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System for cleaning a sensor/transmitter of a motor vehicle

Abstract

The invention relates to a system for cleaning a sensor/transmitter of a motor vehicle, comprising holes for spraying a first fluid onto the sensor/transmitter an openings for spraying a second fluid onto the sensor/transmitter, the second fluid being different from the first fluid, the cleaning system also comprising a guide body for guiding the first fluid and the second fluid respectively to holes for spraying the first fluid and openings for spraying the second fluid. The guide body of the cleaning system according to the invention comprises a first supply portion, configured to be connected to a source of the second fluid, and a second distribution portion comprising pipes for conveying the second fluid that lead to the openings for spraying it, and a pipe for distributing the first fluid arranged substantially perpendicular to the pipes for conveying the second fluid.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS

(1) This application is filed under 35 U.S.C. § 371 U.S. National Phase of International Application No. PCT/EP2020/083986 filed Nov. 30, 2020 (published as WO2021115830), which claims priority benefit to French application No. 1914098 filed on Dec. 10, 2019, the disclosures of which are herein incorporated by reference in their entirety.

TECHNICAL FIELD

(2) The present invention relates to the field of driving aid devices and, more particularly, to the field of the detection assemblies used for this purpose. The invention relates more particularly to the cleaning devices for cleaning a sensor/transmitter of such detection assemblies.

BACKGROUND OF THE INVENTION

(3) Such sensors/transmitters are being fitted on an increasingly large number of motor vehicles in order to assist the driver of the vehicle in certain driving situations, for example to provide the driver with a parking aid or provide a lane departure warning. In order for this assistance to be as effective as possible, the data supplied and/or transmitted by the sensor/transmitter have to be of the best possible quality, and it is therefore essential to have transmission and reception surfaces that are clean in order to perform the corresponding data acquisitions and transmissions. This requirement is all the more important in the case of autonomous vehicles where the vehicle is controlled on the basis of the information gathered by such sensors/transmitters.

BRIEF SUMMARY OF THE INVENTION

(4) In order to achieve this, a device for cleaning a transmission and reception surface of the sensor/transmitter (for example the lens of an image capturing camera, or a window protecting such a lens, in the case of an optical sensor) may be commanded to inject a cleaning fluid onto said transmission and reception surface. To complement this, a stream of air or of another drying fluid may be sprayed onto the surface after the cleaning fluid, so as to rid this surface of the cleaning fluid and of the dirt that said fluid carries with it. Such cleaning devices therefore comprise means for conveying and distributing the cleaning fluid and the drying fluid. These cleaning devices must not, however, impair the operation of the sensor/transmitter, and they must be as compact as possible in order to conform to vehicle space constraints. To this end, it is possible to use a dispenser capable notably of commanding alternating admission, into a head that admits and dispenses the cleaning and drying fluids, of one or other of the aforementioned fluids. Such assemblies may also employ telescopic devices configured to move from a retracted rest position to a deployed cleaning/drying position. Such configurations however generate high operating costs, notably because of the cost of the kinematic means that they involve.

(5) It is an object of the present invention to propose a device for cleaning a motor vehicle sensor/transmitter which has reduced costs of manufacture and of operation, which is easy to install at any point on a vehicle, where constraints on space are complex, and which at the same time

maintains the effectiveness of the cleaning and of the drying of the sensor/transmitter concerned.
(6) To this end, one subject of the invention is a cleaning system for cleaning a motor vehicle sensor/transmitter, comprising on the one hand spray orifices for spraying a first fluid onto the sensor/transmitter and, on the other hand, spray openings for spraying a second fluid onto the sensor/transmitter, the second fluid being distinct from the first fluid, the cleaning system also comprising a guide body guiding the first fluid and the second fluid respectively toward the first-fluid spray orifices and the second-fluid spray openings, characterized in that the guide body comprises a supply first part, configured to be connected to a source of the second fluid, and a distribution second part comprising, on the one hand, second-fluid conveying ducts opening onto the second-fluid spray openings and, on the other hand, a first-fluid distribution duct arranged substantially perpendicular to the second-fluid conveying ducts.
(7) It must be understood that the spraying of fluid onto a sensor/transmitter notably consists in spraying this fluid onto a transparent surface positioned facing the sensor/transmitter and, for example, an optical surface of an image capturing camera or else a surface of a transparent material protecting such an optical surface.
(8) In the context of the invention, the first fluid is advantageously a fluid for cleaning a transparent surface, for example a liquid product such as water or a washer fluid. The cleaning fluid may also be gaseous or take the form of a mixture of gas and of liquid. Advantageously, the second fluid is a drying fluid the purpose of which is to remove from the surface the cleaning fluid in which the dust and dirt present on this surface before cleaning has been trapped. In the context of the invention, the drying fluid is advantageously a gas, for example air, which is made to circulate by a blower.
(9) The term “spray orifice” should be understood here in the broad sense: according to various examples, cleaning-fluid spray means may comprise several distinct spray orifices, for example circular orifices, or they may comprise one or more elongate spray orifices. In all instances, the invention plans for the dimensions of the spray orifices for the first fluid, or cleaning fluid, to be small so as to increase the pressure at which this fluid is sprayed and thus obtain a jet effect that adds a mechanical component to the chemical cleaning performed by the composition of the cleaning fluid. In the cleaning system according to the invention, the cleaning-fluid spray orifices are arranged along a cleaning-fluid distribution duct, in a direction which will be referred to in what follows as a longitudinal direction of the cleaning system according to the invention.
(10) In a similar way to the cleaning-fluid spray orifices, the term “spray opening” must be understood in the broad sense, namely that the drying-fluid spray region may comprise several distinct spray openings, for example circular openings, or may comprise one or more elongate spray openings.
(11) Advantageously, the end of the conveying ducts forming the spray openings is situated in the vicinity of the cleaning-fluid spray orifices: this region will, in what follows, be referred to as the spray region of the cleaning system according to the invention.
(12) In the cleaning system according to the invention, the cleaning fluid and the drying fluid are guided as far as the spray region by guide body which notably comprises a first part configured to be connected to a source of the second fluid, which is to say in this instance to the blower that generates the stream of drying air.
(13) According to the invention, the guide body also comprises a distribution second part, attached to the supply first part of the guide body. According to the invention, this distribution second part comprises, on the one hand, ducts conveying the drying fluid as far as the drying-fluid spray openings and, on the other hand, the cleaning-fluid distribution duct in which the cleaning-fluid spray orifices are formed, said distribution duct being arranged substantially perpendicular to the drying-fluid conveying ducts.
(14) More specifically, the spray region extends at one end of the distribution second part of the guide body which is the opposite end, in the direction in which the drying fluid circulates in the distribution second part, from the end via which this second part is attached to the supply first part

of the guide body. In other words, the distribution second part of the guide body extends between the spray region and an end of the supply first part of the guide body that is the opposite end, in the direction in which the drying fluid circulates, from the end via which this supply first part of the guide body is connected to the source of drying fluid.

(15) With reference to the longitudinal direction of the cleaning system according to the invention, the main direction of circulation of the drying fluid in the distribution second part of the guide body, substantially perpendicular to this longitudinal direction, will be referred to in what follows as the vertical direction of the cleaning system according to the invention. This direction is also the main direction of elongation of the drying-fluid conveying ducts in the distribution second part of the guide body of the cleaning system according to the invention.

(16) According to a complementary feature of the invention, a wall of the first-fluid, which is to say cleaning-fluid, distribution duct contributes to delimiting the second-fluid, which is to say drying-fluid, conveying ducts, in the spray region. In other words, in the cleaning system according to the invention, the cleaning-fluid spray orifices and the drying-fluid spray openings feature, in the spray region, a wall in common. According to the invention, this common wall is arranged between the cleaning-fluid spray orifices and the drying-fluid spray openings, which is to say that it is situated in the vicinity, respectively, of the cleaning-fluid distribution duct and of the ends of the drying-fluid conveying ducts.

(17) More specifically, the drying-fluid spray openings are situated on that side of the cleaning system according to the invention towards which the cleaning-fluid spray orifices are directed. In other words, when the cleaning system according to the invention is installed on a vehicle, in the vicinity of a sensor/transmitter, the drying-fluid spray openings are positioned between the cleaning-fluid spray orifices and the surface that is to be cleaned, the cleaning-fluid spray orifices being logically directed toward this surface. The drying fluid is therefore sprayed between the surface that is to be cleaned and the spray of the cleaning fluid, thereby making it possible to improve the compactness of the cleaning system while at the same time maintaining the effectiveness of the assembly, the drying fluid thus being sprayed as close as possible to the surface that is to be cleaned and allowing complete removal of the cleaning fluid laden with dust and dirt.

(18) The invention may also exhibit one or more of the following features, taken individually or in combination: the conveying ducts open onto spray openings and the distribution second part of the guide body has a dimension, measured in the longitudinal direction of the cleaning system that differs between an edge connecting with the supply first part of the guide body and an edge comprising the second-fluid, which is to say drying-fluid, spray openings. In other words, the distribution second part is such that, on the one hand, it is able to extend, without a sharp increase in the bore section, the supply first part, which is small in size in order to make it easier to install in a reduced amount of space and such that, on the other hand, it enables the creation of a spray region of which the longitudinal dimension, along which the first-fluid spray orifices and the second-fluid spray openings are arranged, is great, thus allowing the cleaning/drying of an extensive surface or the cleaning/drying of a plurality of surfaces of different sensors/transmitters positioned close to one another. the second-fluid spray openings are uniformly distributed along a direction of elongation of the distribution second part, substantially parallel to a longitudinal direction of the cleaning system. This improves the uniformity of the distribution of the second fluid in the spray region of the cleaning system according to the invention. the cleaning system according to the invention comprises a base configured to be secured to a structure of the vehicle, and a casing configured to cover the base. It is appropriate here to draw a clear distinction between the base and the casing of the supply first part and of the distribution second part of the guide body. According to the invention, the base and the casing together form the entirety of the guide body. According to one example, the supply first part of the guide body is made up of a first portion of the casing, and the distribution second part of the guide body is made up of the covered base and of a second portion of the casing. Alternatively, the base and casing may together form the supply first part and

the distribution second part of the guide body of the cleaning system according to the invention. According to one example, the base comprises means of attachment to a structure of the vehicle, for example a bodywork or bodywork protection element, such as a bumper. According to such an example, the base advantageously takes the overall form of a thin sheet of which the shape compliments that of the element of the vehicle structure to which the base is intended to be secured. This notably allows the base to be fitted without altering the overall look of the vehicle. According to another example, the base is made as one with an element of the vehicle structure such as the aforesaid. In all cases, the casing advantageously comprises several walls which together delimit a cavity of which the base constitutes a closing wall when the base and the casing are assembled to form the guide body of the cleaning system according to the invention. the casing comprises a first portion configured to be connected to the source of the second fluid, and a second portion configured to form, with the base, the distribution second part of the guide body, the first portion and the second portion making between them a non-zero angle. The result of the foregoing is that the first portion of the casing makes a non-zero angle with the plane defined by the longitudinal direction and the vertical direction of the cleaning system according to the invention. According to one example, the first portion of the casing extends in an overall direction substantially perpendicular to the second portion of the casing and to the distribution second part of the guide body: in what follows, this direction will be referred to as the transverse direction of the cleaning system according to the invention. Such a configuration notably allows the drying-fluid source, to which the first portion of the casing is connected, to be installed in a region close to the sensor/transmitter equipped with the cleaning system according to the invention, but not visible to a user looking at such a sensor/transmitter. Such a configuration therefore makes it easier for the cleaning system according to the invention to be installed in an environment such as, for example, that of a side of a vehicle. the second-fluid conveying ducts are delimited by ribs projecting out from an exterior surface of the base and an interior surface of the casing which surface is intended to be in contact with the free end of the ribs. With reference to the transverse direction of the cleaning system according to the invention, the inside refers to a region situated, in the transverse direction, on the same side as the surface that is to be cleaned, and the outside refers to a region situated, in the transverse direction, on the opposite side to the surface that is to be cleaned. According to the feature of the invention mentioned here, the ribs, arranged to project in the transverse direction of the cleaning system, from the exterior surface of the base, form a plurality of transverse partitions extending within the cavity defined by the walls of the casing. According to the invention, the dimensions, in the transverse direction, of these partitions are defined so that when the casing is placed to cover the base to form the distribution second part of the guide body, an interior surface of the cavity defined by the walls of the casing comes to bear against the thickness of each of these partitions, thus forming the conveying ducts in which the drying fluid circulates. Advantageously, in order to avoid any leak of drying fluid from one conveying duct to another, the interior surface of the cavity delimited by the walls of the casing is smooth. More specifically, this surface may be polished for better sealing of each drying-fluid conveying duct. the ribs delimit, in the distribution second part of the guide body, conveying ducts which are inclined with respect to the longitudinal direction and to the vertical direction of the cleaning system. More specifically, a rib contributes to delimiting two adjacent drying-fluid conveying ducts, which means to say that this rib is common to these two conveying ducts. In addition, all the conveying ducts are grouped together in the supply first part of the guide body, which part is connected to the source of drying fluid. The complex and inclined shape of these ribs is the result of the configuration of the distribution second part of the guide body of the cleaning system, and more particularly of the increase in the longitudinal dimension of this distribution second part from the first part as far as the spray openings. each second-fluid spray opening is delimited, in the longitudinal direction of the cleaning system according to the invention, by the free ends of two ribs that contribute to delimiting the corresponding conveying duct. In other words, each drying-fluid spray opening is

formed at the opposite end of the corresponding conveying duct to the end via which this conveying duct originates in the supply first part of the guide body. the second-fluid conveying ducts are narrowed at the end via which the second fluid is sprayed from them. What that means to say is that the dimensions of each drying-fluid spray opening are less than the mean dimensions of the conveying duct of which this spray opening forms one end, the dimensions being measured in cross section on a plane perpendicular to the main direction of elongation of the conveying duct concerned. This makes it possible to increase the pressure at which the drying fluid is sprayed, and obtain a jet effect improving the effectiveness of the drying performed. the casing comprises a groove to accept a first-fluid distribution pipe in which a plurality of first-fluid spray orifices is arranged. This groove, together with the distribution pipe, forms the first-fluid distribution duct. According to one example, the distribution pipe is forcibly inserted into the groove and prevented from rotating therein so that the orientation of the cleaning-fluid spray orifices with respect to the surface that is to be cleaned remains constant. According to one example, the distribution pipe may be prevented from rotating by engaging a lug arranged in the groove in a recess made in the surface of the distribution pipe. the casing comprises a first-fluid distribution duct of closed cross section and in which a plurality of first-fluid spray orifices is arranged. This makes it possible, by eliminating the distribution pipe, to limit the number of components in the cleaning system according to the invention and, therefore, the cost thereof. Furthermore, it simplifies assembly and installation of the cleaning system according to the invention while at the same time improving the repeatability of the orientation and of the maintained orientation of the cleaning-fluid spray orifices facing the surface that is to be cleaned.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) Other features, details and advantages of the invention will become more clearly apparent upon reading the description given below by way of indication, with reference to the drawings, in which:

(2) FIG. **1** is a schematic perspective general view of a motor vehicle headlamp equipped with one exemplary embodiment of a cleaning system according to the invention,

(3) FIG. **2** is a schematic perspective view of a cleaning system like the one illustrated in FIG. **1**,

(4) FIG. **3** is a schematic perspective view of one exemplary embodiment of the base of a cleaning system like the one illustrated in FIG. **2**,

(5) FIG. **4** is a schematic perspective view of one exemplary embodiment of a casing configured to cover a base like the one illustrated in FIG. **3** so as to form a cleaning system like the one illustrated in FIG. **2**,

(6) FIG. **5** is a schematic perspective view of a detail of a spray region of a cleaning system like the one illustrated in FIG. **2**, and

(7) FIG. **6** is a view from above of the detail illustrated in FIG. **5**.

DETAILED DESCRIPTION OF THE INVENTION

(8) It should first of all be noted that although the figures set out the invention in detail for implementing the invention, these figures may of course be used in order to better define the invention if necessary. It should also be noted that these figures set out only one possible exemplary embodiment of the invention.

(9) FIG. **1** schematically illustrates one exemplary embodiment of a cleaning system **100** according to the invention in its application to the cleaning of the surface **250** of a sensor/transmitter **200** intended to be fitted to a motor vehicle headlamp **300**.

(10) In what follows, the sensor/transmitter **200** will be described in greater detail as being an optical detection device such as those known by the acronym LIDAR (Laser/Light Detection and Ranging) configured to emit a light or laser beam and to analyze the light or laser beam reflected

by an obstacle situated in the vicinity of the sensor/transmitter **200**. Such a sensor/transmitter **200** comprises an optical surface **250** the state of cleanliness of which dictates the quality of the detection achieved. According to various examples, the surface **250** may be a transmitting/detecting surface of the sensor/transmitter **200** or a transparent window protecting such an a transmitting/detecting surface. It should be noted that what follows is applicable irrespective of the type of sensor/transmitter selected and of the type of associated detection system.

(11) As shown in FIG. **1**, the cleaning system **100** according to the invention is attached to an element **400** of the vehicle structure, in the vicinity of the headlamp **300** and of the sensor/transmitter **200**. More specifically, as FIG. **1** shows, the cleaning system **100** more or less conforms to the shape of the structure element **400** in the region in which it is installed, so that it does not appreciably alter the look of the headlamp **300** and of the structure element **400** in the region in which it is installed. According to one example, a casing, not depicted in FIG. **1**, may be attached to the structure element **400** and to the cleaning system **100** in order to camouflage the latter from a user looking at the headlamp **300**. It should be noted that the particular shape of the cleaning system **100** also allows a blower **500** that forms part of the cleaning system, as will be described in greater detail hereinafter, to be installed in a region of the headlamp **300** that is not very visible to a user looking at the headlamp **300**, while still being close to the spray region **110**.

(12) The cleaning system **100** is configured to spray, onto the surface **250** that is to be cleaned, on the one hand, a first fluid, or cleaning fluid, intended to remove from the surface **250** that is to be cleaned the dust and dirt that may have become deposited thereon and, on the other hand, a second fluid, or drying fluid, chosen to allow quick removal of the cleaning fluid, laden with dust and dirt, from the surface **250** that is to be cleaned, without leaving traces thereon. The cleaning fluid is, for example, a liquid such as water or a washer fluid. According to the example more particularly illustrated in FIG. **1**, the drying fluid is air circulated by the blower **500** schematically indicated in FIG. **1**.

(13) The cleaning fluid and the drying fluid are sprayed onto the surface **250** that is to be cleaned from a spray region **110** of the cleaning system **100**, which region will be detailed later on, with reference to the subsequent figures.

(14) FIG. **2** is a schematic perspective view of a cleaning system **100** according to the invention like the one illustrated in FIG. **1**. The surface **250** that is to be cleaned is schematically indicated in dotted line in this figure.

(15) The cleaning system **100** comprises a supply first part **10**, configured to be connected to the blower **500**, and a distribution second part **11**, which at its opposite end to the supply first part **10** comprises the spray region **110**. The first part **10** and the second part **11** extend continuously so as together to form a guide body **1** of the cleaning system **100**. As FIG. **2** shows, the supply first part **10** of the guide body **1** is connected to the blower **500** at one end along its main direction of extension and is connected, at its opposite end in this main direction of extension, to the distribution second part **11** of the guide body **1**. Arbitrarily, the direction of elongation of the distribution second part **11**, in which direction this part mainly extends between its junction with the supply first part **10** and the spray region **110** will be referred to in what follows as the vertical direction V of the cleaning system **100**. To complement this, the term “lower” will refer, in what follows, to that end of the distribution second part **11**, in the vertical direction V, via which this second part is attached to the supply first part **10**, and the term “upper” will refer, in what follows, to that end of the distribution second part **11**, in the vertical direction V, in which the spray region **110** is situated.

(16) In the spray region **110**, the second part **11** of the guide body **1** comprises, on the one hand, drying-fluid spray openings **12** and, on the other hand, a cleaning-fluid distribution pipe **13**. The cleaning-fluid distribution pipe **13** is advantageously pierced with a plurality of cleaning-fluid spray orifices **130**, which are not depicted in FIG. **2**. According to one example, the cleaning-fluid spray orifices **130** are uniformly distributed along the distribution pipe **13**.

(17) According to the example more particularly illustrated in FIG. **2**, the cleaning-fluid distribution pipe **13** is inserted in a substantially cylindrical groove **14** arranged at the upper vertical end of the distribution second part **11** of the guide body **1**. More specifically, according to this example, the groove **14** is arranged in a substantially cylindrical shape **140** which comprises an axially extending slot **141**, which is to say a slot extending parallel to the axis of elongation of the substantially cylindrical shape, which uncovers a portion of the cleaning-fluid distribution pipe **13**. The distribution pipe **13**, the groove **14** and the substantially cylindrical shape **140**, which are coaxial, together form a cleaning-fluid distribution duct. Advantageously, the cleaning-fluid distribution pipe **13** is inserted into the groove **14** in such a way that the part of this distribution pipe in which the cleaning-fluid spray orifices **130**, not depicted in FIG. **2**, are arranged, faces the slot **141**, so as to allow the cleaning fluid to be sprayed onto the surface **250** that is to be cleaned.
(18) By convention, the main direction of extension of the groove **14**, of the substantially cylindrical shape **140** and of the cleaning-fluid distribution pipe **13** will be referred to in what follows as the longitudinal direction L of the cleaning system **100** according to the invention. It should be noted that this direction may have any orientation with respect to the longitudinal direction of a vehicle equipped with the cleaning system **100** according to the invention, and that it is substantially perpendicular to the vertical direction V.
(19) The result of the foregoing is that the distribution second part **11** of the guide body **1** therefore extends chiefly in the longitudinal direction L and the vertical direction V. It should be noted that the notions of planes or of directions should here, and in the foregoing and in what follows, be understood in the broad sense. Specifically, as indicated hereinabove, the shapes of the elements that make up the cleaning system **100** are defined to conform as closely as possible to the shapes of the vehicle in the region in which the cleaning system **100** is installed, so as to allow the system to be installed in a way that does not detract from the look of the vehicle in this region. The notion of a “plane” in which all or part of an element of the cleaning system **100** extends should therefore here, and in the foregoing and in what follows, be understood as being the plane closest to the surface of the element concerned. Similarly, the notion of a “direction” in which all or part of an element of the cleaning system **100** extends should therefore here, and in the foregoing and in what follows, be understood as being the linear direction closest to the direction in which the element concerned extends.
(20) The supply first part **10** of the guide body **1** makes, with the distribution second part **11**, a non-zero angle **160**. According to the example more particularly illustrated in FIG. **2**, the supply first part **10** of the guide body makes, with the distribution second part **11** thereof, an angle **160** close to 90 degrees. By convention, the main direction of elongation of the supply first part **10** of the guide body **1**, which is substantially perpendicular to the longitudinal direction L and to the vertical direction V, will be referred to in what follows as the transverse direction T of the cleaning system **100**. It should be noted that such a configuration allows the blower **500** that forms the source of drying fluid to be offset away from the spray region **110** in which this drying fluid is sprayed. This makes the cleaning system **100** easier to install on the vehicle.
(21) With reference to the aforementioned directions and orientations, the term “interior” will refer, in what follows, to that side of the cleaning system **100** that is closest, in the transverse direction T, to the end of the supply first part **10** via which this part is connected to the blower **500**. The term “exterior” will refer, in what follows, to that side of the cleaning system that is situated on the opposite side, in the transverse direction T, from the end of the supply first part **10** via which this part is connected to the blower **500**. By extension, the term “interior” will refer to an element of the cleaning system **100** which, in the transverse direction T, is situated on the same side as the surface **250** that is to be cleaned, and the term “exterior” will refer to an element of the cleaning system **100** situated on the opposite side from the surface **250** that is to be cleaned, in the transverse direction T of the cleaning system **100**.
(22) The supply first part **10** of the guide body **1** more or less forms a hollow duct configured to

convey the drying fluid circulated by the blower **500** as far as the distribution second part **11** of the guide body **1**, the two parts of the guide body communicating in order to allow the drying fluid to pass from the first part to the second part.

(23) According to the invention, the drying fluid is conveyed, in the distribution second part **11** of the guide body **1**, through a plurality of conveying ducts **15**, not visible in FIG. **2**, each of which, at its end situated in the spray region **110**, forms one of the spray openings **12**.

(24) A longitudinal dimension of the distribution second part **11** of the guide body **1**, measured in the longitudinal direction L of the cleaning system **100**, increases from the lower vertical end of the distribution second part **11**, via which this part is connected to the supply first part **10**, as far as the spray region **110**. More specifically, this longitudinal dimension increases in such a way that a dimension, measured in the longitudinal direction L, of that part of the spray region **110** in which the drying-fluid spray openings **12** extend, is far greater than a dimension, measured in the longitudinal direction L, of the region of connection between the first and second parts of the guide body.

(25) Each conveying duct **15** therefore follows, between the spray opening **12** situated at one of its ends, and the end of the distribution second part **11**, via which this part is attached to the supply first part **10**, a complex path along which they extend, from the upper end to the lower end of the distribution second part **11** of the guide body **1**, being, on the one hand, substantially perpendicular to the cleaning-fluid distribution pipe **13** and to the distribution duct that this pipe forms with the groove **14** and the substantially cylindrical shape **140** and, on the other hand, inclined with respect to the vertical direction V of the cleaning system **100**, as is more clearly visible in FIG. **3** which illustrates a base of the second part contributing to delimiting these conveying ducts **15**.

(26) Advantageously, the complex paths of the drying-fluid conveying ducts **15** are defined in such a way that the spray openings **12** for this fluid, which in the spray region **110** form the ends of the conveying ducts **15**, are substantially uniformly distributed along the dimension, in the longitudinal direction L of the cleaning system **100**, of the spray region **110**.

(27) According to the invention, the guide body **1** comprises a base **2** and a casing **3** which, positioned to cover the base **2** in the transverse direction T of the cleaning system **100**, forms, with said base **2**, the distribution second part **11** of the guide body **1**. According to the example more particularly illustrated in FIG. **2**, with reference to the directions and orientations defined hereinabove, the base **2** forms the interior side of the distribution second part **11** of the guide body **1**. According to this example, the casing **3** forms, on the one hand, the supply first part **10** of the guide body, and on the other hand covers the base **2** in order therewith to form the distribution second part **11** of the guide body. More specifically, the base **2** and the casing **3** form, in the distribution second part **11** of the guide body, a cavity in which the drying-fluid conveying ducts **15** are arranged, as will now be detailed with reference to FIGS. **3** and **4**.

(28) FIG. **3** illustrates one embodiment of the base **2** of the cleaning system **100** depicted in FIG. **2**.

(29) The base **2** comprises a plate **20** of complex shape, which here has the overall shape of an L of which a base, here vertical, contributes to forming the lower part of the distribution second part **11** of the guide body **1** and of which an extension, here longitudinal, contributes to forming the upper end of the distribution second part **11** of the guide body **1** and the spray region **110**.

(30) According to the example illustrated in FIG. **3**, the base **2** comprises fixing means **21** for fixing to an element of the vehicle structure such as the structure element **400** previously mentioned and not depicted in FIG. **3**. According to the example illustrated in FIG. **3**, the fixing means **21** comprises two tabs **210** of which each prolongs, in the longitudinal direction L of the cleaning system **100**, a longitudinal end of the plate **20** in the upper region thereof. According to the example illustrated in FIG. **3**, each tab **210** comprises an insertion orifice **211**, for example for a screw or rivet not depicted in FIG. **3**, for fixing the base **2** to the structure element **400**.

(31) According to the example illustrated in FIG. **3**, the base **2** comprises, extending substantially perpendicular to the plate **20** from an exterior surface **205** thereof, a plurality of ribs **22** of complex

shape. More specifically, with reference to the directions and orientations defined hereinabove, the ribs **22** extend as a projection from the exterior surface **205** of the plate **20**, which is to say project out from that surface of the plate **20** that is situated, in the transverse direction T of the cleaning system **100**, on the opposite side from the surface via which the plate **20** is secured to the vehicle. As FIG. **3** shows, each rib **22** has, in the longitudinal direction L and in the vertical direction V of the cleaning system **100**, a complex shape, inclined both with respect to the longitudinal direction L and with respect to the vertical direction V of the cleaning system **100**, so as to follow the increase in the longitudinal dimension of the distribution second part of the guide body. The invention also makes provision for the ribs **22** all to have the same dimension in the transverse direction T of the cleaning system **100**.

(32) According to the invention, the ribs **22** contribute to delimiting the conveying ducts **15** conveying the drying fluid in the distribution second part **11** of the guide body **1**. More specifically, in the base **2**, two ribs **22***a*, **22***b* arranged consecutively in the longitudinal direction L of the cleaning system **100** together delimit a circulation pathway **150** for the circulation of the drying fluid in the base **2**. According to the invention, the casing **3** is configured in such a way that, when it covers the base **2**, it closes off the circulation pathways **150**, forming the conveying ducts **15**.

(33) This is particularly visible in FIG. **4** which illustrates, in perspective, the casing **3** of the guide body **1** viewed from the side via which it covers the base **2**, which is to say, in other words, and with reference to the directions and orientations defined hereinabove, viewed from the interior side of the casing **3**.

(34) With reference to FIG. **4**, the casing **3** comprises a first portion **30** configured to form the supply first part **10** of the guide body **1**, which part is not depicted in FIG. **4**, and a second portion **31** configured to cover the base **2** illustrated in FIG. **3**.

(35) With reference to the directions and orientations defined hereinabove, the first portion **30** forms the lower end of the casing **3** in the vertical direction V of the cleaning system **100**, and the second portion **31** forms the upper end of the casing **3**. More specifically, according to the example illustrated in FIG. **4**, the first portion **30** of the casing **3** forms a hollow duct of which the main direction of elongation is parallel to the transverse direction T of the cleaning system **100**, and of which one end, in the transverse direction T, is configured to accept the blower **500**, not depicted in FIG. **4**. At its opposite end in the transverse direction T, the first portion **30** of the casing **3** is attached to a lower end of the second portion **31** of the casing **3**, which is intended to cover the base **2**, the first portion **30** and the second portion **31** being designed to communicate with one another in order to allow the drying fluid to pass. More specifically, the first portion **30** has a closed cross section able of itself to guide the stream of drying fluid toward the second portion, and the second portion **31** has an open cross section able to be pressed intimately against the base **2** in order together to form the drying-fluid guide ducts.

(36) In its second portion **31**, the casing **3** comprises an end wall **310** and lateral walls **311** which extend substantially perpendicular to the end wall **310**, from the longitudinal end edges thereof. The end wall **310** and the lateral walls **311** together define an open cavity **315**.

(37) It should be noted that, according to the embodiment more particularly illustrated in FIG. **4**, the second portion **31** of the casing **3** comprises fixing tabs **32** configured to form, in combination with the fixing tabs **21** of the base **2**, means for fixing the cleaning system **100** to the vehicle. According to the example illustrated in FIG. **4**, the fixing tabs **32** extend, in the longitudinal direction L of the cleaning system **100**, on either side of the lateral walls **311** and each comprise an orifice **320** configured to accept a fixing element such as a screw or rivet intended also to pass through an orifice **211** in the base **2** in order to allow the cleaning system **100** to be fixed to an element **400** of the vehicle structure.

(38) At its upper end in the vertical direction V of the cleaning system **100**, the end wall **310** of the casing **3** is attached to the aforementioned substantially cylindrical shape **140** into which, according to the example more particularly illustrated in the figures, the cleaning-fluid distribution pipe **13** is

inserted. More specifically, the substantially cylindrical shape **140**, of which the main direction of elongation is substantially parallel to the longitudinal direction L of the cleaning system **100**, is arranged in such a way that a part **142** of its wall delimits the open cavity **315** with the end wall **310** and the lateral walls **311**. More specifically still, and as shown by FIG. **4**, the part **142** of the substantially cylindrical shape **140** is attached, in the longitudinal direction L of the cleaning system **100**, to the end wall **310** and is delimited, at its upper end in the vertical direction V of the cleaning system **100**, by the slot **141**. This part **142** of the substantially cylindrical shape **140** thus forms a longitudinal upper wall of the casing **3** and of the cavity **315**.

(39) According to the invention, the shapes and dimensions of the lateral walls **311** and of the curved upper wall **142** are defined to complement the shapes and dimensions of the base **2**, so that when the casing **3** is placed to cover the base **2**, the base **2** closes the cavity **315**. More specifically, the invention makes provision for a dimension, in the transverse direction T of the cleaning system **100**, of the lateral walls **311** to be substantially equal to a dimension, in the transverse direction T, of the ribs **22** of the base **2**.

(40) It then follows that, when the casing **3** is placed covering the base **2**, the free end, in the transverse direction T, of the ribs **22** comes into contact with the end wall **310** of the cavity **315**. In other words, when the casing **3** is placed covering the base **2** to form the cleaning system **100**, and as may have been mentioned earlier, the end wall **310** and the lateral walls **311** close off the circulation pathways **150**, thus forming the drying-fluid conveying ducts **15**.

(41) Advantageously, the interior surface **3100** of the end wall **310**, which is placed against the ends of the ribs **22** when the casing **3** is placed covering the base **2**, is smooth, so as to ensure fluidtight closure of the conveying ducts **15** and avoid any leak of drying fluid between conveying ducts **15**. In one example, the interior surface **3100** is polished.

(42) To complement this, the invention makes provision that when the casing **3** is placed to cover the base **2** to form the distribution second part **11** of the guide body **1** of the cleaning system **100**, the curved upper wall **142** becomes positioned facing the upper free ends **220**, in the vertical direction V of the cleaning system **100**, of each of the ribs **22**. The inclination of this curved upper wall **142** then contributes to reducing the bore section through which drying fluid can pass at each of the spray openings **12**. More particularly, the upper free ends **220**, in the vertical direction V, of the ribs **22** extend in such a way as to lie flush with the upper end edge of the base **2** and to be positioned where the curved upper wall **142** and the end wall **310** of the casing meet. In that way, when the base of the casing are fixed to one another, each spray opening **12** is defined by the base and the ribs and by the end wall, and, where appropriate, the lateral walls, of the casing, and the curved upper wall **142** extends facing each of the spray openings to limit the bore section through which the drying fluid can pass.

(43) With reference to the foregoing, the curved upper wall **142**, which contributes on the one hand to delimiting the groove **14** and which on the other hand contributes to obstructing the spray openings **12** in order to guide the drying fluid made to exit via these openings, forms a wall that is common to the means of spraying the two fluids. This is particularly visible in FIG. **5** which shows, in close-up, a detail of the spray region **110** of the cleaning system **100** positioned in the vicinity of a sensor/transmitter **200** in order to clean a surface **250** thereof.

(44) FIG. **5** again shows the base **2** and the casing **3** as well as, according to the embodiment illustrated here, the cleaning-fluid distribution pipe **13** inserted into the groove **14**. This figure also again shows the upper ends, in the vertical direction V of the cleaning system **100**, of the ribs **22** of the base **2**, which together with the casing **3** delimit the drying-fluid spray openings **12** and conveying ducts **15**. FIG. **5** also schematically indicates a number of cleaning-fluid spray orifices **130** arranged in the distribution pipe **13**.

(45) As FIG. **5** shows, the curved upper wall **142**, on account of its shape and dimensions, obstructs the drying fluid leaving the spray openings **12** in the sense that the upper wall **142** reduces the bore section through which this fluid can pass at the spray openings **12**. It should be noted that the

reduction in the bore section of the spray openings **12** in comparison with the mean bore section of the conveying ducts **15** allows an increase in the velocity of the drying fluid as it exits the cleaning system, making it possible to obtain a jet effect in order to improve the effectiveness of the drying.
(46) It is notable in this FIG. **5** that the curved upper wall **142** extends substantially perpendicular to the main direction of elongation of the conveying ducts **15** so that the same curved upper wall is able to reduce the bore section of all of the spray openings **12**.
(47) FIG. **5** also schematically indicates, on the one hand, a sprayed jet **135** of cleaning fluid sprayed through a spray orifice **130** and, on the other hand, a sprayed jet **155** of drying fluid sprayed via a spray opening **12**. A consequence of the particular arrangement of the cleaning-fluid spray orifices **130** and of the drying-fluid spray openings **12** is that, when the cleaning system **100** is installed is near a surface **250** that is to be cleaned, the drying fluid is sprayed, thanks to the cleaning system according to the invention, between the surface **250** that is to be cleaned and the cleaning-fluid spray orifices **130**. The drying fluid, in this instance air, is therefore sprayed as close as possible to the surface **250** that is to be cleaned, allowing rapid and effective drying thereof, with a reduced loss of air between the spray openings **12** and the surface **250** that is to be cleaned. This last factor notably, in the context of the example illustrated here in which the drying fluid is a stream of air generated by the blower **500**, allows the blower **500** to be dimensioned to more closely meet just the requirements for a stream of drying air.
(48) FIG. **6** is a view from above of the detail depicted in FIG. **5**. FIG. **6** again shows the sensor/transmitter **200** and its surface **250** that is to be cleaned, as well as the cleaning system **100**, and the base **2** and casing **3** thereof. The blower **500** is also schematically indicated in this figure. FIG. **6** also depicts cleaning-fluid spray orifices **130** and the drying-fluid spray openings **12** delimited by the ribs **22** of the base **2** and by the curved upper wall **142** of the casing **3**.
(49) FIG. **6** also shows the path **156** of the drying fluid coming from all the drying-fluid conveying ducts **15**.
(50) As FIG. **6** shows, a consequence of the particular arrangement of the conveying ducts **15** and, in particular, of the inclined shape of the ribs **22** in the longitudinal direction L of the cleaning system **100**, is that the stream of drying fluid, in this instance air, does indeed reach the entirety of the surface **250** that is to be cleaned, and does so even though the source of drying fluid, in this instance the blower **500**, is offset, in the longitudinal direction L, from the spray openings **12** that spray said drying fluid.
(51) The invention, as has just been described, therefore does indeed achieve its stated objectives by offering a simple system for cleaning and drying a surface of a sensor/transmitter of a motor vehicle. The invention also allows such a cleaning system to be installed easily in a small amount of space, while respecting the overall look of the vehicle in the vicinity of the sensor/transmitter and of the cleaning system.
(52) The invention as has just been described is not, however, limited to the means and configurations exclusively described and illustrated, but also applies to all equivalent means or configurations and to any combination of such means or configurations. In particular, while the invention has been described here according to an example in which the cleaning fluid is conveyed in a distribution pipe **13**, the invention applies to alternative instances in which the cleaning-fluid spray orifices **130** are arranged in the substantially cylindrical shape **140**, the latter then not having the slot **141**. In this case, the cleaning-fluid distribution duct is a substantially cylindrical distribution duct **135** pierced with the spray orifices **130** and arranged at the upper end, in the vertical direction V of the cleaning system **100**, of the casing **3**.
(53) Likewise, the invention also applies to instances, not depicted in the figures, in which the base **2** of the cleaning system **100** is formed as one piece with the element **400** of the vehicle structure to which the cleaning system **100** is fixed. In this case, the ribs **22**, which contribute to delimiting the drying-fluid conveying ducts **15**, are arranged to project from the structure element **400**, and the

casing **3** is attached to the latter element, for example by fixing means **32**, **320** such as those described hereinabove.

Claims

1. A cleaning system for cleaning a motor vehicle sensor/transmitter, comprising: a base configured to be secured to a structure of the motor vehicle; a casing configured to cover the base; spray orifices for spraying a first fluid onto the sensor/transmitter and spray openings for spraying a second fluid onto the sensor/transmitter; the second fluid being distinct from the first fluid, wherein the second fluid is a drying fluid; a guide body guiding the first fluid and the second fluid respectively toward the spray orifices of the first-fluid and the spray openings of the second fluid; the guide body including a supply first part configured to be connected to a source of the second fluid; a distribution second part including a plurality of second-fluid conveying ducts opening onto the spray openings of the second-fluid and; a first-fluid distribution duct arranged substantially perpendicular to the second-fluid conveying ducts; wherein the casing includes a first portion configured to be connected to the source of the second fluid; a second portion configured to form the distribution second part with the base, and the first portion and the second portion making between them a non-zero angle.
2. The cleaning system of claim 1, wherein a wall of the first-fluid distribution duct is arranged across the spray openings of the second-fluid conveying ducts in a second-fluid spray region.
3. The cleaning system of claim 1, wherein the distribution second part of the guide body has a dimension, measured in the longitudinal direction (L) of the cleaning system that differs between an edge connecting with the supply first part and an edge including the spray openings of the second-fluid.
4. The cleaning system of claim 1, wherein the openings of the second fluid are uniformly distributed along a direction of elongation of the distribution second part, substantially parallel to a longitudinal direction (L) of the cleaning system.
5. The cleaning system of claim 1, wherein the second-fluid conveying ducts are delimited by ribs projecting out from an exterior surface of the base and an interior surface of the casing is configured to be in contact with free ends of respective ribs.
6. The cleaning system of claim 5, wherein the ribs delimit the guide body within the distribution second part of the second fluid conveying ducts which are inclined with respect to a longitudinal direction (L) and to a vertical direction (V) of the cleaning system.
7. The cleaning system of claim 6, wherein each second-fluid spray opening is delimited by free ends of two ribs along the longitudinal direction (L) of the cleaning system, such that the two ribs are configured to contribute to delimiting a corresponding second-fluid conveying duct.
8. The cleaning system of claim 5, wherein the second-fluid conveying ducts are narrowed at each end via which the second fluid is sprayed from them.
9. The cleaning system of claim 1, wherein the casing includes a groove to accept a first-fluid distribution pipe in which a plurality of first-fluid spray orifices is arranged.
10. The cleaning system of claim 1, wherein the casing includes a first-fluid distribution duct of closed cross section and in which a plurality of first-fluid spray orifices is arranged.
11. A motor vehicle equipped with at least one sensor/transmitter, characterized in that the motor vehicle includes at least one sensor/transmitter-cleaning system of claim 1 for cleaning the at least one sensor/transmitter.