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(54) Title: REAR AUTOMOTIVE LIGHT

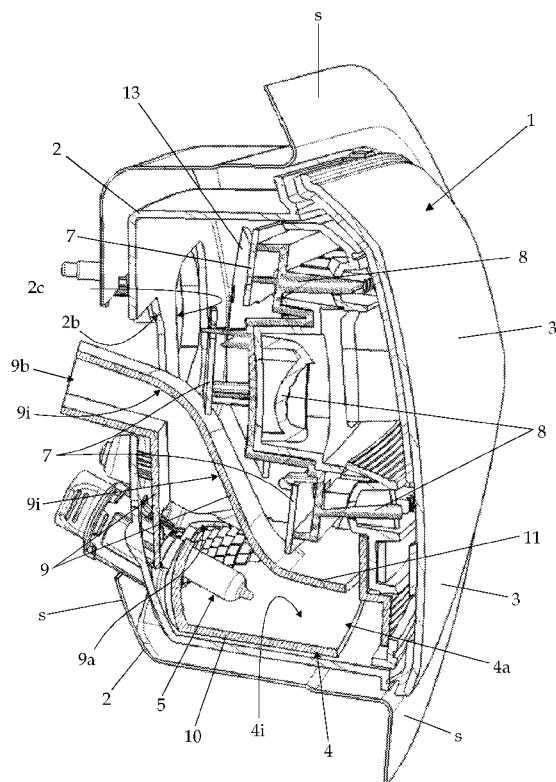


Fig. 2

(57) Abstract: A rear automotive light (1) of the type comprising: a substantially basin-shaped, rear shell (2) which is structured so to be fixed to the vehicle body; a front lenticular half-shell (3) which is arranged to close the mouth (2a) of the rear shell (2); at least one cup-shaped reflector body (4), which is arranged inside the rear shell (2) with its mouth (4a) facing a first transparent or semitransparent portion of the front lenticular half-shell (3); and a light source (5), which is structured so as to emit light when electricity powered, and is arranged within the cup-shaped reflector body (4), close to the bottom thereof, so as to backlight said first transparent or semitransparent portion of the front lenticular half-shell (3); and finally a heat extraction duct (9) that juts out from the bottom of the cup-shaped reflector body (4), and extends upwards into the rear shell (2) up to reach an opening (2b) made at the bottom of the rear shell (2).



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REAR AUTOMOTIVE LIGHT

TECHNICAL FIELD

The present invention relates to a rear automotive
5 light.

More in detail, the present invention relates to a rear light for cars, use to which the following description refers purely by way of example without this implying any loss of generality.

10 BACKGROUND ART

As is known rear lights of cars usually consist of a substantially basin-shaped, rigid rear body, which is structured so as to stably recessed in a compartment specifically made in the rear part of the vehicle body;
15 of a front lenticular half-shell, which is at least partially made of transparent or semitransparent plastic material, usually possibly colored, and is arranged to close the mouth of the body so as to surface on the outside of the vehicle body; of one or more cup-shaped
20 reflector bodies with an approximately parabolic profile, each of which has a mirror-finished inner surface and is positioned within the rear shell with its mouth facing a corresponding transparent or semitransparent portion of the front lenticular half-
25 shell; and of a series of incandescent lamps, each of which is arranged within a corresponding cup-shaped body, close to the bottom thereof, so as to backlight the transparent or semitransparent portion of the front

lenticular half-shell directly above the cup-shaped reflector body itself.

Furthermore, over the past years, rear automotive lights have been increasingly integrated in the outer profile of the vehicle body, up to envelop the two edges of the body which join the rear part of the vehicle body with the two lateral sides thereof.

Obviously, the considerable integration of the outer profile of the vehicle body has implied the adoption of lenticular half-shells with particularly complex three-dimensional shapes and the drastic reduction of the working space needed to accommodate the cup-shaped reflector bodies inside the shell.

In order to at least partially obviate this drawback, most rear automotive light manufacturers have decided to replace some of the cup-shaped reflector bodies and the corresponding incandescent lamps with light emitting diode arrays, traditionally referred to as LEDs. LEDs are indeed much smaller in size than the traditional incandescent lamps for automotive purposes, and allow to make relatively thin flat light sources which exactly mimic the shape of the transparent or semitransparent portions of the half-shell to be backlighted, and may be positioned immediately underneath the front lenticular half-shell of the rear light locally following its profile.

Regretfully, the arrangement of LEDs in the rear light has created new problems. The interior of the rear

light is indeed a small, closed space where relatively high temperatures can be reached due to the large amount of heat produced by the incandescent lamps, while LEDs are electronic components which are highly heat responsive and which break/burn out beyond repair in case of excessive overheating.

In front automotive lights, traditionally referred to as headlights or headlamps, the heat produced by incandescent or gas discharge lamps is usually very high, whereby cooling the LEDs is crucial and generally ensured by a number of large-sized heat sinks made of metal material, which are arranged directly on the bases supporting the LEDs and are touched by a flow of cold air produced by a small cooling fan arranged within the shell of the headlight. Furthermore, protective partitions made of heat-insulating material are usually arranged between reflector bodies and LED bases and are structured so as to limit the heat transfer from the lamps to the bases by convection and/or radiation.

Regretfully, rear automotive lights have an insufficient inner volume to accommodate and ensure the correct operation of the forced-air, LED cooling systems used in automotive headlights. Furthermore, forced-air cooling systems are too costly to be integrated in a rear automotive light.

DISCLOSURE OF INVENTION

Aim of the present invention is to ensure the correct cooling of LEDs in a rear automotive light,

without significantly increasing the light production costs.

In compliance with these aims, according to the present invention there is provided a rear automotive
5 light as specified in claim 1 and preferably, though not necessarily in any one of the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be described with reference to the accompanying drawings, which show a
10 non-limitative embodiment thereof, in which:

- figure 1 shows in an exploded perspective view, with parts removed for clarity, an automobile rear light realized according to the teachings of the present invention;

15 - figure 2 is a section view of the rear automotive light shown in figure 1, with parts removed for clarity; whereas

- figures 3 and 4 are two perspective views of a component of the automotive light in figure 1.

20 BEST MODE FOR CARRYING OUT THE INVENTION

With reference to figures 1 and 2, numeral 1 indicates as a whole an automotive light particularly adapted to be fixed to the rear part of the body of a car, motorcycle or the like, i.e. a rear automotive
25 light.

More in detail, in the example shown, the automotive light 1 is preferably, though not necessarily structured so as to be recessed in the rear part of a

car, and comprises:

- a substantially basin-shaped, rigid rear shell 2, which is structured so as to be recessed into a compartment specifically made in the rear part of the vehicle body s;
- a front lenticular half-shell 3, which is provided with at least one portion made of transparent or semitransparent, possibly colored, material and is arranged to close the mouth 2a of the rear shell 2, preferably, though not necessarily to surface on the outside of the vehicle body s at the same time; and
- at least one cup-shaped reflector body 4, which is arranged inside the rear shell 2 with its mouth 4a facing a corresponding transparent or semitransparent portion of the front lenticular half-shell 3; and
- a corresponding incandescent lamp 5 or the like, which is structured so as to emit light when electricity powered, and is arranged within the cup-shaped body 4, close to the bottom thereof, so as to backlight the transparent or semitransparent portion of the front lenticular half-shell 3 which is aligned with the mouth 4a of the cup-shaped body 4.

Obviously, in a different embodiment, the rear shell 2 may be structured in order to be simply fixed so as to protrude from the rear part of the vehicle body.

In the example shown, in particular, the rear shell 2 is preferably made of an opaque plastic material by means of an injection molding process; while the front

lenticular half-shell 3 is preferably, though not necessarily made of a transparent or semitransparent plastic material, possibly with transparent or semitransparent portions of different color, also in
5 this case preferably by means of an injection molding process.

On the other hand, with regards to the cup-shaped reflector body 4, the inner surface 4i of the cup-shaped reflector body 4 is preferably metallized or otherwise
10 mirror-finished, so as to reflect the light produced by the lamp 5 towards the transparent or semitransparent portion of the lenticular half-shell 3 which is arranged over the mouths 4a of the cup-shaped body 4.

Furthermore, the cup-shaped reflector body 4
15 preferably has a substantially parabolic profile, so that the light rays which are reflected by the inner surface 4i of the cup-shaped body 4 towards the mouth 4a of the cup-shaped body 4 itself, are locally substantially perpendicular to the portion of the
20 lenticular half-shell 3 which covers the mouth 4a of the cup-shaped reflector body 4.

More in detail, in the example shown, the cup-shaped reflector body 4 is preferably made of an opaque plastic material by means of an injection molding
25 process and its inner surface 4i is metallized and mirror-finished so as to completely reflect the incident light.

With reference to figure 2, the lamp 5 is instead

preferably inserted into a through hole made at the bottom of the cup-shaped reflector body 4, so that the glass bulb of the lamp may juts out into the cup-shaped reflector body 4.

5 With reference to figures 1 and 2, the automotive light 1 is additionally provided with at least one set of light emitting diodes 6, traditionally referred to as LEDs, which are fixed to a common support base 7 which, in turn, is fixed within the rear shell 2 with the LEDs
10 6 facing a corresponding transparent or semitransparent portion of the front lenticular half-shell 3, so as to allow the LEDs 6 to backlight the same transparent or semitransparent portion of the lenticular half-shell 3.

In the example shown, in particular, the automotive
15 light 1 is provided with two sets of LEDs 6, each of which is fixed to a corresponding support base 7 which in turn is fixed within the rear shell 2, with the LEDs 6 facing a corresponding transparent or semitransparent portion of the front lenticular half-shell 3 so as to
20 allow the LEDs 6 to backlight the same transparent or semitransparent portion of the lenticular half-shell 3.

Preferably, though not necessarily, the automotive light 1 additionally comprises a light-guide body 8 made of photoconductive material, which is positioned
25 immediately over the LEDs 6 on the support base 7, and is structured so as to collect the light emitted by the various LEDs 6, and then convey such a light towards specific areas/zones of the portion of the front

lenticular half-shell 3 facing the support base 7.

In the example shown, in particular, the guide-light body 8 is preferably made of a transparent plastic material, such as transparent polycarbonate or
5 transparent polymethyl methacrylate by means of an injection molding process.

With reference to figures 1, 2, 3 and 4, unlike the current rear automotive lights, the automotive light 1 further comprises a heat extraction duct 9 that juts out
10 from the bottom of the cup-shaped reflector body 4, and extends upwards into the rear shell 2 up to reach an opening 2b made for this purpose at on bottom wall of the rear shell 2.

More in detail, the inlet mouth 9a of the heat
15 extraction duct 9 is arranged immediately above the glass bulb of lamp 5, while the outlet mouth 9b of the extraction duct 9 is preferably located immediately downstream of the opening 2b made at the bottom of the rear shell 2.

20 In addition to the above description, the passage section of the heat extraction duct 9 is reduced more or less progressively as the distance from the inlet mouth 9a increases, so as to gradually increase the hot air speed flowing along the heat extraction duct 9.
25 Furthermore, the inner surface 9i of the extraction duct 9 is preferably metallized or otherwise mirror-finished so as to reflect the incident light.

With reference to figures 1 and 2, the bottom wall

of the rear shell 2 is instead preferably provided with an additional air inlet 2c, through which the air can easily/freely penetrate into the closed cavity delimited by the rear shell 2 and by the front lenticular half-shell 3, to reach the mouth 4a of the cup-shaped reflector body 4.

With reference to figures 1, 2, 3 and 4, in the example shown, in particular, the cup-shaped reflector body 4 is divided into a lower half-shell 10 and an upper half-shell 11 which are structured so as to be reciprocally coupled and stably fastened by means of a series of snap-locking members, and the heat extraction duct 9 is made in one piece with the upper half-shell 11.

More in detail, in the example shown, the two half-shells 10 and 11 which form the cup-shaped reflector body 4 are both preferably made of an opaque plastic material, by means of an injection molding process, and the face of both, which will form the inner surface 4i of the cup-shaped reflector body 4, is completely coated by a silver paint capable of completely reflecting the incident light. Moreover, this silver paint substantially covers the entire inner surface 9i of the extraction duct 9.

With reference to figures 1 and 2, the automotive light 1 is also preferably provided with one or more protective screens 13 which are arranged within the rear shell 2, between the heat extraction duct 9 and the

support bases 7, so as to limit the heat transfer by convection and/or radiation to the bases 7 which support the LEDs 6. In the example shown, the protective screens 13 preferably consist of plates made of metal material and/or of heat insulating material partitions.

The general operation of the automotive light 1 is easily inferable from the above description and no further explanations are required.

On the other hand, with regards to the operation of the heat extraction duct 9, experimental tests have indicated that the metallization of the inner surface 4i of the cup-shaped reflecting body 4 and of the inner surface 9i of the heat extraction duct 9, prevents/limits the cooling of the hot air which surrounds the glass bulb of the incandescent lamp 5 thus significantly increasing the flue effect which is triggered by the heat produced by the incandescent lamp 5 in the heat extraction duct 9.

In other words, the air which reaches the bulb of lamp 5 through inlet 4a is heated and then rapidly rises due to the flue effect along the extraction duct 9 without significantly cooling down. The gradually decreasing section of the heat extraction duct 9 allows instead to increase the average speed of the hot air which flows within the extraction duct 9, thus reducing the permanence time of the air within the duct.

Furthermore, the increase of the average speed of the air within the heat extraction duct 9 results in a

very high value of the air flow which crosses the cup-shaped body 4.

This implies that, under stationary conditions, the hot air which leaves the cup-shaped body 4 by rapidly
5 flowing through the heat extraction duct 9 takes most the heat produced by lamp 5 out of the automotive light 1. Therefore, the average temperature of the air within the rear light 1 is always maintained within values considerably lower than those measurable within a
10 traditional rear light and compatible with the operation of the LEDs.

The advantages deriving from the particular structure of the automotive light 1 are apparent. By virtue of the presence of the heat extraction duct 9,
15 the LEDs 6 which are inside the automotive light 1 operate in an environment with significantly lower temperatures, and in which a flow of cold air from the outside continuously circulates, which air flow is capable of effectively cooling the LEDs 6 before
20 reaching the inlet 4a of the cup-shaped body 4.

It is finally apparent that changes and variations can be made to the automotive light 1 described herein without departing from the scope of the present invention.

25 For example, in a more advanced embodiment, the base(s) 7 which support LEDs 6 may be provided with one or more heat sinks made of metal material, which are structured so as to increase the heat transfer from the

LEDs 6 to the flow of cold air which enters the automotive light 1 through the air inlet 2c or other openings/gaps present in the rear shell 2.

CLAIMS

1.- Rear automotive light (1) of the type comprising: a substantially basin-shaped, rear shell (2) which is structured so to be fixed onto the vehicle body; a front lenticular half-shell (3) arranged to close the mouth (2a) of the rear shell (2); at least a cup-shaped reflector body (4) which is arranged inside the rear shell (2) with its own mouth (4a) facing towards a first transparent or semitransparent portion of the front lenticular half-shell (3); and a light source (5) which is structured so to emit light when electricity powered, and is arranged within the rear shell (2), close to the bottom of the latter, so as to be able to backlight said first transparent or semitransparent portion of the front lenticular half-shell (3);

the rear automotive light (1) being characterized in that it also comprises a heat extraction duct (9) that overhangingly extends from the bottom of the cup-shaped reflector body (4), and extends upwards inside the rear shell (2) up to reach an opening (2b) made in the back of the rear shell (2).

2.- Rear automotive light according to Claim 1, characterized in that the inlet mouth (9a) of the heat extraction duct (9) is arranged immediately above said light source (5).

3.- Rear automotive light according to Claim 2, characterized in that the light source (5) is an

incandescent lamp or similar (5) and that the inlet mouth (9a) of the heat extraction duct (9) is arranged immediately above the bulb of said incandescent lamp or similar (5).

5 4.- Rear automotive light according to any one of the preceding claims, characterized in that the outlet mouth (9b) of the heat extraction duct (9) is arranged immediately downstream of the opening (2b) made in the back of the rear shell (2).

10 5.- Rear automotive light according to any one of the preceding claims, characterized in that the passage section of the heat extraction duct (9) decreases as the distance from the inlet mouth (9a) of the heat extraction duct (9) increases.

15 6.- Rear automotive light according to any one of the preceding claims, characterized in that the inner surface (9i) of the heat extraction duct (9) is mirror finished so as to reflect incident light.

20 7.- Rear automotive light according to any one of the preceding claims, characterized in that the inner surface (4i) of the cup-shaped reflector body (4) is mirror finished so as to reflect incident light.

25 8.- Rear automotive light according to any one of the preceding claims, characterized in that the back of rear shell (2) is further provided with an air inlet (2c), through which air can penetrate inside the closed cavity delimited by the rear shell (2) and by the front lenticular half-shell (3).

9.- Rear automotive light according to any one of the preceding claims, characterized in that the cup-shaped reflector body (4) is subdivided into a lower half-shell (10) and an upper half-shell (11) that are structured for being reciprocally coupled, and in that the heat extraction duct (9) is made in one piece with the upper half-shell (11).

10.- Rear automotive light according to any one of the preceding claims, characterized by also comprising at least one set of light-emitting diodes (6) which are located on a supporting board (7) that, in turn, is fixed inside the rear shell (2) with the diodes (6) faced towards a corresponding second transparent or semitransparent portion of the front lenticular half-shell (3).

11.- Rear automotive light according to claim 10, characterized in that it also comprises a light-guide body (8) made of photoconductive material and which is arranged immediately above the light-emitting diodes (6) placed on the support base (7), and is structured so as to collect the light emitted by the various diodes (6) and then channelling this light to specific areas/zones of the second portion of the front lenticular half-shell (3).

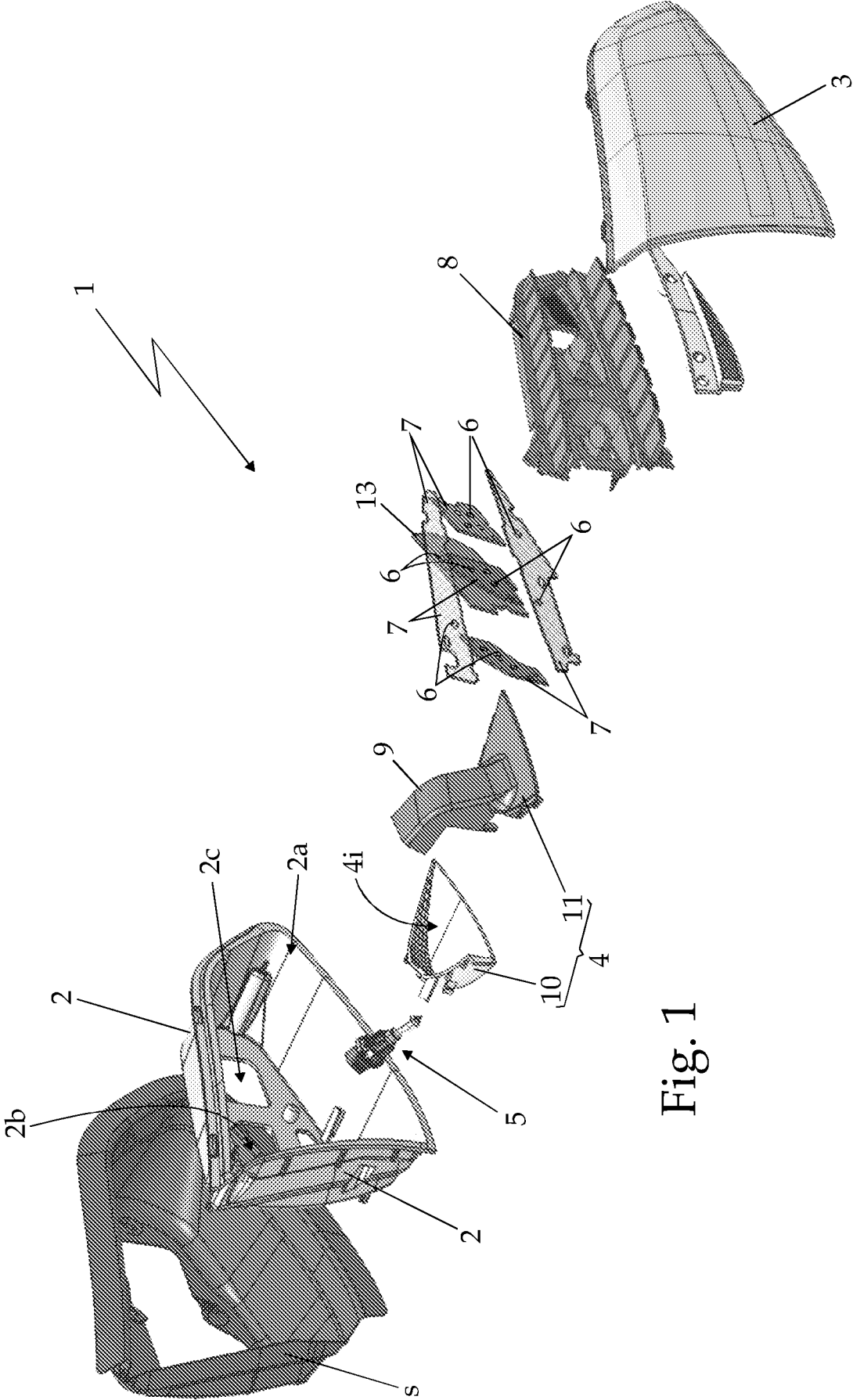


Fig. 1

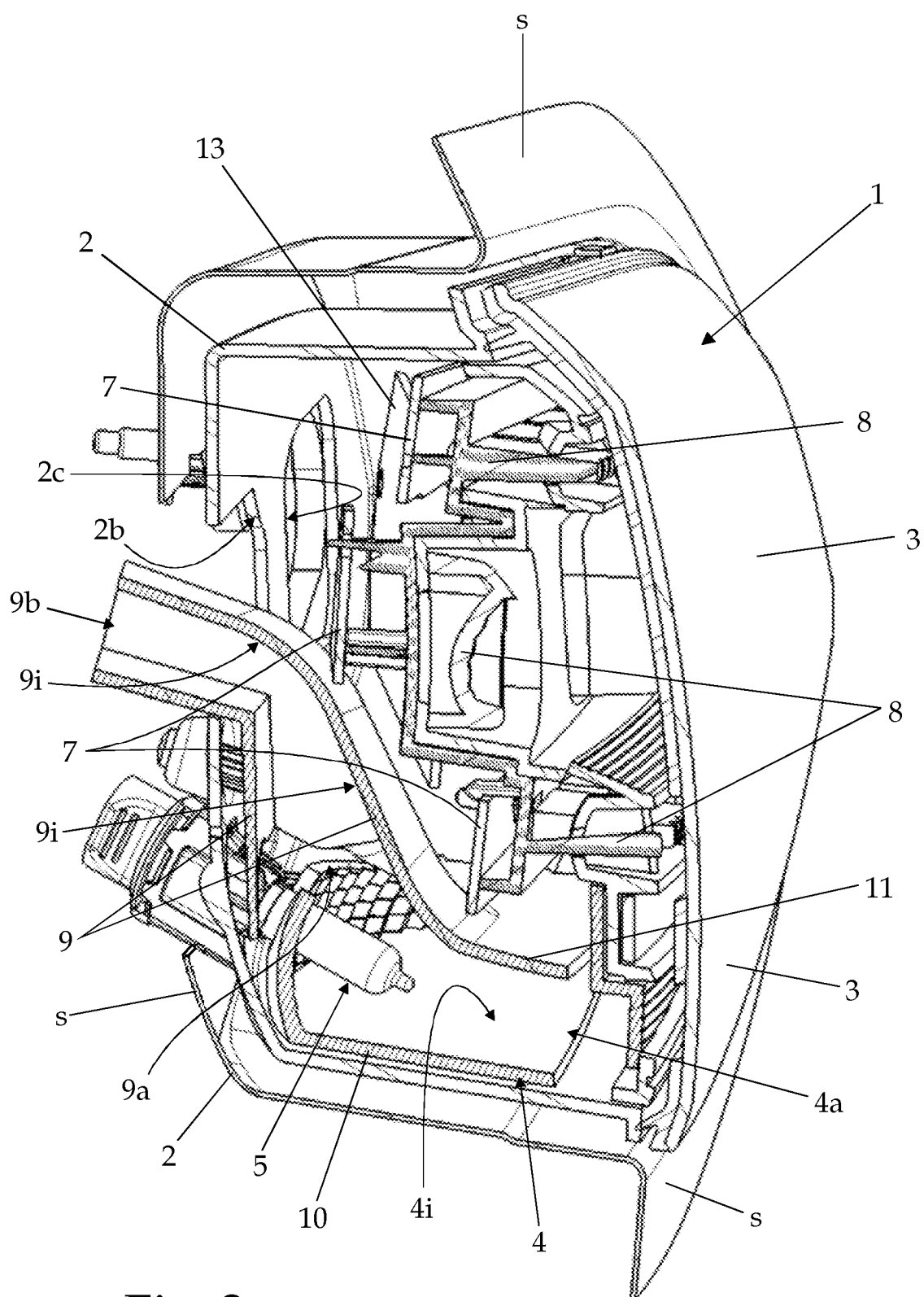
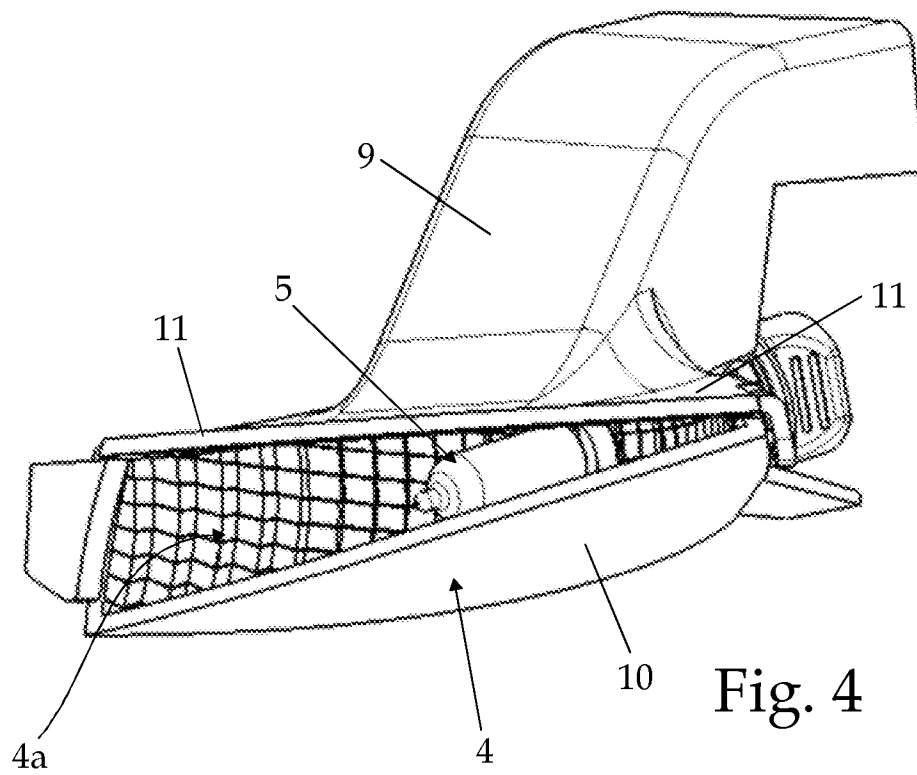
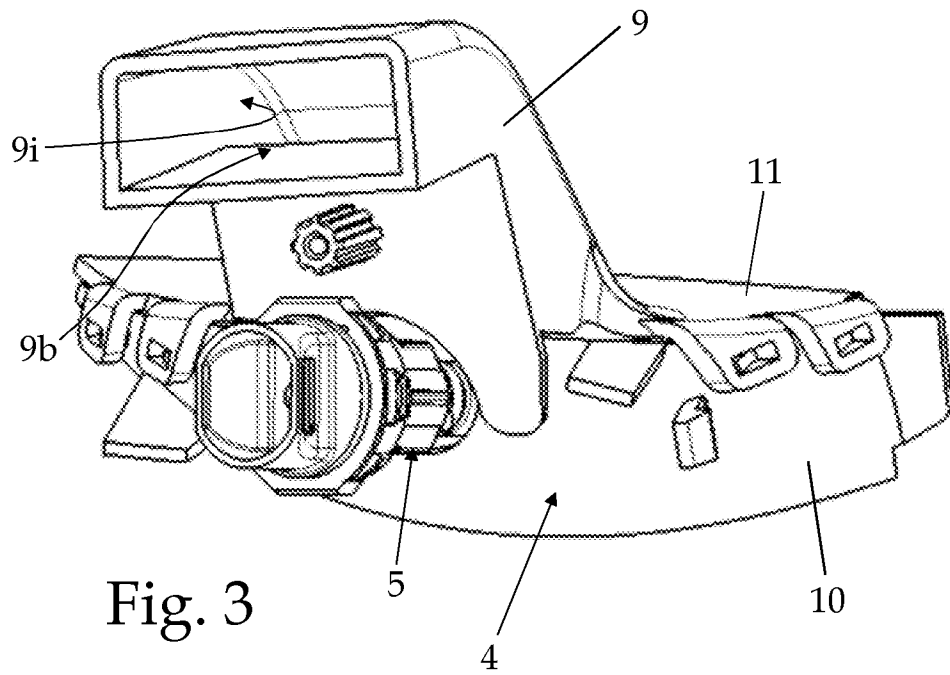


Fig. 2



INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2012/053548

A. CLASSIFICATION OF SUBJECT MATTER

INV. B60Q1/26 F21S8/10 F21V29/00
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F21V F21S B60Q

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EP0-Internal

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Further documents are listed in the continuation of Box C.



See patent family annex.

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INTERNATIONAL SEARCH REPORT

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