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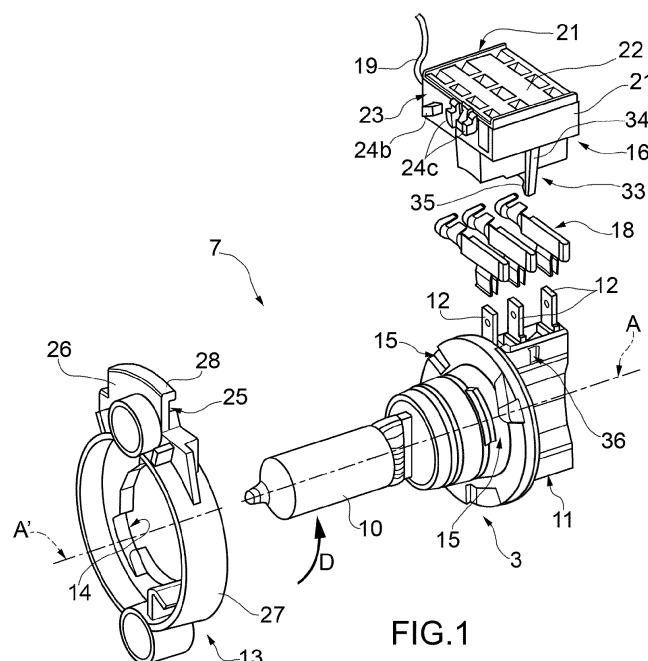
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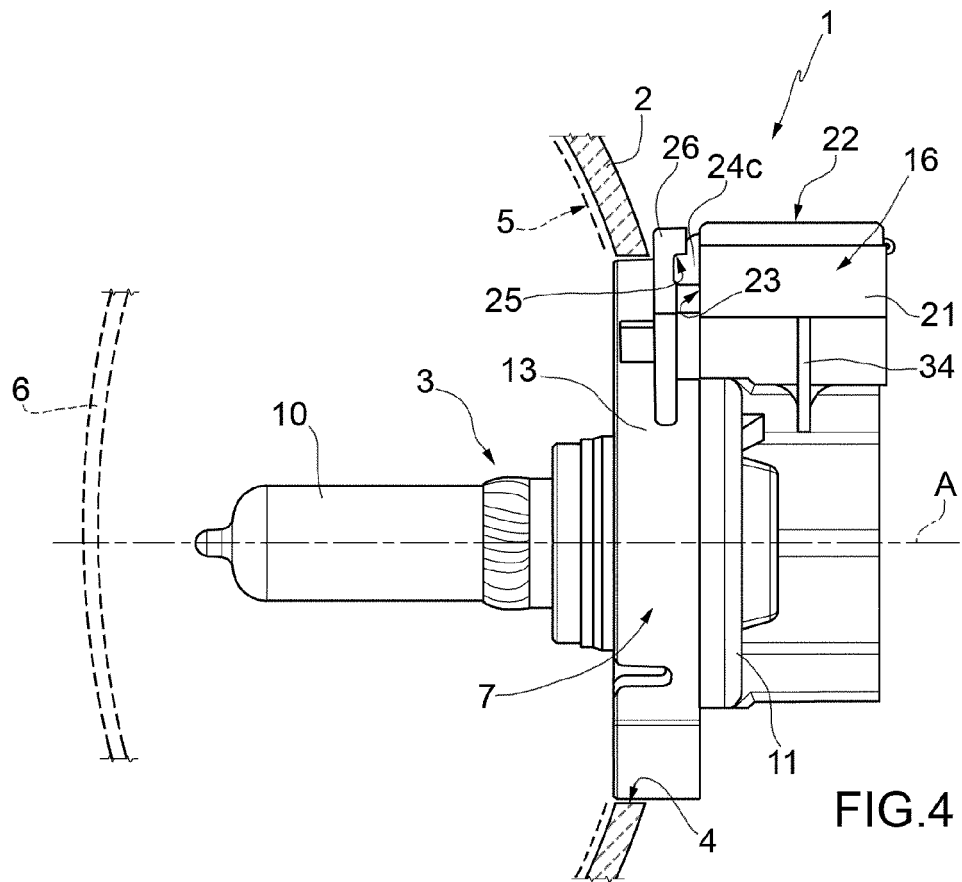
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10121 Torino (IT)**(54) **Automotive lighting device**

(57) An automotive lighting device (1) for vehicles with a headlight body, a lamp (3) including a bulb (10) and a lamp socket (11) integrally connected in one piece to the bulb and having male contacts (12) arranged so as to project at a right angle with respect to an axis (A) of the lamp, and a system (7) for assembling the lamp including a base (13), bayonet coupling means (15; 14) between lamp socket and base, and a connector (16) integrally provided with female contacts (18) which can be coupled with the male contacts by means of the move-

ment of the connector perpendicular to the axis; the connector (16) includes at least one projecting part (24) protruding from a frontal face (23) of the connector which, with the connector being coupled to the lamp socket, faces the bulb; and the base (13), towards the lamp socket, is provided with a channel (25) arranged transversally to the axis and shaped so as to receive, in an undercut-like slidingly coupled manner, the at least one projecting part (24) when the lamp socket is bayonet coupled to the base.

**FIG.1****EP 2 690 353 A1**



Description

[0001] The present invention relates to an automotive lighting device, typically a headlamp or a headlight provided with at least one lamp and with a system for the quick and safe assembly of the lamp on the reflector or on the headlight body. In particular, the lamp is of the so-called "H15" type, wherein the lamp comprises a bulb and a lamp socket made of a non-conductive material and integrally connected in one piece with the bulb; the lamp socket is provided with respective male contacts, typically of the blade or "faston" type, arranged laterally protruding from the lamp socket at a right angle with respect to a symmetry axis of the bulb.

[0002] A headlight for motor vehicles of this type is known from EP1637803A. The lamp assembling system comprises: a base which can be secured in use in a known manner to a headlight body or reflector, the base being provided with bayonet-type receiving means for the lamp socket, which is in turn provided with bayonet-type assembly means complementary to the receiving means of the base; and a connector made of a non-conductive material and integrally provided with respective female contacts. The connector, by operating in use in the engine compartment of the vehicle, is slidably laterally inserted on the lamp socket so as to couple the male contacts of the latter with the female contacts of the connector, which are connected to the electrical supply system of the vehicle.

[0003] In order to prevent the accidental release in use of the connector from the lamp socket, the base is tangentially provided with a shelf-like projecting part which supports in use the connector and guides it in use to the insertion thereof onto the lamp socket, to which projecting part thereof the connector couples snap-wise.

[0004] The above solution is relatively effective but has several drawbacks.

[0005] Firstly, the force with which the connector is retained coupled to the lamp socket only depends on the resistance exerted by the snap coupling between connector and shelf-like projecting part of the base; this means that, in order to obtain an effective retaining, the force that the user must exert for coupling and releasing the connector is strong, which makes the lamp replacement operation very difficult when it breaks down.

[0006] Secondly, in order to complete the electrical connection of the lamp to the electrical supply system of the vehicle, with the insertion of the connector on the lamp socket and the consequent coupling of the female contacts of the connector with the male contacts of the lamp socket, it is necessary to first bayonet couple the lamp socket to the base, since the latter is provided with the projecting part intended for receiving snap-wise the connector. Accordingly, due to the narrow spaces normally present in the engine compartment of vehicles, the insertion of the connector on the lamp socket is doubly difficult for the user.

[0007] Finally, still due to the narrow spaces in which

it is necessary to operate, the user carries out the operations for removing and assembling the lamp on the base, which is in use fixedly secured to the headlight, substantially blindly. This implies the possibility of assembling the lamp in a wrong manner.

[0008] Therefore, an object of the invention is to obviate such drawbacks by providing an automotive lighting device including at least one lamp of the type described and a system for quickly assembling the lamp, wherein the retaining force exerted in use on the connector is made independent of the force required by the user for coupling the female contacts of the connector with the male contacts of the lamp socket.

[0009] A further object of the invention is to provide a lighting device wherein it is very simple for the user to replace the lamp even if the operation is carried out in narrow spaces and wherein the lamp assembling system is simple and cost-effective to be implemented and has small dimensions and which actually eliminates any risk of accidental release, in use, of the connector from the lamp socket.

[0010] The invention therefore relates to an automotive lighting device as defined in claim 1.

[0011] The invention further relates to a vehicle provided with such a lighting device and to a method of assembling a lamp on an automotive lighting device according to claim 11.

[0012] In particular, the lighting device of the invention comprises a headlight body in which at least one lamp is housed, and a quick system for assembling the lamp on the headlight body and/or on a possible reflector coupled to the headlight body; the lamp comprises a bulb and a lamp socket made of an electrically non-conductive material, for example by molding a synthetic plastic material, integrally connected in one piece to the bulb and mounted in use on a base which can be secured to the headlight body and/or to the reflector by means of bayonet-type assembly means carried by the lamp socket and which can be coupled to bayonet receiving means of the base, complementary thereto.

[0013] The lamp socket is provided with respective male contacts arranged laterally protruding from the lamp socket at a right angle with respect to an optical axis, coincident with a relative rotation axis between lamp socket and base with respect to which, in use, the bayonet coupling is achieved between the bayonet-type receiving means of the base and the bayonet-type assembly means of the lamp socket; a connector made of an electrically non-conductive material, for example by molding a synthetic plastic material, is integrally provided with respective female contacts which can be coupled by means of the movement of the connector perpendicular to the axis, to the male contacts of the lamp socket.

[0014] According to the invention, the connector comprises at least one projecting part obtained so as to protrude from a frontal face of the connector which, with the connector being coupled to the lamp socket, faces in use the bulb, and is arranged substantially parallel to the op-

tical axis; and the base, towards the lamp socket, is provided with a channel arranged transversally to the optical axis and shaped so as to receive, in an undercut-like slidingly coupled manner, the at least one projecting part of the connector when the lamp socket is bayonet coupled to the base, so as to prevent relative movements between the connector and the lamp socket perpendicular to the axis and thus keep the female contacts of the connector safely coupled to the male contacts of the lamp socket.

[0015] Preferably, the transversal channel of the base is a circumferential curved channel having a centre of curvature coinciding with the axis and obtained on a projecting lug which radially protrudes, on the opposite side of the axis, from an annular coupling portion of the base; the channel being defined between the annular coupling portion and a peripherally outer edge of the lug, which is curved and L- or preferably C-shaped in radial section.

[0016] The connector comprises a plurality of projecting parts obtained so as to protrude from the frontal face of the connector, which is in turn arranged perpendicular to the axis; a first projecting part, arranged upstream in a rotational coupling direction of the bayonet-type assembly means of the lamp socket with the bayonet-type receiving means of the base is substantially rectilinear, non-deformable, and arranged according to a chord of said curved trajectory; a pair of second projecting parts, arranged downstream in said rotational coupling direction, on the other hand, are provided as elastically deformable, L- or hook-shaped teeth and are integrally secured in one piece to the connector only by means of a root portion thereof and at a peripheral edge of the frontal face, facing the opposite side of the lamp socket and towards the channel.

[0017] The connector is further provided with snap coupling means towards the lamp socket to pre-position it in use with the female contacts already coupled to the male contacts of the lamp holder, to then mount the lamp socket on the base with consequent sliding insertion of the projecting parts of the connector into the base channel.

[0018] In this way, once the lamp socket has been locked on the base, the connector cannot be released from the lamp socket anymore since the removal movement is totally prevented by the undercut-like coupling of the projecting parts of the connector with the base channel.

[0019] In order to disassemble the lamp it is therefore necessary to first releasing the lamp socket from the base and then the connector can be moved away from the lamp socket.

[0020] In the practice, thanks to the described structure, the same bayonet coupling movement in rotation about said axis, between lamp socket and base, also carries out the insertion of the projecting parts of the connector in the base channel, locking the connector on the lamp socket as long as the lamp socket is locked on the base.

[0021] This allows the user to carry out the lamp re-

placement in an easy, quick and simple manner, since the removal and the insertion of the connector from/on the lamp socket is carried out with the lamp socket free, not coupled to the base and accordingly, to the headlight body, allowing the user to see what he/she is doing. Moreover, the coupling of the lamp socket, having the connector already pre-mounted, with the base is carried out with a simple movement of rotation only, which can therefore also be carried out in narrow spaces and with poor or null visibility, and the presence of the projecting parts on the connector prevents the insertion of the lamp socket on the base in a wrong position.

[0022] Further features and advantages of the invention will appear clearly from the following description of a non-limiting purely exemplary embodiment thereof, made with reference to the figures in the accompanying drawings, in which:

- figure 1 shows a perspective three-fourth front view in exploded configuration of the main components of the quick system for assembling a lamp, in particular shown of the H15 type, to a headlight body, not shown, implemented according to the invention;
- figure 2 shows a slightly rotated perspective view of one of the components shown in figure 1;
- figure 3 shows an enlarged scale view of a detail of a coupling step between the components in figure 1;
- figure 4 schematically shows an elevation, partially axial section view of a lighting device fitted with the components in figure 1; and
- figure 5 shows an enlarged scale view of a detail of the coupling between base, lamp socket and connector of the lighting device in figure 4.

[0023] With reference to figures 1 to 5, reference numeral 1 indicates as a whole an automotive lighting device (figure 4), such as a headlamp or a headlight, comprising a headlight body 2, generally cup-shaped, inside which at least one lamp 3 is arranged, which lamp is housed in body 2 through a through seat 4, so as to protrude from the back of body 2; this may also house a reflector 5 either directly or indirectly coupled to the headlight body 2, for example integrally obtained therewith or internally carried by body 2 mounted on a dedicated frame or bracket, not shown for simplicity; the headlight body 2 is closed at the front by a lens or transparent screen 6 which completes the lighting device 1.

[0024] Lamp 3 is shown in detail in figure 1 and is fixed in use to the headlight body 2 and/or to the possible reflector 5 by means of a quick assembling system 7, shown in exploded configuration in figures 1 and 3.

[0025] Lamp 3 comprises a bulb 10 and a lamp socket 11 made of an electrically non-conductive material, for example a molded synthetic plastic material, integrally connected in one piece with bulb 10 and provided with respective male contacts 12 arranged laterally protruding from the lamp socket 11 at a right angle with respect to an optical axis A of bulb 3 and of the related lighting device

1 as a whole. In the example shown, lamp 3 is a lamp of the so-called "H15" type.

[0026] The assembling system 7 for lamp 3 comprises a base 13 which can be secured in use to the headlight body 2 and/or to the reflector 5 in a known and therefore not shown manner for simplicity; base 11 carries bayonet-type receiving means 14, of the known type as a whole, for the lamp socket 11, which is in turn provided with bayonet-type assembly means 15, of the known type as a whole, complementary to the receiving means 14 and carried by the lamp socket 11 so as to allow the removable connection thereof with base 13 by means of a simple relative rotation between lamp socket 11 and base 13 about the optical axis A, which therefore coincides with a relative rotation axis A' between lamp socket 11 and base 13 with respect to which, in use, the bayonet coupling is achieved in a known manner between the receiving means 14 of base 13 and the assembly means 15 of the lamp socket 11 (base 13 is in fact secured in fixed position to the headlight body 2 and/or to reflector 5) in a direction D shown by the arrow in figure 1.

[0027] The assembling system 7 for lamp 3 is completed by a connector 16 made of an electrically non-conductive material, for example a molded synthetic plastic material, and integrally provided with respective female contacts 18 (figure 1), for example co-molded with connector 16, which can be coupled in a known manner by means of a rectilinear movement of connector 16 carried out perpendicularly to axis A (A'), with the male contacts 12 of the lamp socket 11, by the snap insertion, as will be seen, of connector 15 on the lamp socket 11.

[0028] Contacts 18 are connected in a known manner to the electrical supply system of the vehicle (known and not shown for simplicity) by means of a multipolar electrical cable 19 (figure 1) or by means of three independent electrical wires 20, one for each contact 18 (figure 3); preferably, cable 19 and/or wires 20 are co-molded with connector 16 and laterally protrude from the same, for example through a lateral wall 21 arranged in use parallel to axis A/A'. In the non-limiting example shown, connector 16 is a substantially T-shaped and is delimited by a pair of opposite lateral walls 21, by a top wall 22 provided with suitable relieves, and by a frontal wall or face 23 facing in use, when connector 16 is coupled to the lamp socket 11, towards bulb 10.

[0029] According to a feature of the invention, connector 16 comprises at least one projecting part 24 obtained so as to protrude from the frontal wall 23 and arranged substantially parallel to axis A/A'.

[0030] In combination, base 13, towards the lamp socket 11, is provided with a channel 25 arranged transversally to axis A/A' and shaped so as to receive, in use, in an undercut-like slidingly coupled manner, the at least one projecting part 24 of connector 16 when the lamp socket 11 is bayonet coupled to base 13. In this way, any relative movements between connector 16 and the lamp socket 13 perpendicular to axis A/A' are prevented in

use, when lamp 3 is assembled on base 13, as will be seen in more detail hereafter, and the female contacts 18 of connector 16 are kept safely coupled to the male contacts 12 of the lamp socket 11.

[0031] The transversal channel 25 of base 13 is a circumferential curved channel having a centre of curvature coinciding with axis A/A' and obtained on a projecting lug 26 which radially protrudes, on the opposite side of axis A/A', from an annular coupling portion 27 of base 13. Channel 25 is defined between the annular coupling portion 27 and a peripherally outer edge 28 of the lug, which is curved and L- or preferably C-shaped in radial section (figure 3). In particular, the curved edge 28 has a centre of curvature substantially coinciding with axis A (A').

[0032] Channel 25 is circumferentially open at both opposite ends thereof and extends about the coupling portion 27 by a circumferential stretch, which is substantially equal to the width of the rotation movement D about axis A/A' for carrying out in use the bayonet coupling of lamp 3 (i.e. of the lamp socket 11 integral with bulb 10) with base 13, and which is located between the travel start and end of such a movement, as defined by the receiving means 14 and by the complementary coupling means 15.

[0033] According to the preferred embodiment of the invention, connector 16 comprises a plurality of projecting parts 24 obtained so as to protrude from the frontal wall 23 and arranged aligned, in a plane perpendicular to axis A/A', along a curved trajectory having a centre of curvature substantially coinciding with axis A/A'. In particular, the frontal wall 23 is a flat face arranged, when connector 16 is coupled on the lamp socket 11, perpendicular to axis A/A', and has a plurality of respective projecting parts 24 so as to protrude from face 23, parallel to walls or faces 21, and arranged substantially aligned on such a face 23 along a curved trajectory having a centre of curvature substantially coinciding with axis A/A'.

[0034] In particular, connector 16 carries a first projecting part 24b on face 23, arranged upstream in a rotational coupling direction D of the bayonet-type assembly means 15 of the lamp socket 11 with the bayonet-type receiving means 14 of base 13, and a pair of second projecting parts 24c, arranged alongside and downstream with respect to the coupling direction D.

[0035] The projecting part 24b is substantially rectilinear and solid, so as to substantially be non deformable, and is arranged according to a chord of said curved trajectory along which the projecting parts 24 are substantially aligned; on the other hand, the projecting parts 24c are implemented as elastically deformable, L- or preferably hook-shaped teeth. In particular, the projecting parts or teeth 24c are integrally secured in one piece to connector 16 only by means of a root portion 30 thereof (figure 3) and at a peripheral edge 31 of the frontal face 23, facing the opposite side of the lamp socket 11 and towards channel 25.

[0036] According to a further and non secondary feature of the invention, moreover, connector 16 is provided with snap coupling means 33 towards the lamp socket

11. Said snap coupling means 33 comprise a pair of elastically deformable, opposite wings 34 which laterally project so as to protrude from connector 16 with respect to the frontal face 23 and in the insertion direction of the female contacts 18 onto the male contacts 12 of the lamp socket 11; wings 34 are obtained on the lateral faces 21 and end on the opposite side of connector 16, with respective coupling teeth 35 (figures 1 and 3) to respective lateral cavities 36 of the lamp socket 11 arranged close to the male contacts 12.

[0037] Thanks to the described structure it is very easy for an operator to assemble lamp 3 on the headlight body 2 and for the user to carry out the replacement of a faulty lamp 3 with a new one, despite the narrow spaces in which the operator/user must operate when the lighting device 1 is mounted on a vehicle.

[0038] In a first operating step, connector 16, secured to cable 19 and/or to wires 20, is inserted perpendicularly to axis A/A' on contacts 12 of the lamp socket 11 belonging to lamp 3. During such a step, contacts 18 couple with contacts 12, establishing an electrical connection between wires 20/cable 19 and lamp 3; moreover, connector 16 snap couples on the lamp socket 11 thanks to wings 34, the teeth 35 whereof snap into cavities 36.

[0039] The force of such a snap coupling is set up in the design stage so as to be relatively weak and not capable of preventing, in use, an accidental disconnection of connector 16 from contacts 12, so as not to require any considerable force by the user/operator for carrying out the coupling between connector 16 and lamp socket 11. However, once contacts 18 have been inserted on contacts 12, connector 16 is pre-mounted on the lamp socket 11 in a sufficiently firm manner to handle lamp 3 and connector 16 as a single unit.

[0040] Thereafter, such lamp 3/connector 16 "unit" is mounted fixed on base 13, operating in a known manner and as it would be done for mounting only lamp 3 on base 13.

[0041] However, during the relative rotation between the lamp socket 11 and base 13, the projecting parts 24 of connector 16 enter channel 25 on the left side (figure 3) to move, at the rotation travel end (and thus, when the lamp socket 11 is bayonet assembled on base 13) with the projecting part 24b at the terminal end on the right side of figure 3) of channel 25 and with the projecting parts 24c arranged substantially on the center line of channel 25. The hook projecting parts 24c slidably engage under the undercut defined by edge 28, axially and radially locking both connector 16 and lamp 3 on base 13.

[0042] In these conditions it is impossible for connector 16 to accidentally disconnect from the lamp socket 11, whatever the extent of the force applied, unless the whole assembling system 7 is broken.

[0043] The disconnection of connector 16 from the lamp socket 11 is only possible when lamp 3 is first released from the bayonet coupling with base 13, by simply pulling connector 16 perpendicularly to axis A/A', so as to move it away from the lamp socket 11, overcoming

the resistance of the elastic wings 34.

Claims

1. An automotive lighting device (1) like a headlamp or headlight, comprising a headlight body (2) in which at least one lamp (3) is housed, and a quick system (7) for assembling the lamp on the headlight body and/or on a possible reflector (5) coupled with the headlight body, wherein the lamp (3) comprises a bulb (10) and a lamp socket (11) made of an electrically non-conductive material and integrally connected in one piece to the bulb (10); and wherein the lamp socket (11) is provided with respective male contacts (12) arranged laterally protruding from the lamp socket at a right angle with respect to an axis (A) of the lamp; the lamp assembling system comprising a base (13) which can be secured, in use, to the headlight body and/or reflector, bayonet-type receiving means (14) for the lamp socket (11) carried by the base (13), bayonet-type assembly means (15) carried by the lamp socket (11) and complementary to the receiving means of the base, and a connector (16) made of an electrically non-conductive material and integrally provided with respective female contacts (18) which can be coupled by means of the movement of the connector perpendicular to said axis (A), to the male contacts of the lamp socket; **characterized in that**, in combination:

i)- the connector (16) comprises at least one projecting part (24) obtained so as to protrude from a frontal face (23) of the connector which, with the connector being coupled to the lamp socket, faces in use the bulb (10), and is arranged substantially parallel to the axis (A);

ii)- the base (13), towards the lamp socket (11), is provided with a channel (25) arranged transversally to the axis (A) and shaped so as to receive, in an undercut-like slidably coupled manner, said at least one projecting part (24) of the connector when the lamp socket (11) is bayonet coupled to the base (13), so as to prevent relative movements between the connector (16) and the lamp socket (11) perpendicular to the axis (A) and thus keep the female contacts (18) of the connector safely coupled to the male contacts (12) of the lamp socket.

2. A device according to claim 1, **characterized in that** said axis (A) of the lamp coincides with a relative rotation axis (A') between the lamp socket (11) and the base (13) with respect to which, in use, the bayonet coupling is achieved between the bayonet-type receiving means (14) of the base and the bayonet-type assembly means (15) of the lamp socket.

3. A device according to claim 1 or 2, **characterized in that** said transversal channel (25) of the base is a circumferential curved channel having a centre of curvature coinciding with said axis (A/A') and open at its opposite ends.
4. A device according to one of the preceding claims, **characterized in that** said connector (16) comprises a plurality of projecting parts (24b; 24c) obtained so as to protrude from the frontal face (23) of the connector and arranged aligned, in a plane perpendicular to the axis, along a curved trajectory having a centre of curvature substantially coinciding with the axis.
5. A device according to one of the preceding claims, **characterized in that** said transversal channel (25) of the base is obtained on a projecting lug (26) which radially protrudes, on the opposite side of said axis, from an annular coupling portion (27) of the base (13); said channel (25) being defined between the annular coupling portion (27) and a peripherally outer edge (28) of the lug, which is curved and L- or preferably C-shaped in radial section.
6. A device according to claim 5, **characterized in that** said curved edge (28) has a centre of curvature substantially coinciding with said axis.
7. A device according to one of the preceding claims, **characterized in that** said frontal face (23) of the connector is arranged, with the connector being coupled to the lamp socket, perpendicular to said axis, and has respective projecting parts (24b; 24c) obtained so as to protrude from the frontal face and arranged substantially aligned on said face along a curved trajectory having a centre of curvature substantially coinciding with the axis (A/A'); a first projecting part (24b), arranged upstream in a rotational coupling direction (D) of the bayonet-type assembly means of the lamp socket with the bayonet-type receiving means of the base, being a projecting part which is substantially rectilinear and solid, substantially non-deformable, arranged according to a chord of said curved trajectory; and a pair of second projecting parts (24c), arranged downstream in a rotational coupling direction (D) of the bayonet-type assembly means of the lamp socket with the bayonet-type receiving means of the base, being provided as elastically deformable, L- or hook-shaped teeth which are integrally secured in one piece to said connector only by means of a root portion (30) thereof and at a peripheral edge (31) of the frontal face, facing the opposite side of the lamp socket and towards said channel.
8. A device according to one of the preceding claims, **characterized in that** said connector (16) is provided

ed with snap coupling means (33) towards the lamp socket.

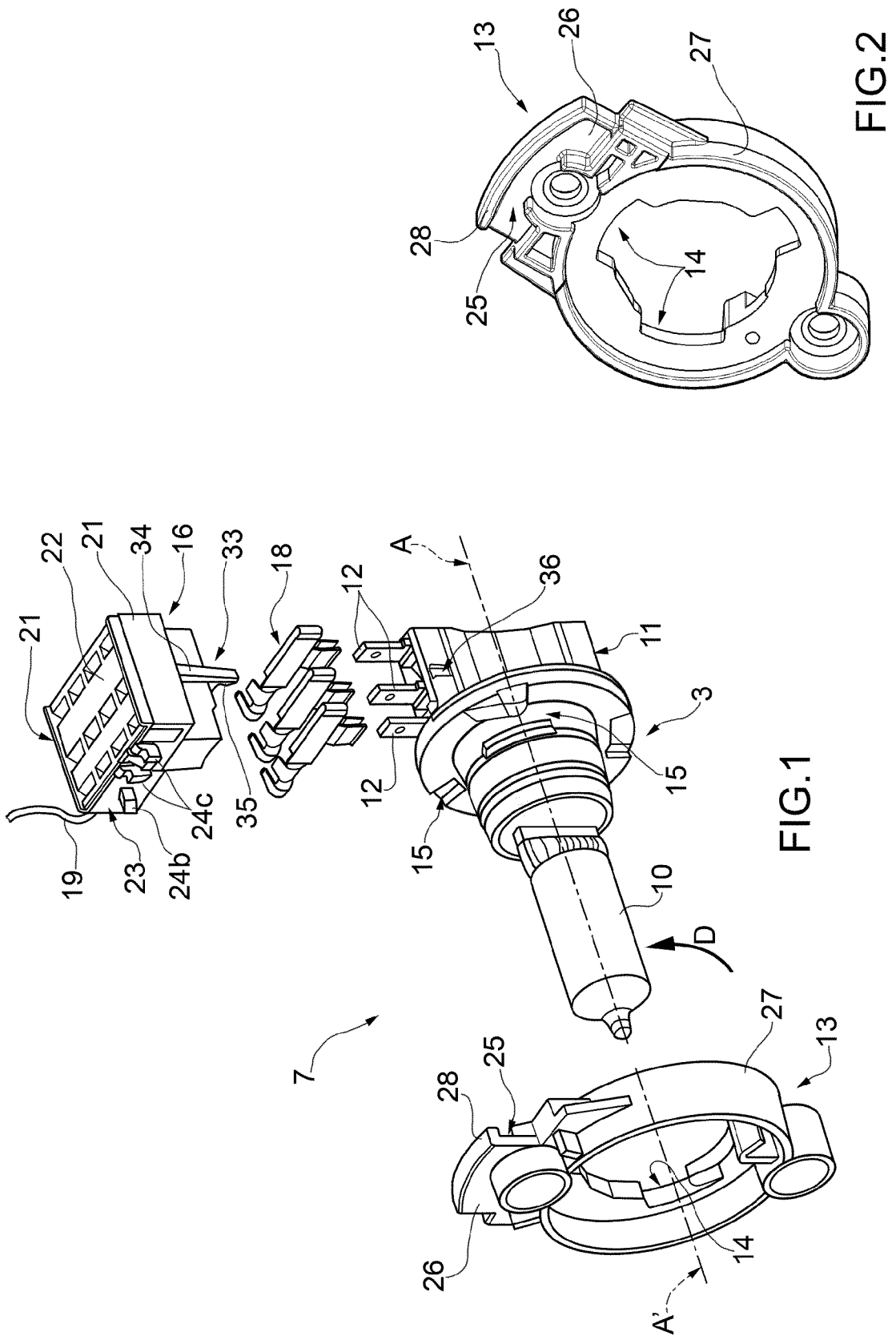
9. A device according to claim 8, **characterized in that** said snap coupling means (33) comprise a pair of elastically deformable, opposite wings (34) which laterally project so as to protrude from the connector (16) with respect to said frontal face (23) of the connector and in the insertion direction of the female contacts of the connector onto the male contacts of the lamp socket; which wings end on the opposite side of the connector, with respective coupling teeth (35) to respective lateral cavities (36) of the lamp socket arranged close to said male contacts (12).

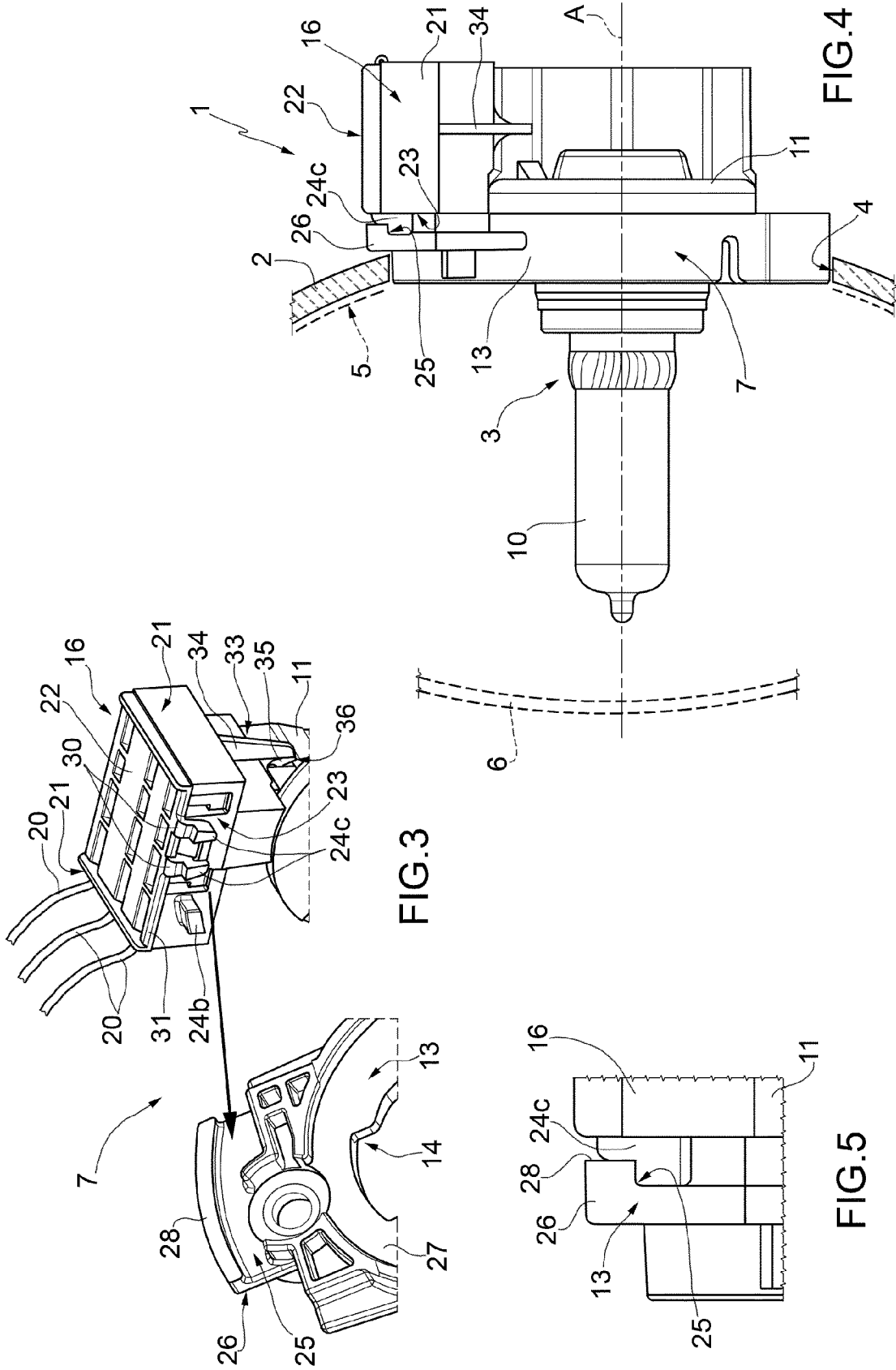
10. A vehicle provided with a lighting device (1) according to one of the preceding claims.

11. A method for assembling a lamp (3) on an automotive lighting device (1), the lamp comprising a bulb (10) and a lamp socket (11) made of an electrically non-conductive material integrally connected in one piece to the bulb and provided with respective male contacts (12) arranged so as to laterally project from the lamp socket at a right angle with respect to an axis (A/A') about which the lamp is relatively rotatable with respect to a base (13) in order to bayonet assemble the lamp on the base; comprising the steps of:

- snap assembling a connector (16) made of an electrically non-conductive material and integrally provided with respective female contacts (18) on the male contacts (12) of the lamp socket (11), by means of a movement of the connector perpendicular to said axis (A/A');

- bayonet coupling the thus obtained lamp/connector unit to the base (13), rotating the lamp (3) about said axis so as to insert at least one projecting part (24) of the connector (16) carried so as to protrude from a frontal face (23) thereof facing the bulb within a channel (25) obtained on the base (13) and arranged transversally to the axis, shaped so as to receive, in an undercut-like, slidingly coupled manner, said at least one projecting part (24) of the connector, so as to prevent relative movements between the connector and the lamp socket in a direction perpendicular to the axis and thus keep the female contacts (18) of the connector safely coupled to the male contacts (12) of the lamp socket.







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EP 13 17 8282

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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