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(54) LED-retrofit for vehicle signaling lights

(57) The LED-based lamp is installable in a vehicle signaling light having a lamp-holder (26, 28, 30) suited for lamps with roto-traslatory coupling and provided with contact means (38, 40, 42) connected to the electric supply line of the vehicle. The LED-based lamp comprises a mount (46, 146) shaped for coupling with the lamp-holder (26, 28, 30) and provided with at least one first pair of contact members (54a, 54b) connected to respective contact surfaces (47, 58) arranged to engage said contact means (38, 40, 42) of the lamp-holder, and a LED-based illuminator (52, 252, 352, 452). The latter comprises a LED-bearing board (60) supporting a plurality of lighting LEDs (62) connected to a second pair of contact members (64a, 64b) engageable with friction fit with said first contact members (54a, 54b) for removably connecting the illuminator to the mount.

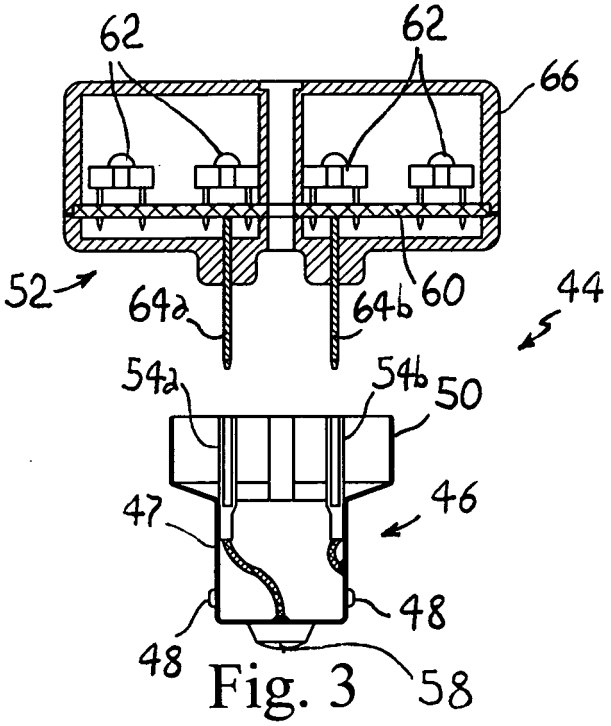

Fig. 3

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Description

[0001] The present invention relates to a LED-based lamp for vehicle signaling lights, such as tail lights, stop lights, turn indicator lights, and the like.

[0002] As known, the vehicle signaling lights tipically comprise a box-shaped housing made of plastics and provided with one or more recesses each having an incandescent lamp received therein. The recesses are closed by a mask of a translucent material which may be differently coloured depending on the specific function of the light. The recesses each are internally provided with a parabolic reflector for deviating the light beams from the lamp into the desired direction, i.e., towards the mask.

[0003] As known, a drawback of the incendescent lamps is that they have a limited life, which circumstance both leads to relatively frequent replacements and affects the safety of the vehicle, mainly in consideration of the fact that a certain time can pass before the driver notices the fault and replaces the lamp.

[0004] Another well known drawback of the incandescent lamps is that, in case of long stops with the lights on, without the ventilation deriving from the movement of the vehicle, they may cause a partial melting of the reflector. This drawback is particularly relevant in old vehicles, in which the lights were designed for standing relatively short stops, typically of about one hour, on the basis of obsolete standards.

[0005] The above drawbacks lead to provide the most recent vehicles with signaling lights having LED-based lamps installed in lieu of conventional incandescent lamps. The LED-based lamps generally comprise a printed circuit board bearing a plurality of LEDs (light emitting diode) arranged, and in number, such as to meet the desired requirements of brilliancy.

[0006] As known, the LED-based lamps overcome the above drawbacks of the incandescent lamps because they have a high reliability, with a substantially unlimited life in relation to the mean-life of a vehicle, as well as a very low operative temperature. In particular, due to the high number of LEDs mounted on the board, even if a diode broke down (which event is very rare per se) however the remaining LEDs would provide a sufficient light, so that no replacement would be required.

[0007] A further advantage of the LED-based lamps is that they have an electrical input that is considerably lower then the input of the conventional incandescent lamps. This circumstance results in a lower consumption, i.e., a higher autonomy, of the battery in case of long stops with the engine in motion and the lights out, which stops may be necessary, for example, in case of long queues on the motorway.

[0008] However, the traditional lights designed for incandescent lamps usually are neither equipped for housing LED-based lamps nor provided with the necessary electrical connections.

[0009] Therefore, recently attempts have been made of providing the LED-based lamps with a connection compatible with the conventional lamp holders designed for lamps having a bayonet coupling. However, the LED-bearing boards often are large-sized, which circumstance affects the possibility of handling, and more particularly rotating, the lamp within the respective recess, whereby the lamp cannot be installed.

[0010] It is a main object of the present invention to provide a LED-based lamp which overcomes the above-mentioned drawbacks of the prior art lamps, with a higher degree of compatibility and flexibility in relation to the conventional signaling lights designed for incandescent lamps, and which can be installed easily and without requiring any adaptation to the signaling light, even when the size of the lamp with respect to the recess affects the possibility of handling the lamp for the installation.

[0011] In particular, it is an object of the invention to provide a LED-based lamp having a high modularity in relation to the size and shape of the pre-existing, conventional signaling lights.

[0012] The above objects and other advantages, which will better appear from the following description, are achieved by a LED-based lamp having the features recited in claim 1, while the dependent claims state other advantageous, though secondary, features of the invention.

[0013] The invention will be now described in more detail with reference to a few preferred, non exclusive embodiments shown by way of non limiting examples in the attached drawings, wherein:

Fig. 1 is a view in longitudinal, cross section of a portion of a conventional rear light for vehicles, which is designed for incandescent lamps provided with bayonet couplings;

Fig. 2 is a plan view of a LED-based lamp according to the invention, in a disassembled configuration;

Fig. 3 is a view in cross section along line III-III of the LED-based lamp of Fig. 2, in a disassembled configuration;

Fig. 4 is a view similar to Fig. 3, showing the LED-based lamp in an assembled configuration;

Figs. 5, 6 are two views similar to Fig. 1 and showing two subsequent steps of the installation of the LED-based lamp according to the invention in the signaling light;

Fig. 7 is a view in longitudinal cross section of a portion of a rear light for vehicles of a conventional type differing from the light shown in Fig. 1 but always designed for incandescent lamps;

Fig. 8 is a view in axial cross section of a LED-based lamp according to an alternative embodiment of the invention, which is compatible fith a signaling light

of the type of Fig. 7, in a disassembled configuration;

Figs. 9, 10 are two views similar to Fig. 7 and showing two subsequent steps of the installation of the LED-based lamp of Fig. 8 on the signeling light of Fig. 7;

Figs. 11-13 show three further alternative embodiments of the LED-based lamp according to the invention.

[0014] With initial reference to Fig. 1, a rear signaling light for vehicles generally comprises a box-shaped housing 10 provided with a plurality of side-by-side recesses 12, 14, 16, which are open to a front face of housing 10, which face is closed by a mask 18 made of a translucent material. The recesses each have a parabolic reflecting bottom 20, 22, 24 respectively, at the centre of which a lamp-holding socket or lamp holder 26, 28, 30 is formed, of the type with L-shaped grooves 26a, 28a, 30a suitable for receiving an incandescent lamp 32, 34, 36 provided with a base 32a, 34a, 36a connectable with a bayonet-like action. A first elastic foil 38, 40, 42 radially projects from the bottom of the lamp holder to the inside thereof to contact the insertion end of the base of lamp 32, 34, 36. A second foil (not shown) is incorporated in lamp holder 22 to contact the side wall of the base of the lamp. Both the foils of the lamp holders are connected to the electric supply line of the vehicle, which is conventionally designed, e.g., for generating a voltage of 12V or 24V at the contact ends, with a current of about 1,8 A.

[0015] Having now reference to Figs. 2-4, a LED-based lamp 44 according to the invention comprises a hollow metal mount 46 having a circular profile and provided with a cylindrical base 47 for engaging one of the lamp holders 26, 28, 30 with a bayonet-like action - with bosses 48 insertable in grooves 26a, 28a, 30a - and with a cylindrical support end which is larger in diameter and on which a platform 50 is defined for mounting a LED-based illuminator 52, as will be better described below. mount 46 houses two pairs of contact clamps 54a, 54b and 56a, 56b arranged at right angles to each other. The contact clamps are open towards platform 50 and are respectively connected in pairs to a contact pole 58 formed on a boss at the insertion end of base 47, and to the lateral wall of base 47. mount 46 is filled with an insulating resin (not shown for better clarity) in which the contact clamps are immersed.

[0016] LED-based illuminator 52 comprises a LED-bearing board 60 having a plurality of lighting LEDs such as 62 mounted thereon, which are connected to a pair of contact projections 64a, 64b via a current dissipating circuit (not shown), which is incorporated within LED-bearing board 60 and has the aim of lowering the value of the current to a level which is compatible with the LEDs, e.g., a current of 30 to 80 mA. Contact projections 64a, 64b are insertable by friction into either the first or the second pair of contact clamps, 54a, 54b, or 56a, 56b respectively. LED-bearing board 60 is hermetically closed in a tranparent shell 66 made of plastics, with the sole contact projections 64a, 64b out of the shell. A plurality of lenses 68 are formed on the shell, each of which is aligned to a respective LED for directing and intensifying the light emitted by the LED.

[0017] In use, with reference to Figs. 5, 6, LED-based lamp 44 according to the invention can be installed in one of the recesses of the signaling light in lieu of a conventional incandescent lamp. For example, with reference to housing 12, at first metal mount 46 is installed into lamp-holder 26 with a bayonet-like, roto-traslatory action (Fig. 5). Thereafter, LED-based illuminator 52 is axially mounted onto mount 46, with contact projections 64a, 64b inserted with friction fit into one of the pairs of clamps 54a, 54b or 56a, 56b (Fig. 6).

[0018] The two-part construction of the LED-based lamp according to the invention allows the illuminator to be frontally installed into the housing without any rotation. As it will be immediately understood, this allows the LED-based lamp according to the invention to be installed into a pre-existing signaling light even when the the shape of the recess does not allow the lamp to be rotated, which circumstance makes this system very flexible and modular. Furthermore, the presence of two pairs of contact clamps arranged at right angles to each other provides the LED-based lamp with a further degree of modularity, because it allows a plurality of illuminators having different shapes and sizes to be applied on a single type of mount 46.

[0019] Fig. 7 shows a portion of a rear vehicle signaling light of a conventional type differing from the signaling light of Fig. 1 in that lamp-holder 126 is arranged with its axis parallel to the front face of housing 110, on which face the coloured mask of a translucent material 118 is applied.

[0020] An alternative embodiment of the lamp according to the invention is shown in Fig. 8, which is compatible with a signaling light of the type shown in Fig. 7. In the embodiment of Fig. 8, base 147 of hollow metal mount 146 is bent at right angles whereby, with the mount engaged into lamp-holder 126 of signaling light 110, platform 150 is parallel to mask 118. Similarly to the previous embodiment, mount 146 houses two pairs of contact clamps such as 154a, 154b arranged at right angles to each other, the clamps being connected in pairs to the lateral wall of base 147 and to a contact pole 158 which is formed on a boss at the insertion end of base 147. Also with this embodiment, mount 146 is filled with an insulating resin (not shown for better clarity) in which the clamps are immersed. A LED-based illuminator is installable on metal mount 146, which is identical to the illuminator described in the previous embodiment and consequently will not be further described below.

[0021] In use (Figg. 9, 10), similarly to the previous embodiment, at first metal mount 146 is installed into lamp-holder 126 with a bayonet-like roto-traslatory action (Fig. 10). Thereafter, the LED-based illuminator is frontally mounted onto mount 146.

[0022] Figs. 11, 12, 13 are plan views showing three LED-based illuminators whose profiles differ from the rectangular profile of the previous embodiments, i.e., a triangular illuminator 252, a rhomboidal illuminator 352, and an arrow-shaped illuminator 452 respectively.

[0023] A few preferred embodiments of the invention have been described herein, but of course many changes may be made by the person skilled in the art within the scope of the inventive concept. In particular, other profiles for the illuminator can be easily contrived by the person skilled in the art, e.g., circular or square profiles. Moreover, the contact projection 64a, 64b on the LED-bearing board and the respective contact clamps 54a, 54b and 56a, 56b on the metal mount could have profiles and sizes different from what described above, in particular, cilindrical projections could be provided which are insertable into corresponding contact seats with a complementary profile. Of course, although in the examples shown the contact clamps are associated to the mount and the contact projections are associated to the illuminator, this arrangement could be easily reversed, i.e., the mount could be provided with a pair of contact projections and the illuminator could be provided with one or more pairs of contact clamps. Nevertheless, the lenses could be made apart from the shell, for example, they could be formed on a transparent plate supported above the LED-bearing board within the shell. Moreover, certain parts of the above-described LED-based lamp could be not necessary in certain cases. For example, lenses 68 on shell 66 could be not necessary in those cases in which a lower light intensity is required.

Claims

1. A LED-based lamp for installation in a vehicle signaling light having a lamp-holder (26, 28, 30) for lamps with roto-traslatory coupling and provided with contact means (38, 40, 42) connected to the electric supply line of the vehicle, **characterized in that** it comprises:

   - a mount (46, 146) shaped for engaging the lamp-holder (26, 28, 30) and provided with at least a first pair of contact members (54a, 54b) connected to respective contact surfaces (47, 58) arranged to engage said contact means (38, 40, 42) in the lamp-holder, and
   - a LED-based illuminator (52, 252, 352, 452) comprising a LED-bearing board (60) supporting a plurality of lighting LEDs (62) connected to a second pair of contact members (64a, 64b) engageable with friction fit with said first contact members (54a, 54b) for removably connecting the illuminator to the mount.

2. The LED-based lamp of claim 1, **characterized in that** said first contact members on the mount (46, 146) comprise clamps (54a, 54b) and said contact elements on the LED-based illuminator (52) comprise projections (64a, 64b) insertable into said clamps with friction fit.

3. The LED-based lamp cof claim 1, **characterized in that** said first contact members on the mount comprise projections and said contact elements on the LED-based illuminator comprise clamps into which said projections are insertable with friction fit.

4. The LED-based lamp of claim 2 or 3, **characterized in that** it comprises two pairs of said clamps (54a, 54b) arranged at right angles to each other.

5. The LED-based lamp of any of claims 1 to 4, **characterized in that** said mount (46, 146) has a base (47, 147) engageable into said lamp-holder (26, 28, 30), and a platform (50) connected to one end of the base, on which said first contact members (54a, 54b) are arranged for receiving said illuminator.

6. The LED-based lamp of claim 5, **characterized in that** said base (147) is bent at right angles.

7. The LED-based lamp of any of claims 1 to 6, **characterized in that** said LED-bearing board (69) is housed within a shell (66) of an at least partially transparent material.

8. The LED-based lamp of claim 7, **characterized in that** said shell (66) has a plurality of lenses (68) formed thereon which are substantially aligned to the LEDs.

9. The LED-based lamp of any of claims 1-8, **characterized in that** said LED-based illuminator (52) has a substantially rectangular profile.

10. The LED-based lamp of any of claims 1-8, **characterized in that** said LED-based illuminator has a substantially triangular profile (252).

11. The LED-based lamp of any of claims 1-8, **characterized in that** said LED-based illuminator has a substantially rhomboidal profile (352).

12. The LED-based lamp of any of claims 1-8, **characterized in that** said LED-based illuminator has a substantially arrow-like profile (452).

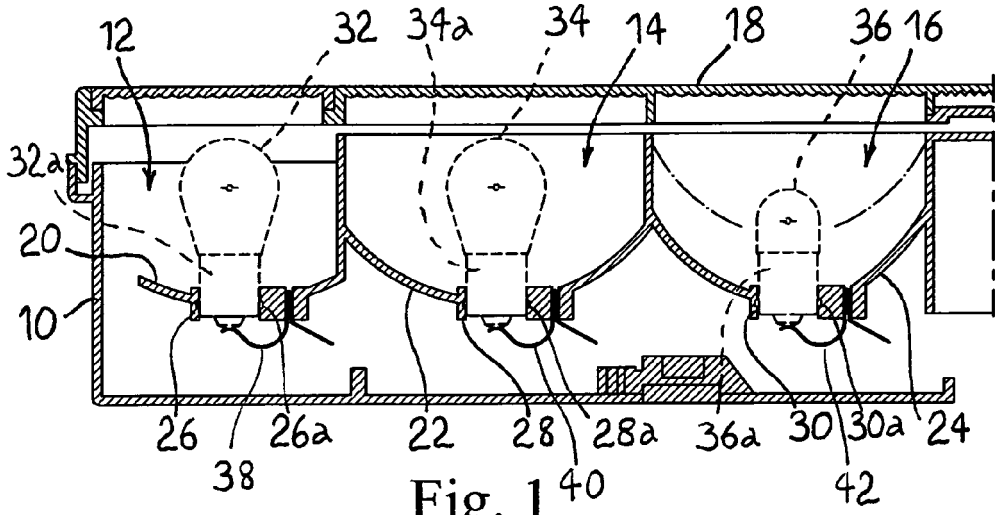

Fig. 1

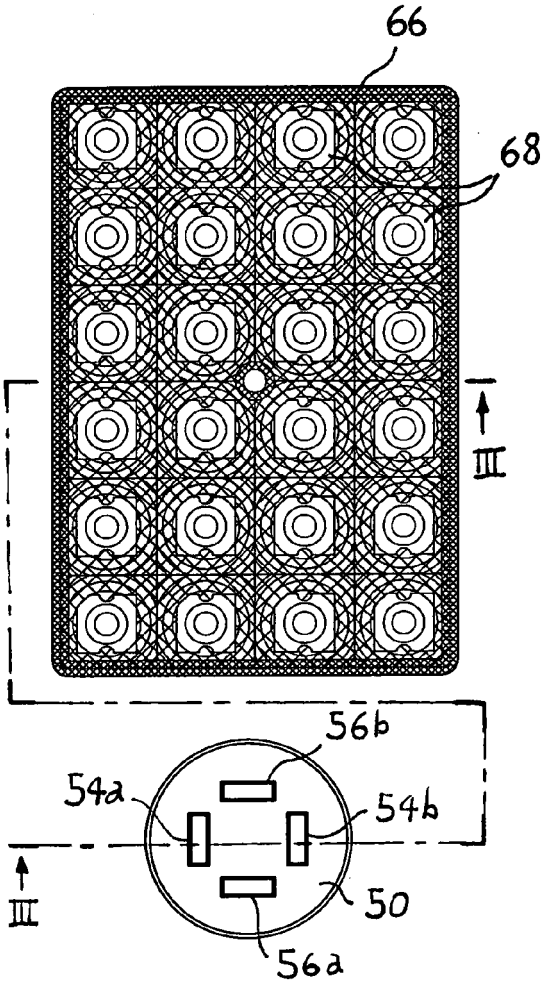

Fig. 2

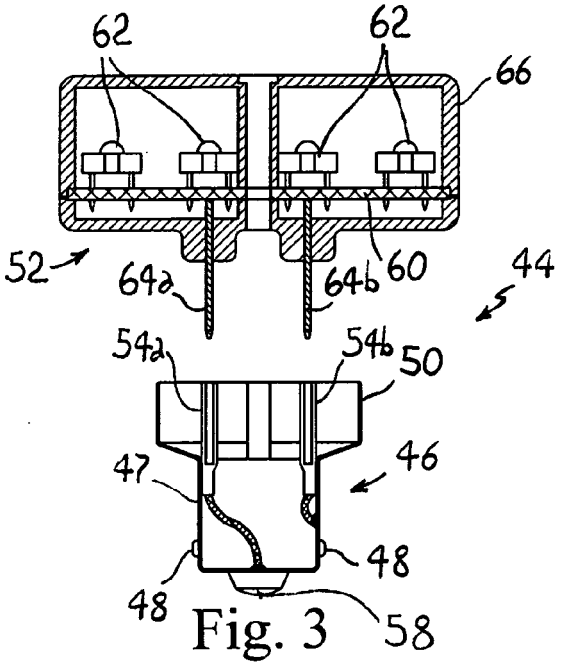

Fig. 3

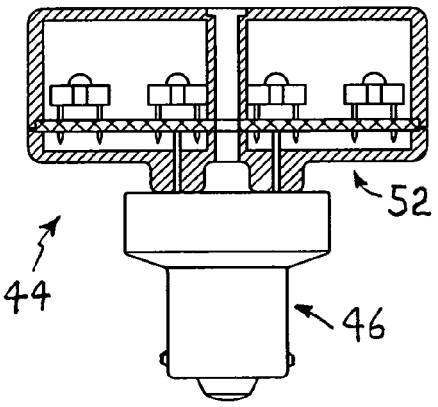

Fig. 4

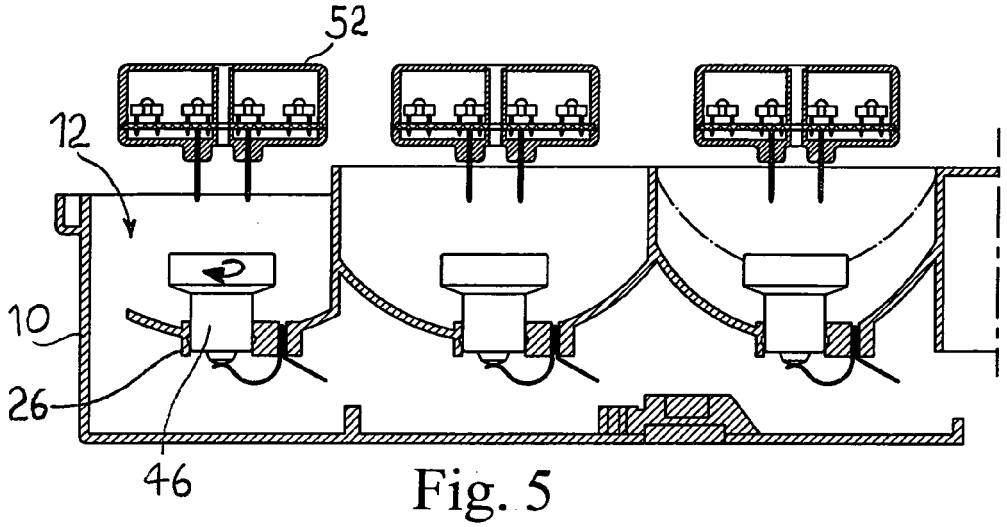

Fig. 5

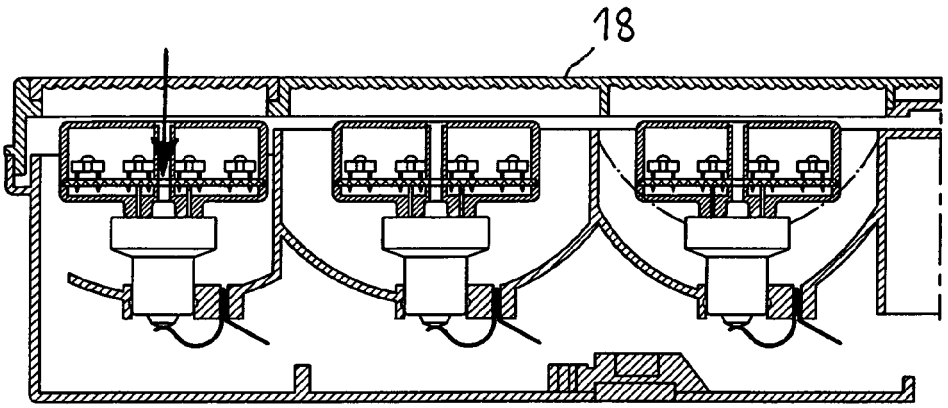

Fig. 6

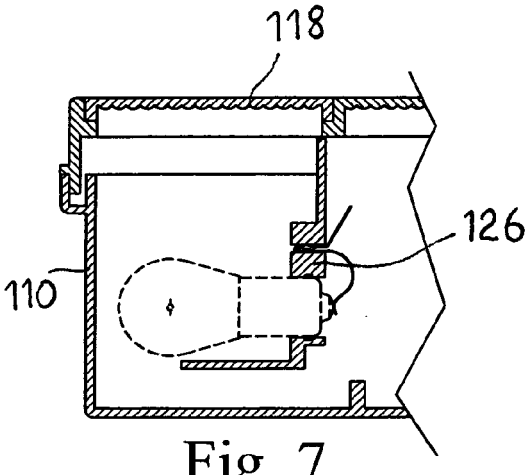

Fig. 7

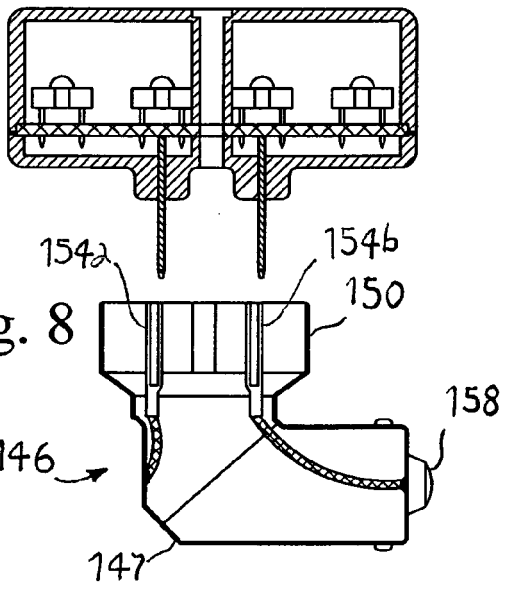

Fig. 8

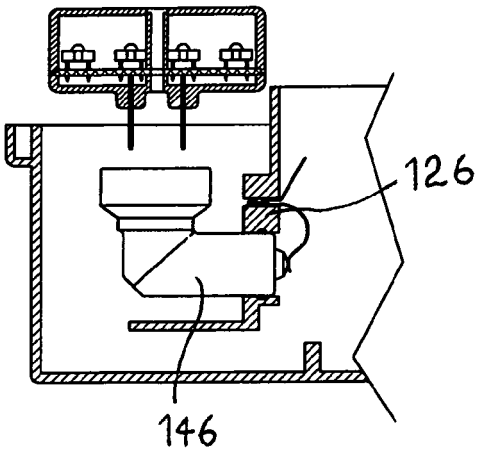

Fig. 9

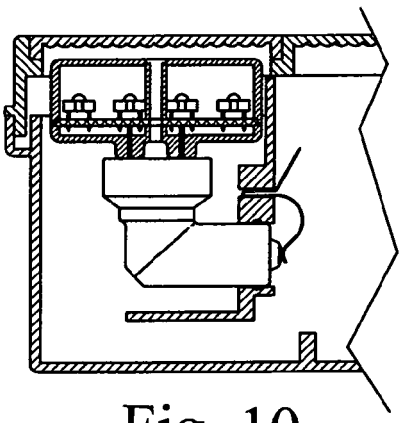

Fig. 10

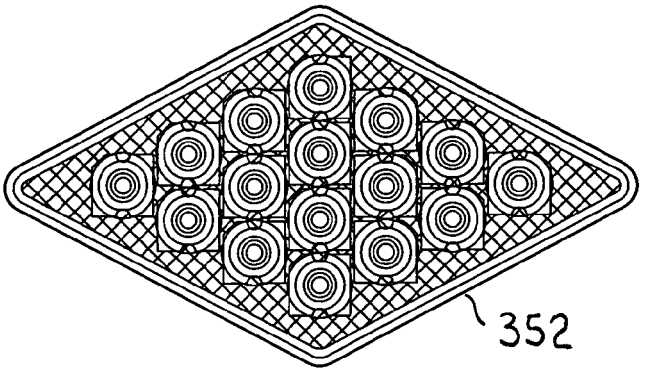

Fig. 12

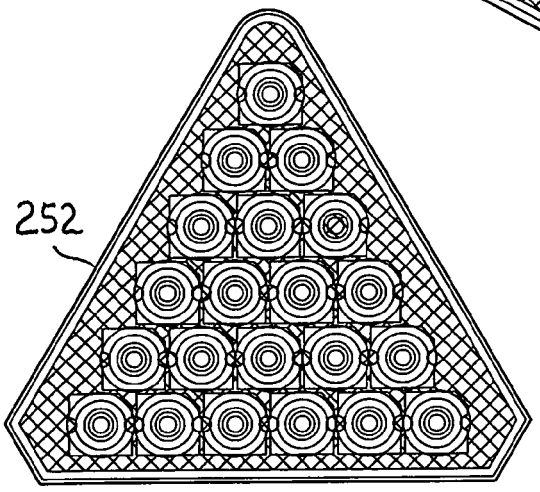

Fig. 11

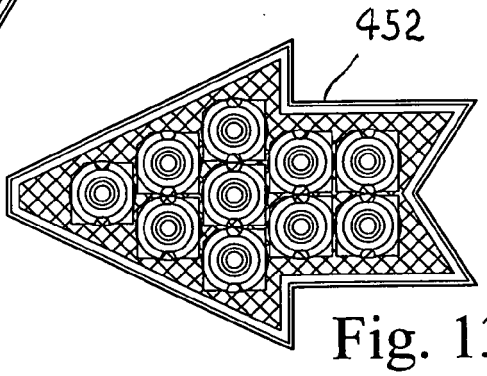

Fig. 13

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 42 5800

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F21S
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F21V

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	10 April 2007	Stirnweiss, Pierre

CATEGORY OF CITED DOCUMENTS

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