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### REMOVABLE LIGHTING ASSEMBLY

#### Abstract

The invention relates to a light assembly including a main housing with a front opening and a rear opening facing at least a part of the front opening, a luminous device with a secondary housing, and an outer lens sealingly closing the front opening of the main housing. The luminous device can be seated in the rear opening, and the secondary housing is sealingly and reversibly fastened to the main housing. In the event of a failure of a component of a luminous device of a light assembly and/or in the event of impacts damaging a part of the light assembly, the light assembly according to the invention requires just one part to be replaced, for example, only the outer lens and the main housing or only the luminous device need be replaced.

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## **Background/Summary**

### **TECHNICAL FIELD**

[0001] The technical field of the invention is the field of light assemblies for automotive vehicles (private vehicles or commercial vehicles). The light assembly may in particular be capable of emitting a lighting and/or signaling function.

[0002] The present invention relates in particular to removable light assemblies, in particular those located at the front or at the rear of the vehicle.

### **BACKGROUND OF THE INVENTION**

[0003] At present, automotive vehicles are equipped with light assemblies at the front and rear, either to illuminate the road or to be visible to other motorists. These assemblies consist of one or more light sources arranged in a hermetically sealed housing, since usage conditions require the assembly to be sealed to prevent water from reaching the light sources. As a result, in the event of an accident damaging a part of the assembly or of failure, for example affecting one of the light sources or an electronic component, the entire assembly has to be changed, which increases the cost of repair for the user.

### **SUMMARY OF THE INVENTION**

[0004] The invention offers a solution to the problems mentioned above, by requiring only the part of the assembly which is damaged to be changed, and not the complete assembly.

[0005] The invention relates to a light assembly intended to be mounted on an automotive vehicle and comprising: [0006] a main housing comprising a first side with a front opening and a second side, opposite the first side, with a rear opening facing at least a part of the front opening, [0007] a luminous device with a secondary housing, [0008] an outer lens sealingly closing the front opening in the first side of the main housing, [0009] it is characterized in that the luminous device is seated in the rear opening in the second side of the main housing, and the secondary housing is sealingly and reversibly fastened to the second side of the main housing. The front opening preferably extends over the entire front surface of the main housing.

[0010] In the event of a failure of a component of a luminous device of a light assembly and/or in the event of impacts damaging a part of the light assembly, the light assembly according to the invention requires just one part of the light assembly to be replaced: for example, only the outer lens and the main housing or only the luminous device need be replaced, while guaranteeing the seal of the assembly before and after the repair. This helps to reduce repair costs,

[0011] The opening in the second side, opposite the first side, enables the luminous device to be inserted into the main housing, in particular if the latter is closed irreversibly on the first side by the outer lens.

[0012] The invention also permits a degree of standardization since the same main housing with the related outer lens of a given light assembly can be used with different luminous devices depending on the equipment level of the vehicle.

[0013] Advantageously, the outer lens is irreversibly fastened to the main housing. The outer lens may, for example, be bonded to the main housing.

[0014] Advantageously, the secondary housing comprises a groove in which a gasket is positioned facing the main housing. This gasket guarantees the seal between the two housings, in particular between the secondary housing of the luminous device and the main housing of the light assembly.

[0015] Advantageously, the luminous device comprises means for attaching the secondary housing to the main housing. This fastening means for example consists of lugs placed on the secondary housing, in which fastening screws may be inserted into complementary fastening means, such as screw bushings, placed on the main housing. Tightening the fastening screws compresses the gasket on the main housing, thereby guaranteeing the sealed fastening of the secondary housing, and therefore of the luminous device, on the main housing.

[0016] Advantageously, the secondary housing is open on a front face and the outer lens closes the front face of the secondary housing. Indeed, since the secondary housing is sealingly fastened to the main housing and the outer lens sealingly closes the front opening of the main housing, the outer lens forms part of the sealed closure of the front face of the secondary housing. In particular, the front face of the secondary housing is not fastened to the outer lens, i.e. the front face of the secondary housing and the outer lens are not in contact. The outer lens then participates indirectly in closing the front face of the secondary housing.

[0017] Advantageously, the luminous device comprises a light source and an optical deviation element, such as for example a reflector, a lens or a light guide. The optical deviation element is used to shape the light rays emitted by the light source to participate in the formation of a light or signaling beam.

[0018] According to a first embodiment, the luminous device is a headlamp or a taillight. In particular, the headlamp, or respectively the taillight, may comprise one or more luminous modules, or respectively one or more lighting units. The luminous module or modules, or respectively the lighting unit or units, are arranged in the secondary housing. According to one example, the secondary housing comprises a cavity receiving the luminous module or modules, or respectively the lighting unit or units. The cavity may in particular comprise an opening, and the headlamp, or respectively the taillight, may or may not have a closing outer lens closing the opening of this cavity.

[0019] For example, each luminous module, or respectively each lighting unit, comprises at least one light source and an optical deviation element for shaping the light rays emitted by the light source.

[0020] Advantageously, the main housing has an elongate shape having two ends and comprises two headlamps or two taillights, each having a secondary housing sealingly and reversibly fastened to each end of the main housing. In this case, the light assembly is intended to cover the entire front or rear width of the vehicle. The main housing and the outer lens then constitute a panel to which the headlamps or taillights are attached. In this case, the light assembly comprises both this panel, which is very voluminous and very wide with the outer lens, which is large and therefore expensive, as well as several other very expensive elements, such as headlamps or taillights. The invention obviates the need to change the whole of the light assembly, formed by the panel and the headlamps or the taillights, in the event of a headlamp or a taillight failing, or in the event of an impact on the outer lens. Indeed, only the defective headlamp or taillight needs to be changed, enabling the pane to be kept, i.e. the outer lens and the main housing as well as the other headlamp or taillight, or only the outer lens and the main housing need to be changed, enabling the headlamps or taillights to be kept.

[0021] Advantageously, the outer lens covers both headlamps or both taillights. In particular, the secondary housing of each of the two headlamps or each of the two taillights is open on a front face, and the outer lens covers the front face of the secondary housings of both headlamps or of both taillights. This opening in the front face may correspond to the opening of the cavity of the secondary housing. The panel in this case comprises a single large outer lens covering both headlamps or both taillights and the part located therebetween, instead of two smaller outer lenses

each covering only a single headlamp or a single taillight. The light assembly according to the invention is in this case particularly advantageous because the headlamps or the taillights can be saved in the event of impacts on the outer lens, for example.

[0022] Advantageously, the light assembly includes at least one light guide placed in the main housing behind the outer lens. These light guides are used to form a light pattern. These light guides are used in particular to form a light signature specific to the automotive vehicle on which the light assembly is intended to be mounted.

[0023] Advantageously, the or each light guide is fed by a light source arranged in the headlamp or in the taillight. This obviates the need for electronics in the panel. In other words, in the light assembly, only the headlamps or the taillights include electronic components. This makes it easy to separately replace the panel, or one or other of the headlamps or taillights.

[0024] This specific light source may be arranged in the secondary housing of the headlamp or taillight, for example on a dedicated printed circuit board. “Dedicated printed circuit board” means that this printed circuit board differs from a printed circuit board on which the light source of the headlamp or taillight is arranged and which produces the light or signaling beam.

[0025] According to a second embodiment, the light assembly is a headlamp and the luminous device comprises at least one luminous module.

[0026] The invention and its various applications will be better understood from reading the following description and from examining the accompanying figures.

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## Description

### BRIEF DESCRIPTION OF THE DRAWINGS

[0027] The figures show a non-limiting example of the invention.

[0028] FIG. 1 is an exploded view of a first embodiment of the invention,

[0029] FIG. 2 is a cross-sectional view of the middle of the assembly in FIG. 1,

[0030] FIG. 3 shows a detail of a cross-sectional view of the assembly in FIG. 1,

[0031] FIG. 4 is an exploded view of a second embodiment at one of the headlamps,

[0032] FIG. 5 is an exploded view of a variant of the second embodiment.

### DETAILED DESCRIPTION OF THE INVENTION

[0033] Unless stated otherwise, the same element appearing in different figures is provided with a single reference.

[0034] Throughout the description, the side through which the light exits will be called “front”, and the side from which the light is emitted will be called “rear”.

[0035] In the first embodiment illustrated in FIG. 1, the light assembly 1 comprises two luminous devices formed by two headlamps 2, a main housing 3 and an outer lens 4. The description is given here for luminous devices formed by front headlamps, but this would apply in the same way to luminous devices formed by taillights. The main housing 3 comprises a first side with a front opening 32 and a second side, opposite the first side, with two rear openings 30. In an alternative that is not shown, the light assembly may comprise only one headlamp, and the main housing may comprise only one rear opening.

[0036] In the example illustrated, the main housing 3 has an elongate shape having two ends. The front opening 32 extends from one end of the main housing 3 to the other, i.e. over the entire surface of the main housing 3. Each of the rear openings 30 faces the front opening 32, at one of the ends of the main housing 3.

[0037] The outer lens 4 faces the front opening 32 of the main housing 3. It sealingly closes the front opening of the main housing 3. In the example illustrated, the outer lens 4 is fastened to the main housing 3 by bonding. As visible in FIG. 2, which shows a cross section made in the middle of the assembled light assembly 1, the outer lens 4 comprises a rib 40, and the main housing 3

comprises a slot **31** receiving the rib **40**. To rigidly connect the outer lens **4** to the main housing **3** by bonding, adhesive is inserted into the slot **31**, and the rib **40** of the outer lens **4** is then inserted into the slot **31**. Alternatively, the outer lens **4** could be joined to the main housing **3** by welding, or by a hotplate process. It is understood that the outer lens **4** is therefore fastened not only sealingly to the main housing **3**, but also irreversibly, or in other words in a non-removable manner. The outer lens **4** and the main housing **3** thus form a non-removable panel **10**. "Non-removable" means that the outer lens **4** cannot be detached from the main housing **3** without damaging the outer lens **4** and/or the main housing **3**.

[0038] The headlamps **2** are each arranged at one end of the main housing **3**, facing one of the rear openings **30** of the main housing **3**, and they are attached to the main housing **3**. Each headlamp **2** comprises a front opening **25** aligned with the rear opening **30** of the main housing **3**.

[0039] When the light assembly **1** is mounted on a vehicle, the panel **10** covers the entire front of the vehicle, and both headlamps **2**, arranged at each end of the main housing **3**, thus constitute a right-hand headlamp and a left-hand headlamp of the vehicle.

[0040] The headlamps **2** have at least one light source and one optical deviation element, such as for example a reflector, a lens or a light guide, for shaping the light rays emitted by the light source to form at least part of a light or signaling beam. For example, the headlamps **2** may comprise luminous modules including the at least one light source and the optical deviation element.

[0041] Since the outer lens **4** also faces the rear openings **30** of the main housing **3**, the light or signaling beam formed by each headlamp **2** can thus pass through the outer lens **4** and be visible from outside the light assembly **1**.

[0042] FIG. **3** shows a cross section of the light assembly **1** at one of the headlamps **2**. Each headlamp **2** comprises a secondary housing **21** sealingly and reversibly attached to the main housing **3**.

[0043] The secondary housing **21** comprises attachment elements which cooperate with complementary attachment elements arranged on the main housing **3**. For example, the attachment elements of the secondary housing **21** may be formed by lugs arranged on the periphery of the secondary housing **21** and including a through-hole, and the complementary attachment elements arranged on the main housing **3** may be formed by screw bushings. Thus, fastening screws can be inserted into the through-holes and into the screw bushings in order to attach the secondary housing **21** and the main housing **3** together in a reversible manner. The headlamps **2** can thus be removed from the main housing **3** and therefore from the panel **10**.

[0044] The light assembly **1** comprises a gasket **20** positioned in a groove **23** of the secondary housing **21** and bearing against the main housing **3** in order to guarantee a sealed fastening between the headlamp **2** and the panel **10**. When the secondary housing **21** is joined to the main housing **3**, the fastening screws are tightened, which brings the main housing **3** into contact with the secondary housing **21**, thus compressing the gasket **20** between the main housing **3** and the secondary housing **21**. This guarantees the seal between the main housing **3** and the secondary housing **21**.

[0045] In this example, the headlamps **2** do not have their own closing outer lens. In other words, the front opening **25** of each headlamp is not closed by a outer lens specific to the headlamp. The outer lens **4** indirectly and sealingly closes the front opening **25** of each headlamp **2**, thereby protecting the headlamps **2**. In fact, the outer lens **4** sealingly closes the front opening **32** of the main housing **3**, and the secondary housing **21** of each headlamp **2** is sealingly fastened to the main housing **3** at the rear openings **30**. Thus, the outer lens **4** sealingly closes the front openings **25** of the headlamps **2**.

[0046] In a variant that is not shown, the front opening **25** of the headlamps **2** can be sealingly closed by an outer lens specific to the headlamp **2**.

[0047] In the non-limiting example illustrated, the light assembly **1** also comprises a plurality of light guides **5**, a support **50** for the light guides **5**, and a mask **6**. The support **50** for the light guides **5**, the light guides **5** and the mask **6** are arranged between the main housing **3** and the outer lens **4**,

and more precisely between the first side of the main housing **3** and the outer lens **4**. The support **50** for the light guides **5**, the light guides **5** and the mask **6** are sandwiched between the main housing **3** and the outer lens **4**. The panel **10** thus comprises the light guides **5**, the support **50** for the light guides **5** and the mask **6**.

[0048] The support **50** for the light guides, the light guides **5** and the mask **6** are optional. The panel **10** need only comprise the main housing **3** and the outer lens **4**. It is also possible for the panel **10** to comprise only the main housing **3**, the outer lens **4** and one or other of the mask **6** and the assembly formed by the support **50** for the light guides **5** and the light guides **5**.

[0049] The light guides **5** are used to form a light signature specific to the vehicle on which the light assembly **1** is mounted. In the example illustrated, the light assembly comprises six light guides **5** distributed along the periphery of the front face of the main housing **3**. Two curved lateral light guides **5a** are located at each end of the main housing **3**, and two central light guides **5b** join the lateral light guides **5a** in pairs. This distribution of the light guides **5** optimizes the guiding of the light in the curved parts. However, the number of light guides is not limiting, and a single light guide, or two light guides, could for example be used.

[0050] As visible in FIG. **2**, the light guides **5** are placed in a groove **51** of the support **50** for the light guides **5**, to be held in position.

[0051] Each light guide **5** is fed by at least one light source arranged in one of the headlamps **2**. The light sources feeding the light guides **5** are positioned in the secondary housing **21** of the headlamps **2**, for example on a dedicated printed circuit board **15** (visible in FIG. **3**). Thus, the panel **10** does not have any electronic components, which enables the panel or one or other of the headlamps **2** to be replaced more easily and separately. It will be noted that the light sources feeding the light guides **5** are distinct from the light sources forming the light or signaling beams of the headlamps **2**.

[0052] The central light guides **5b** are each fed by a light source arranged in one of the headlamps **2** at the first end thereof, and a light source arranged in the other of the headlamps **2** at the second end thereof. FIG. **1** shows the two light inlets **15b** of the central light guides **5b**. This double feed to the central light guides **5b** enables the central light guides **5b** to be uniformly illuminated. The lateral light guides **5a** are fed by a single light source arranged in the headlamp **2** located at the same end of the main housing **3** as the corresponding lateral light guide **5a**. FIG. **1** shows the light inlet **15a** of the lateral light guides **5a**.

[0053] The mask **6** is arranged in front of the support **50** for the light guides **5** and the light guides **5**. The mask **6** comprises two orifices **60** placed at the ends thereof and facing the rear openings **30** of the main housing **3**. The orifices **60** therefore also face the headlamps **2**, and in particular face the front openings **25** of the headlamps **2**. The light or signaling beams emitted by the headlamps **2** can thus be transmitted through the rear openings **30**, the front opening **32** and the orifices **60** as far as the outer lens **4**, so that they are visible from outside the light assembly **1**.

[0054] The mask **6** comprises an opaque part **63** enabling certain parts of the light assembly **1** to be masked, in particular the central part of the light assembly **1**, and a transparent part **61** facing the light guides **5**, in front of the light guides **5**. The light guides **5** and the light emitted by the light guides **5** can thus be seen from outside the light assembly **1**.

[0055] Moreover, patterns may be drawn on the front face of the mask **6**, corresponding to the face turned toward the outer lens **4**, to style the vehicle. For example, the patterns may be geometric shapes.

[0056] The support **50** for the light guide **5** and the mask **6** are for example joined together by snap-fitting or screwing, and the light guides **5** are positioned and held by being sandwiched between the support **50** and the mask **6**. Alternatively, the support **50** and the mask **6** could be joined together by bonding. Joining by snap-fitting or screwing reduces joining time compared to joining by bonding, which requires a drying time.

[0057] Once assembled, the support **50**, the light guides **5** and the mask **6** are positioned between

the main housing **3** and the outer lens **4**, being sandwiched between the main housing **3** and the outer lens **4**. Thus, the panel **10** comprising the main housing **3**, the support **50**, the light guides **5**, the mask **6** and the outer lens **4** is joined in a non-removable manner.

[0058] The panel may optionally also comprise a logo **7** arranged between the mask **6** and the outer lens **4**.

[0059] The light assembly **1** is advantageous in that in the event of an impact on the outer lens **4** or in the event of malfunction of one of the headlamps **2**, only the panel **10** needs to be changed, enabling the headlamps **2** to be kept, or only one of the headlamps **2** needs to be changed, enabling the panel **10** and the other headlamp **2** to be kept.

[0060] To change the panel **10**, all that is required is to remove the light assembly **1**, then to unscrew the two headlamps **2** from the panel **10**, and to screw the two headlamps **2** back onto a new panel. To change one of the headlamps, all that is required is to remove the light assembly **1**, then to unscrew the headlamp **2** to be changed and to replace this defective headlamp **2** with another headlamp.

[0061] In this embodiment, the panel **10** can be more or less complex depending on the options (with or without light guide, with or without logo, etc.), and the removable joining of the headlamps **2** to the panel **10** enables different, more or less sophisticated, headlamps **2** to be mounted on the panel **10**, depending on the desired performance of the light assembly **1**.

[0062] FIG. **4** shows a second embodiment in which the light assembly **1** is a headlamp **11** and comprises a main housing **3**, an outer lens **4** and a luminous device **8**. The luminous device **8** comprises luminous modules **41**, a support **62** for the luminous modules **41**, and a secondary housing **21** in which the luminous modules **41** and the support **62** for the luminous modules **41** are arranged.

[0063] Elements similar to the first embodiment will be described briefly, it being understood that the description given of these elements in the first embodiment applies.

[0064] As in the first embodiment, the main housing **3** comprises a first side with a front opening **32** and a second side, opposite the first side, with a rear opening (not visible) facing the front opening **32**, and the outer lens **4** sealingly closes the front opening in the first side of the main housing **3**. Furthermore, the outer lens **4** is irreversibly fastened to the main housing **3**. The fastening of the outer lens **4** to the main housing **3** is similar to that described for the first embodiment.

[0065] The rear opening is intended to receive the secondary housing **21** of the luminous device **8**. As in the first embodiment, the secondary housing **21** of the luminous device **8** comprises lugs **24** having through-holes distributed on the periphery of the secondary housing **21**, co-operating with screw bushings of the main housing **3** and enabling the insertion of fastening screws **9** to reversibly attach the secondary housing **21** to the main housing **3**. Furthermore, the secondary housing **21** of the luminous device **8** is also mounted sealingly on the main housing **3**. As described for the first embodiment, a gasket may be used to guarantee the seal.

[0066] The luminous device **8** comprises a front opening **25** aligned with the rear opening of the main housing **3**. In the example illustrated, the luminous device **8** does not have its own closing outer lens. In other words, the front opening **25** of the luminous device **8** is not closed by an outer lens specific to the luminous device **8**. The outer lens **4** of the headlamp **11** enables the front opening **25** of the luminous device **8** to be closed indirectly and sealingly.

[0067] The luminous modules **41** have at least one light source and one optical deviation element, such as for example a reflector, a lens or a light guide, for shaping the light rays emitted by the light source to form at least part of a light or signaling beam. The beams emitted by the luminous modules **41** pass through the outer lens **4** and are thus visible from outside the headlamp **11**.

[0068] With this headlamp **11** according to the invention, in the event of an impact on the outer lens **4**, only the assembly formed by the outer lens **4** and the main housing **3** needs to be changed, enabling the luminous device **8** to be kept. And, in the event of malfunction of a luminous module

**41**, only the luminous device **8** needs to be changed, enabling the assembly formed by the outer lens **4** and the main housing **3** to be kept.

[0069] Moreover, the removable joining of the luminous device **8** to the main housing of the headlamp **11** makes it possible to change the luminous device **8** mounted on the headlamp **11**, and in particular the number or type of luminous modules arranged in the luminous device **8**.

[0070] Thus, as shown in FIG. 5 showing a variant of the second embodiment, the luminous device **8** may comprise just one luminous module **42** instead of the two luminous modules **41**.

Furthermore, the luminous module **42** is different from the luminous module **41**. Thus, the headlamp **11** can easily be adapted depending on the lighting or signaling functions to be performed by the headlamp **11** by choosing the luminous device **8** which is positioned in the headlamp **11**. The headlamp **11** therefore enables good interchangeability i between different luminous devices **8**.

## Claims

1. A light assembly intended to be mounted on an automotive vehicle, comprising: a main housing including a first side with a front opening and a second side, opposite the first side, with a rear opening facing at least a part of the front opening, a luminous device with a secondary housing, an outer lens sealingly closing the front opening in the first side of the main housing, and the luminous device is seated in the rear opening in the second side of the main housing, and the secondary housing is sealingly and reversibly fastened to the second side of the main housing.
  2. The light assembly as claimed in claim 1, wherein the outer lens is irreversibly fastened to the main housing.
  3. The light assembly as claimed in claim 1, wherein the secondary housing includes a groove in which a gasket is positioned facing the main housing.
  4. The light assembly as claimed in claim 1, wherein the luminous device includes means for attaching the secondary housing to the main housing.
  5. The light assembly as claimed in claim 1, wherein the secondary housing is open on a front face and in that the outer lens closes the front face of the secondary housing.
  6. The light assembly as claimed in claim 1, wherein the luminous device includes a light source and an optical deviation element.
  7. The light assembly as claimed in claim 1, wherein the luminous device is a headlamp or a taillight.
  8. The light assembly as claimed in claim 7, wherein the main housing has an elongate shape having two ends and includes two headlamps or two taillights, each having a secondary housing sealingly and reversibly fastened to each end of the main housing.
  9. The light assembly as claimed in claim 8, wherein the outer lens covers both headlamps or both taillights.
  10. The light assembly as claimed in claim 7, wherein the luminous device includes at least one light guide placed in the main housing behind the outer lens.
  11. The light assembly as claimed in claim 10, wherein the light guide is fed by a light source arranged in the headlamp or in the taillight.
  12. The light assembly as claimed in claim 1, wherein the light assembly is a headlamp and in that the luminous device device comprises at least one luminous module.
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