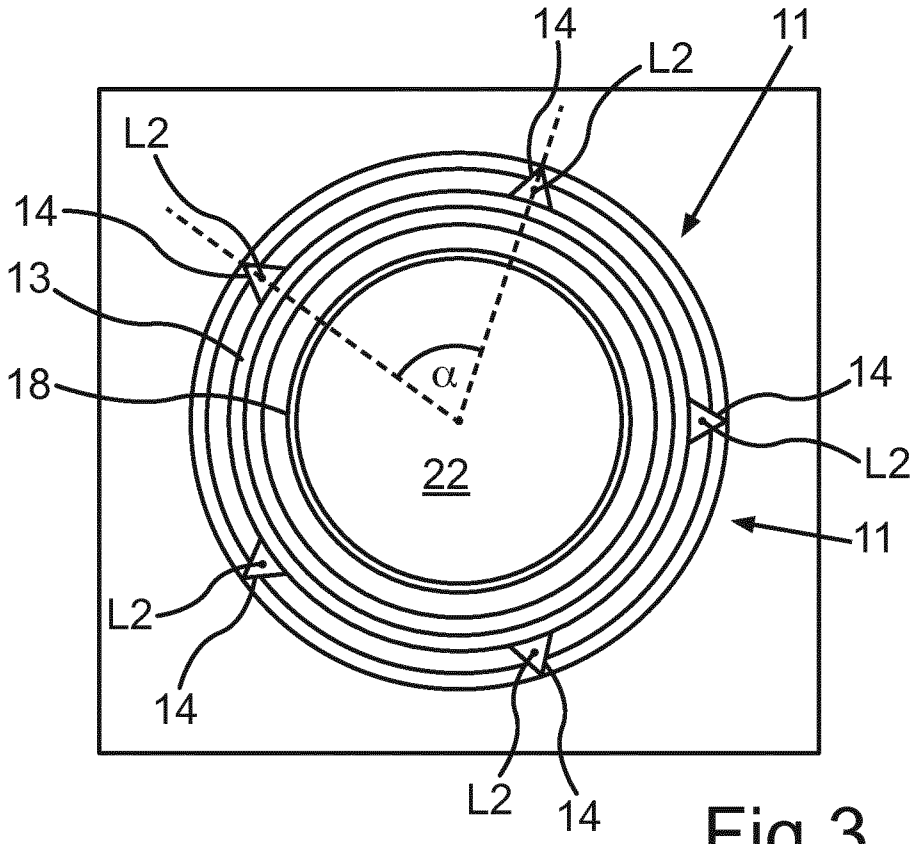

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Fig.3

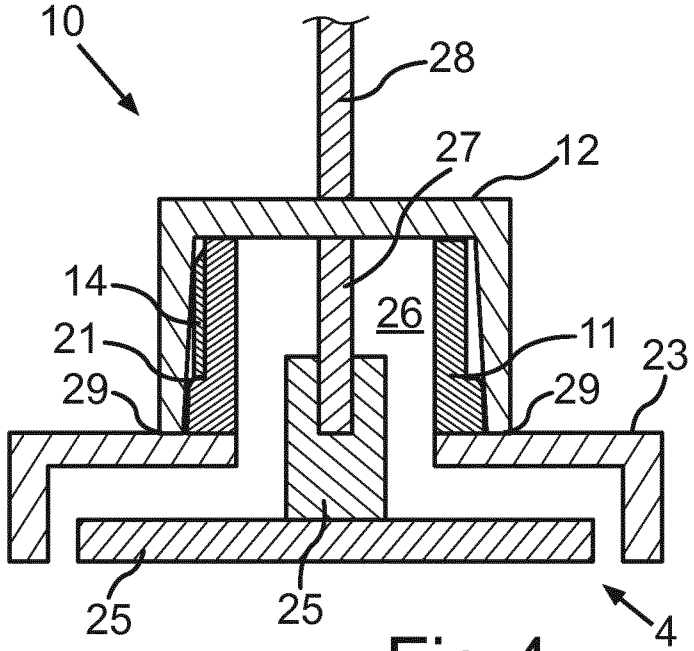

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Fig.4

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2018/069429

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04N5/225 B60R11/04 H01R13/629
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04N B60R H01R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2013/280949 A1 (SUZUKI MIKI [JP] ET AL) 24 October 2013 (2013-10-24) paragraphs [0048] - [0057]; figures 1-3	1-15
X	DE 20 2014 100919 U1 (PRECI DIP SA [CH]) 1 June 2015 (2015-06-01) paragraphs [0042] - [0044]; figures 3,4	1-15
X	US 2003/036302 A1 (FUKUDA EIJI [JP]) 20 February 2003 (2003-02-20) paragraphs [0093], [0099], [0100], [0143] - [0146]; figures 1,5,6,10,22,24-26	1-15
A	US 2009/316038 A1 (SCHMACK ANDREAS [DE] ET AL) 24 December 2009 (2009-12-24) paragraph [0023]; figures 1-3	1-15

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 September 2018	24/09/2018

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Schinnerl, Arnold

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2018/069429

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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A	DE 942 336 C (SCHAEFER WILHELM) 3 May 1956 (1956-05-03) page 2, line 94 - page 3, line 23; figures 1,2 -----	12

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