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(54) **REFLECTOR**

REFLEKTOR

REFLECTEUR

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Description

[0001] In the field of lighting equipment for vehicles the present invention relates to reflectors of headlights, fog lamps and other lighting means for vehicles, while in the field of commonly illuminating the invention relates to controlling thermal conditions in the interior of the reflector, meaningfully at least cooling the reflector, and actually also avoiding the inadmissible temperature difference between the hottest and coolest zone within the reflector.

[0002] The invention is based on the problem, how to conceive a reflector, which should enable achieving a required luminous intensity and optical characteristics and should consist of a polymeric material, which would enable achieving an essential improvement of thermal conditions in its interior, so that despite to long-term operation the wall thereof, which consists of a polymeric material, could not be overheated in the hottest zone in the upper area above the bulb, and moreover also the negative effects, which result from the presence of an essentially cooler zone in the lower area below the bulb, would also have to be avoided.

[0003] For the purposes of further discussion, the term reflector describes a part of a headlight, which is mounted within a housing of such headlight or similar lighting means, and surrounds a bulb. The headlight namely comprises, in addition to the said reflector and a bulb, also an appropriate casing, by which in the area of its casing in appropriate manner the reflector is attached, and moreover also a transluclide covering glass sheet, which is placed over the reflector in order to protect it against the influences from the outside. Reflector may be either spherical or elliptical or even otherwise shaped, which means that the reflection area of the reflector is formed onto a portion of surface, which belongs to a sphere, an ellipsoid or any other appropriate geometrical object. In addition, the reflector is a body, which is a shell from quite geometrical point of view, having a desired thickness of the wall in the radial direction thereof. A bulb is inserted within the reflector on a desired location, so that the heat beams, which are emitted by the bulb, are then reflected on the surface of the reflector in a desired direction. Still further, the term reflector for the purposes of this application relates exclusively to reflectors, which consist of polymeric materials. Such version of reflectors is intended for mass production in a relatively simple and economic manner.

[0004] In addition to the luminiscence, the bulb also generates an essential amount of heat energy. When bearing in mind the thermal conditions within the reflector, two main areas may be determined within the reflector, namely the lower area below the horizontal i.e. equatorial plane, in which the bulb is placed, as well as the upper area above the said plane of the bulb.

[0005] Reflector, to which the present invention relates, consists of a polymeric material and is foreseen for headlights with housing and transluclide covering

glass and is merely intended for use in various vehicles. Polymeric reflectors, which may be coated with reflection layer without any previous treatment, represent an attractive and simple solution for vehicle headlights. Reflection layer on the reflector is ordinary a thin metallic i.e. metallized layer, which is obtained by means of vacuum deposition. By small lighting means, e.g. by fog lamps, the use of polymeric reflectors is limited by high temperature, which occurs on the reflector, more precisely in the upper area of the reflector, due to hot convective air column, which is moved upwards above the lighting body i.e. the bulb. This relates especially to reflectors with very small and hot surface. Such lighting bodies are all kinds of bulbs with filament as well as modern discharging lamps.

[0006] In addition, by certain embodiments of headlights also the problem may occur, which relates to presence of the so-called cold zone in the lower area below the light source. Such zone is mostly the coolest surface within the complete headlight housing. In such cold zone then the vaporized substances are condensed, which are before that evaporated from hot portions of the polymeric casing or also from the adhesive on the headlight housing. Especially upon several switching-on and switching-off the headlight in the cold and wet weather conditions, in such zone also a certain quantity of condensed water may be present. Such phenomena is a consequence of the lack of heat accumulation in the lower area of the reflector, which is then the first cooled below the condensation point of the moisture, which is present in the air.

[0007] Constructors of headlights with polymeric housings as well as polymeric reflectors according to the state of the art have normally tried to avoid the problem related to hot zone above the bulb by inserting special bulbs, which generate less heat, or also by using much more expensive polymeric materials, which are resistant to higher temperature. A solution is also known, by which an aperture is foreseen on the hottest portion of the reflector, by means of which the hot air column is left away. Such approach is inadmissible by reflectors, which are intended for hermetically covering the last portion of the headlight, or also from quite aesthetical point of view. The applicant could not find any relevant patent literature, in which such problems related to the said cold zone would be described.

[0008] By taking into account the previously exposed facts and also the known solutions, which belong to the prior art, there no doubt exists a challenge in course of appropriate stabilization of heat conditions within the polymeric reflector, however without any essential reconstruction and disturbing the existing luminiscence and other characteristics of such reflector. Accordingly, the present invention relates to a reflector, which consists of a polymeric material, which is resistant with respect to possible deviations of form and dimensions when being exposed to an increased temperature, and comprises an internal surface, which extends adjacent to the bulb and is provided with a reflection layer. The said bulb is placed

in the central area, where a stable insertion of such bulb is ensured by means of sufficient thickness of the wall. According to the invention, the thickness of the wall in the upper area of the shell of the reflector, which is placed above the area of insertion the bulb, is smaller than the thickness of the wall in the lower area of the shell, which lies below the area of insertion the bulb. In a preferred embodiment, the thickness of the wall in the lower area of the shell of the reflector below the area of insertion the bulb is 1,5-times do 2-times greater than the thickness of the wall in the upper area of the shell of the reflector above the area of insertion the bulb. In addition, the reflector according to the invention is characterized in that at least a portion thereof, namely at least the wall thereof, consists of a thermoplastic polymer either without filling agents or with filling agents, which are smaller than 3 μm , by which appropriate resistance with respect to deviations in geometry due to increasing the temperature is ensured at least up to temperature value of 120°C. Furthermore, the reflector according to the invention is characterized in that at least a portion thereof, namely at least the wall thereof, consists of an amorphous polymer without filling agents, which belongs to the group of polycarbonates, polyethersulphones or polyeterimides. The said reflection layer on the internal surface of the shell is a metallized layer, especially vacuum deposited, in particular vaporized layer. In addition, the thickness of the wall in the upper area of the shell of the reflector above the area of insertion the bulb is 1 to 2 mm, preferably 1,4 to 1,8 mm, while the thickness of the wall in the lower area of the shell of the reflector below the area of insertion the bulb is 1,6 to 4 mm, preferably 2,2 to 3 mm.

[0009] According to the invention, a quite new concept of the reflector is suggested, by which at least two areas are characteristic, namely the upper area, in which the thickness of the wall is smaller than the thickness of the wall in the central area of the reflector, as well as the lower area, in which the thickness of the wall is greater than the thickness in the central area of the reflector, in which the bulb is inserted and which in common remains the same as by the previously known reflectors. By means of thinning the wall in the upper area the heat transfer is essentially increased from the area above the bulb, which is in contact with the hot air. Polymeric material, of which the reflector consists, is namely a heat insulator. Accordingly, by thinning the wall is then the thickness of the insulator essentially reduced. On the contrary, by thickening the wall in the lower area an opposite effect is achieved, since the insulation in this area is increased. Thickening the wall in the lower area results in increasing the heat capacity in this lower area, so that condensation by switching-off the headlight is slowed-down or even displaced to other locations.

[0010] Still another embodiment of the reflector according to invention is equipped with relatively rigid carrying ring, which is either continuously or discontinuously arranged around the shell of the reflector with various thickness of the wall, and which serves for attachment

of the reflector within each belonging housing, so that due to the presence of the said ring an upwardly closed wedge-shaped is formed, in which then hot air may be collected. In this connection, the said ring or also an appropriate connecting element between the said ring and the shell is equipped with at least one opening or similar passage. By means of the said opening the said wedge-shaped space above the external surface of the shell and above the carrying ring is connected with the exterior outside of the external circumference of the said ring or the connecting element, respectively. Various possible arrangements of the said opening are foreseen, which may either be arranged in the top area of the carrying ring in a position, which is situated at the maximum distance above the equatorial plane, or adjacent to this area, or also in the top area of the connecting element when available between the shell and the carrying ring, or even in the top area of the said ring and in the top area of the said carrying element between the ring and the shell, by which the thickness of the wall of the shell in the area above the equatorial plane is smaller than the thickness of the wall of the shell in the area below the equatorial plane. The opening may be formed either as a single opening or may also consist of a desired number of separately arranged openings.

[0011] Still further measure in course of efficient heat transfer includes determining of appropriate roughness on the external surface of the reflector shell, which should in accordance with the invention be between 0,003 and 0,01 mm. Such roughness should be ensured on the external surface of the shell at least in the upper area of the reflector above the horizontal i.e. equatorial plane, at least essentially adjacent to the location of the bulb. Such roughness is achieved by means of presence of punctiform and/or line shaped cavities and/or projections of relatively slope triangular or trapezoidal longitudinal cross-section on the said surface.

[0012] Efficiency of the improved concept of the reflector in course of controlling the thermal conditions is presented by means of embodiments, which will be explained in more detail in connection with the enclosed drawings, wherein

Fig. 1 is a vertical cross-section of an embodiment of a circular reflector, which belongs to a fog lamp;
 Fig. 2 is a cross-section of the reflector along the plane A - A;
 Fig. 3 is a perspective view of a further embodiment of a reflector;
 Fig. 4 is a front view of the reflector according to Fig. 3;
 Fig. 5 is a vertical cross-section of the reflector according to Fig. 3; and
 Fig. 6 is a detail B according to Fig. 5, from which a further possible approach as well as a corresponding embodiment may be derived.

[0013] The metallized reflection layer 101 on the inter-

nal surface 13 of the observed embodiment of the reflector 1, which has a diameter 75 mm and is manufactured of polyetherimide, is capable to withstand a short-term temperature stress up to 200°C. By currently used reflectors 1 having the above specified diameter, the thickness D_0 of the wall 10 of the shell 3 should be 2,2 mm along the complete circumference, and the heat conductivity is 0,24 W/mK; when by such thermally stressed reflector 1 the measured temperature on the external surface 14 is 168°C, then the temperature on the internal surface 13 may be matematically calculated, and is 204,7°C. When assuming, that the same reflector 1, i.e. a reflector 1 with equal optical characteristics and dimensions at the one hand, has smaller thickness D , of the wall 10 of the reflector 1 in its upper area 11 on the other hand, by which this thickness D , is e.g. 1,7 mm, and when the measured external temperature is 167°C (which means practically the same thermal stresses), then the temperature on the internal surface 13 of the reflector 13 may be evaluated on the basis of thickness D , of the wall 10 as well as of the thermal conductivity, and should be only 195°C. When the wall 10 is thinned along the complete upper area 11, i.e. within the complete top half of the reflector 1 above the bulb 4, then the heat flux is distributed from the hottest zone above the bulb 4 towards the other surfaces, which are available adjacent to the hottest zone. Due to improved taking-away the heat, such thinning the wall 10 in the upper area 11 of the shell 3 of the reflector 1 then results in decreasing temperature within the complete interior of the casing of a headlight and therefore indirectly in additional decreasing temperature within the hottest zone above the bulb 4.

[0014] If the wall 10 in the upper area 11 of the shell 3 is thinned only locally in the hottest zone thereof, then increasing temperature occurs on the external surface 14, since the heat flux through the said area is increased.

[0015] When bearing in mind exclusively the aspects related to heat transfer, the most desired embodiment of the upper area 11 of the shell 3 of the reflector 3 is a thinn membrane, which is in the praxis however not really applicable. Manufacturing of such headlight is ordinary carried out by means of injection molding, which is bound to certain limitations, so that by smaller reflectors 1 the minimum thickness D , of the wall 10 should be at least 1 mm. Manufacturing by means of injection molding is no doubt the optimum choice, which should not be changed due to any other creations and requirements in reflector, which do not relate to heat transfer. However, even by manufacturing the products with thickness of the wall 10 of approx. 1 mm may still lead to serious problems, especially to inadmissible vaulting of extremely heated internal surface 13 in the upper area 11 of the shell 3, which is intended for receipt of the reflection layer 101. The said vaulting is a consequence of thermal dilatations in the upper area 11 of the shell 3 of the reflector in respect to less warmed circumferential area 15 of the shell 3 of the reflector 1. On such basis, appropriate choice with respect to minimum thickness D , D_1 , D_2 of the wall 10 of

the shell 3 enables achieving a desired stiffness of the reflector 1. Providing various reinforcing means like ribs or similar additional elements on the external surface 14 of the reflector 1 should not be taken into account, since such ribs consist of a heat-insulating material any may therefore essentially hinder a desired heat transfer. The minimum thickness D , of the wall 10 may be varied depending on diameter of the reflector 1, requirements with respect to adequately precise directing the light rays, or also on thermal expansion coefficient in corelation with the module of elasticity, which correspond to the material used. Nevertheless, on the basis of obtained results it may be stated, that by appropriate geometric properties of the reflector 1, the thickness D , the wall 10 in amount of at least 1,5 mm is still acceptable, however by taking into account, that the bulb 4 is built within a rigid central area 100 and/or a lower area 12 of the reflector 1, which should however not represent any serious obstacle in course of successfully realization of the invention.

[0016] Effects related to thickening the lower area 12 of the shell 3 of the reflector 1 may also be illustrated by means of an embodiment of reflector 1, which consists of polyetherimide and has diameter of 75 mm. In fact, such projector 1 completely corresponds to the above mentioned reflector 1, in connection to which the effects related to thinning the wall 10 in the upper area 11 of the shell 3 have already been described, by taking into account, that in this case the thickness D_2 of the wall 10 is 2.2. mm and that thermal conductivity is 0,22 W/mK, which is a consequence of some lower temperature in this lower area 12 of the shell 3. When the shell 3 is thermally stressed, the measured temperature on its external surface 14 is 70°C. The internal temperature 81.5°C is matematically calculated. By enlarging the thickness D_2 of the wall 10 up to 2.8 mm, the measured temperature on the external surface 14 in the lower area 12 of the shell 3 is 69°C, which is a consequence of reduction of the heat flux, whilst the temperature 83°C on the internal wall 10 within the same area 12 of the shell 3 of the reflector 1 is matematically calculated. In each case this means at least certain improvement of conditions, especially, since the condensation process depends on small temperature differences, in particular when the operating conditions are very close to conditions, where such undesired condensation is started, which often occurs in the practice.

[0017] When bearing in mind the heat transfer, it would be ideal to ensure such temperature D_2 of the wall 10 in the lower area 12 of the shell 3 of the reflector 1, that the temperature on the internal surface 13 of the reflector 1 would be increased up to such degree, that this temperature would not be the lowest temperature within the casing of the reflector 1. In such a way, the problem of the so-called "cold zone" might be avoid, e.g. displaced to any other area of the casing of reflector 1, which is not so much exposed and important as the visible surface in the lower area 12 of the reflector 1. It can also be assumed, that such problem might be solved by exposing

the thickest part of the casing as the low-temperature zone. However, this is in the practice unfortunately not possible, since this portion and also some other portions of the casing are due to optical or quite esthetical reasons manufactured in dark colour. These dark surfaces then intensively absorb radiation of the light source (infrared and visible light), so that the temperatures in the lower part of the casing of the reflector 1 are regularly higher than in the lower area 12 of the reflector 1. It may also be stated in the practice, that due to technologic limitations resulting from the process of injection molding by the most economic thickness of approx. 3,5 mm, increasing the temperature in the area 12 cannot be achieved in a sufficient extent. If the thickness D_2 of the wall 10 in the lower area 12 of the reflector 1 would exceed a double thickness D , of the wall 10 in the upper area 11 of the reflector 1, addition problems would arise in course of disturbances during filling the mould cavity with the melted material due to insufficient hydraulic resistance in direction towards the thicker lower area 12 of the reflector 1. Of that reason, the thickness D_2 of the wall 10 in the lower area 12 of the reflector 1 shall not exceed a double thickness D , of the wall 10 in the upper area 11 of the reflector 1.

[0018] Combination of benefits, which are obtained by means of thinning the upper area 11 and thickening the lower area 12 of the shell 3 of the reflector 1, may be analysed on the basis of a comparable reflector 1 having a diameter of 75 mm (which is the same reflector 1 as in the previously discussed embodiments, at least with respect to optical characteristics and dimensions), by which the thickness D_2 of the wall 10 in the lower area 12 is 2,8 mm, and the thickness D_1 of the wall 10 in the upper area 11 is 1,7 mm, while the thickness D_0 of the wall 10 in the central area 100 in the level of the bulb 4 i.e. in the so-called equatorial plane, is 2,2 mm. Additional thickening of the wall 10 in the lower area 12 has a very small influence with respect to the heat transfer, so that consequently any effect of the thickening of the lower area 12 cannot be measured in the upper area 11 at all. It is namely estimated, that three to five times more heat is transferred through the upper area 11 of a reflector 1 than through the wall 10 in the lower area 12 of the shell 3. However, this effect of increasing the heat conductivity in the top half of the reflector 1 may be measured also in the bottom half thereof. Increased heat transfer on the top side of the reflector 1 namely leads to essentially decreasing the temperature within the whole casing and consequently also in the lower area 12 of the reflector 1. When being thermally stressed, the measured temperature on the external surface 14 of the lower area 12 of the shell 3, which is thinned upwards and thickened downwards, is 66°C. Additional decreasing of temperature for 3°C is a consequence of thinning the upper area 11. This is no doubt valuable, since thinning the wall 10 in the upper area 11 of the shell 3 results in decreasing the temperature also in other portions, where potential sources of vaporized substances may be present, which are

normally condensed in the lower part 12 of the reflector 1.

[0019] Thickening the lower area 12 of the reflector 1 among others also leads to establishing much more stable fixation of the bulb 4 in the central area 100 and preventing its deviations from the correct position due to extension of the warmed upper area 11 of the reflector 1.

[0020] Whenever the temperature field is known, each desired thickness D_0 , D_1 , D_2 of the wall 10 of the reflector 1 may be determined depending on local temperature. Accordingly, smaller thickness D_0 , D_1 , D_2 of the wall 10 may be foreseen in the area with higher temperature.

[0021] In the practice it is estimated to be economic, if the reflector 1 consists of a polymer without filling agents, or exceptionally also with filling agents, the dimensions of which do not exceed 3µm. Such polymers may namely be coated in vacuum by a metallic reflection layer 2 without applying a lacque onto the internal surface 13 before that. Reflector 1, by which a desired heat transfer is achieved by means of determining appropriate values of thickness D_0 , D_1 , D_2 in certain areas 11, 12, 100 of the wall 10, may no doubt also consist of reactive polymers. These are normally filled with rough filling agents. During the manufacturing of the reflector 1, the presence of such agents normally requires appropriate pre-treatment of the inner surface 13 by applying a lacquer.

[0022] The most suitable materials for manufacturing the said reflectors 1 are thermoplastic polycarbonates, co-polymers of polycarbonates, polyether-sulphones and polyetherimides, all of them without any filling agents. These materials are thermoplastic polymers, which excel in appropriate behaviour during processing thereof by injection molding, and may moreover be regenerated i.e. recycled.

[0023] A further indirect effect, which results from the use of the reflector according to the invention, is evident in the possibility of use less sophisticated and correspondingly cheaper bulbs 4, by which during the use thereof much more heat is generated and released like e.g. by more sophisticated and more expensive bulbs 4, so that the use thereof without taking into account the proposed measures would not be admitted.

[0024] A further embodiment, which is shown in Figs. 3 to 5, relates to a reflector 1 as well, which is manufactured of a polymeric material and consists of a carrying ring 2 and a shell 3, wherein the last one comprises a concave internal surface 13, on which appropriate reflective layer is foreseen, as well as a convex external surface 14. The said ring 2 is essentially cylindrical or toroidal, and may be either continued or discontinued, so that it is formed of more segments, extending in the circumferential direction.

[0025] The shell 3 of the reflector 1 comprises a tube-like projection 33, which includes appropriate opening, into which the bulb 4 is inserted with its base or bracket, which is arranged in the horizontal equatorial plane 30 and is not shown in the drawing. The thickness of the wall 10 in the upper area 11 of the shell 3 above the

equatorial plane 30 of the reflector 1 i.e. above the bulb 4, as shown in Fig. 1 or 2, may be smaller than the thickness in the lower area 12 of the shell 3 below the said plane 30 i.e. the bulb 4, by which the heat transfer from the inside of the reflector 1 towards the outside thereof may be much more intensive, especially the transfer from the upper area 11 of the shell 3 above the said plane 30 towards the area adjacent to the external surface 14 above the said plane 30.

[0026] As evident in the Fig. 3, an upwardly closed wedge-shaped space 23 is present between the carrying ring 2 and the outer surface 14 of the shell 3. In this embodiment, the shell 3 is connected to the said ring 2 by means of a relatively thin connecting element 21, which extends continuously along the circumference thereof.

[0027] When the reflector 1 is in operation, a certain quantity of heat is released in the area of the bulb 4, the most of which is then in the upper area 11 above the equatorial plane 30 of the reflector 1 conducted from the internal surface 31 of the shell 3 through the wall 10 of the said shell 3 to the outer surface 14 of the shell 3. On the outer surface 14 this heat is then transferred to the air, which is collected within the said wedge-shaped space 23 between the outer surface 14 of the shell 3 and the ring 2 or the connecting element 21 between the ring 2 and the shell 3, respectively. According to the invention, at least one opening 22 is foreseen at least in the upper area of the connecting element 21 between the bearing ring 2 and the shell 3, which is situated at a maximum distance from the equatorial plane 30 and enables draining of heated air, which is collected within the said wedge-shaped space 23. In such a way a desired decreasing of temperature within the said space 23 may be achieved, by means of which also the difference between the temperature of the internal surface 13 and the temperature of the external surface 14 is increased, on the basis of which the heat transfer from the inside of the reflector 1 towards the outside thereof becomes adequately more intensive.

[0028] A still further measurement in course of improvement the thermic conditions in the reflector 1 is shown in Fig. 6. In fact, still another embodiment of the reflector 1 according to the invention is shown quite simply and schematically, by which the outward surface 14 at least in the upper area 11 of the shell 3 is characterized by appropriate, in advance determined roughness, which means, that it includes cavities and projections having determined dimensions. Actually, a characteristic rough surface 14 is carried out in such a manner, that it includes adequately slope cavities or projections in form of pyramid and/or truncated pyramid and/or cone and/or truncated cone of appropriate depth or height Δ , by which such roughness essentially improves emissivity of electromagnetic radiation.

[0029] When taking into account conditions during operation of the reflector 1, the temperature of the wall 10 in the upper area 11 of the shell 3 is approx. 400 K, and

the majority of energy, which is radiated by the reflector 1, represents radiation in the area of wavelengths between 3,5 in 25 μm . Appropriate roughness, which leads to improvement of emissiveness, corresponds to approximately a tenth of the maximum wavelength, which means, that the minimal depth/height Δ of the said cavities/projections on the surface 14 should be approximately 0,003 mm. On the contrary, roughness of the external surface 14 may also lead to forming a static air layer, which is in fact a heat insulating layer on the external surface 14 of the shell 3. Despite to that, by correspondingly determined roughness such static air layer still has no essential influence, so that e.g. by reflector 1 of the fog lamp for motor vehicles, where the heat flux is 0,5 W/cm², a determined roughness should be 0,01 mm.

[0030] According to the invention, the roughness Δ of the external surface 14 of the shell 3 in the upper area 11 of the reflector 1 at least adjacent to the area 100 of insertion a bulb 4 and in the neighborhood thereof should be between 0,003 and 0,01 mm.

[0031] It should therefore be stated, that appropriate roughness Δ in the area between 0,003 and 0,01 mm on the external surface 14 of the shell 3 of the reflector 1 may be obtained by means of relatively slope punctiform cavities and/or projections, which are triangular or trapezoidal in their longitudinal cross-section and are arranged on the said surface 14. In certain cases, such cavities or projections may also be line shaped i.e. elongated, like grooves, recesses, ribs or the like.

Claims

1. Reflector, which consists of a polymeric material, which is resistant with respect to possible deviations of form and dimensions when being exposed to an increased temperature, and comprises a continued or discontinued ring (2), which is intended for mounting the reflector (1) into corresponding casing and by which a shell (3) is surrounded in the circumferential direction, by which the shell (3) includes a tubular member intended for insertion of a bulb (4) in its central area (100) and comprises an internal surface (13), which extends adjacent to the bulb (4) and is provided with a reflection layer (101), and the thickness (D_0) of the wall (10) of the shell (3) in the said central area (100) is sufficient for stable fixation of the bulb (4), **characterized in that** the thickness (D_1) of the wall (10) in the upper area (11) of the shell (3) of the reflector (1), which is placed above the area (100) of insertion the bulb (4), is smaller than the thickness (D_2) of the wall (10) in the lower area (12) of the shell (3), which lies below the area (100) of insertion the bulb (4).
2. Reflector according to Claim 1, **characterized in that**, the thickness (D_2) of the wall (10) in the lower area (12) of the shell (3) of the reflector (1) below

the area (100) of insertion of the bulb (4) is 1,5-times do 2-times greater than the thickness (D_1) of the wall (10) in the upper area (11) of the shell (3) of the reflector (1) above the area (100) of insertion the bulb (4).

3. Reflector according to Claim 1 or 2, **characterized in that** it consists of a thermoplastic polymer either without filling agents or with filling agents, which are smaller than 3 μm , by which appropriate resistance with respect to deviations in geometry due to increasing the temperature is ensured at least up to temperature value of 120°C.

4. Reflector according to Claim 1 or 2, **characterized in that** at least a portion thereof, namely the area of the wall (10) of the shell (3), consists of a thermoplastic polymer either without filling agents or with filling agents, which are smaller than 3 μm , by which appropriate resistance with respect to deviations in geometry due to increasing the temperature is ensured at least up to temperature value of 120°C.

5. Reflector according to Claims 1 or 2, consisting of amorphous polymer without filling agents, which belongs to the group of polycarbonates, polyethersulphones or polyeterimides.

6. Reflector according to Claim 1 or 2, consisting at least essentially, namely in the area of the wall (10) of the shell (3), of an amorphous polymer without filling agents which belongs to the group of polycarbonates, polyethersulphones or polyeterimides.

7. Reflector according to one of Claims 1 to 6, **characterized in that** the reflection layer (101) on the internal surface (13) of the shell (3) is a metallized layer.

8. Reflector according to one of Claims 1 to 7, **characterized in that**, the thickness (D_1) of the wall (10) in the upper area (11) of the shell (3) of the reflector (1) above the area (100) of insertion the bulb (4) is 1 to 2 mm, while the thickness (D_2) of the wall (10) in the lower area (12) of the shell (3) of the reflector (1) below the area (100) of insertion the bulb (4) is 1,6 do 4 mm.

9. Reflector according to one of Claims 1 to 7, **characterized in that** the thickness (D_1) of the wall (10) in the upper area (11) of the shell (3) of the reflector (1) above the area (100) of insertion of the bulb (4) is 1,4 to 1,8 mm, while the thickness (D_2) of the wall (10) in the lower area (12) of the shell (3) of the reflector (1) below the area (100) of insertion the bulb (4) is 2,2 do 3 mm.

10. Reflector according to one of the preceding Claims,

characterized in that it includes at least one opening (22) or similar passage, which is arranged in the upper area (11) in a position, which is situated at the maximum distance above the equatorial plane (30), or adjacent to this area, namely either within a connecting element (31) when available between the shell (3) and the carrying ring (2) or even within the said ring (2) above the convex external surface (32) of the shell (3), where the upwardly closed wedge-shaped space (23) is available, so that by means of the said opening (22) the said wedge-shaped space (23) above the external surface (32) of the shell (3) and above the carrying ring (2) is connected with the exterior outside of the external circumference of the said ring (2) or the connecting element (21), respectively.

11. Reflector according to Claim 10, **characterized in that** the opening (22) is foreseen in the top area of the carrying ring (2), which is positioned at the maximum distance from the equatorial plane (30), or adjacent to such position, and that the thickness (D_1) of the wall (10) of the shell (3) in the area (11) above the equatorial plane (30) is smaller than the thickness (D_2) of the wall (10) of the shell (3) in the area (12) below the equatorial plane (30).

12. Reflector according to Claim 10, **characterized in that** the opening (22) is foreseen in the top area of the connecting element (21) between the carrying ring (2) and the shell (3), which is positioned at the maximum distance from the equatorial plane (30), and that the thickness (D_1) of the wall (10) of the shell (3) in the area (11) above the equatorial plane (30) is smaller than the thickness (D_2) of the wall (10) of the shell (3) in the area (12) below the equatorial plane (30).

13. Reflector according to Claim 10, **characterized in that**, the opening (22) is foreseen in the top area of the carrying ring (2) and also in the top area of the connecting element (21), which are positioned at the maximum distance from the equatorial plane (30), or adjacent to such position, and that the thickness (D_1) of the wall (10) of the shell (3) in the area (11) above the equatorial plane (30) is smaller than the thickness (D_2) of the wall (10) of the shell (3) in the area (12) below the equatorial plane (30).

14. Reflector according to one of Claims 10 to 13, **characterized in that** the opening (22) is a single opening. ,

15. Reflector according to one of Claims 10 - 13, **characterized in that** the opening (22) consists of a desired number of separately arranged openings.

16. Reflector according to one of the preceding Claims,

characterized in that the roughness (Δ) of the external surface (14) of the shell (3) is between 0,003 and 0,01 mm.

17. Reflector according to Claim 16, **characterized in that** the roughness (Δ) of the external surface (14) of the shell (3) at least in the upper area (11) of the reflector (1) above the equatorial plane (30) is between 0,003 and 0,01 mm.
18. Reflector according to Claim 16 or 17, **characterized in that** the roughness (Δ) of the external surface (14) of the shell (3) at least in the upper area (11) of the reflector (1) above the equatorial plane (30), at least essentially adjacent to the location of the bulb (4), is between 0,003 and 0,01 mm.
19. Reflector according to one of Claims 16 to 18, **characterized in that** the roughness (Δ) on the external surface (14) of the shell (3) of the reflector (1) is achieved by means of presence of punctiform cavities and/or projections of relatively slope triangular or trapezoidal longitudinal cross-section on the said surface (14).
20. Reflector according to one of Claims 16 to 18, **characterized in that** the roughness (Δ) on the external surface (14) of the shell (3) of the reflector (1) is achieved by means of presence of line shaped cavities and/or projections of relatively sloped triangular or trapezoidal longitudinal cross-section on the said surface (14).
21. Reflector according to one of Claims 16 to 18, **characterized in that** the roughness (Δ) on the external surface (14) of the shell (3) of the reflector (1) is achieved by means of presence of punctiform and line shaped cavities and/or projections of relatively sloped triangular or trapezoidal longitudinal cross-section on the said surface (14).

Patentansprüche

1. Reflektor, der aus einem Polymermaterial besteht, das gegenüber möglichen Abweichungen der Form und der Abmessungen widerstandsfähig ist, wenn es einer Temperaturerhöhung ausgesetzt ist, und einen durchgehenden oder unterbrochenen Ring (2) umfasst, der zur Montage des Reflektors (1) in das entsprechende Gehäuse bestimmt ist und durch den eine Schale (3) in Umfangsrichtung umgeben ist, bei dem die Schale (3) ein rohrförmiges Element umfasst, das zur Einführung einer Lichtquelle (4) in deren Zentralgebiet (100) gedacht ist und eine interne Oberfläche (13) aufweist, die sich angrenzend an die Lichtquelle (4) erstreckt und mit einer Reflexionsschicht (101) versehen ist, und die Dicke (D_0) der

Wand (10) der Schale (3) im besagten Zentralgebiet (100) ist ausreichend für eine stabile Befestigung der Lichtquelle (4), **dadurch gekennzeichnet, dass** die Dicke (D_1) der Wand (10) im oberen Bereich (11) der Schale (3) des Reflektors (1), der sich oberhalb des Bereiches (100) der Einführung der Lichtquelle (4) befindet, kleiner als die Dicke (D_2) der Wand (10) im unteren Bereich (12) der Schale (3) ist, der unter dem Bereich (100) der Einführung der Lichtquelle (4) liegt.

2. Reflektor nach Anspruch 1, **dadurch gekennzeichnet, dass** die Dicke (D_2) der Wand (10) im unteren Bereich (12) der Schale (3) des Reflektors (1) unter dem Bereich (100) der Einführung der Lichtquelle (4) von 1,5 mal bis zweimal größer als die Dicke (D_1) der Wand (10) im oberen Bereich (11) der Schale (3) des Reflektors (1) oberhalb des Bereiches (100) der Einführung der Lichtquelle (4) ist.
3. Reflektor nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** er aus einem thermoplastischen Polymer, entweder ohne Füllstoffe oder mit Füllstoffen besteht, die kleiner als $3\ \mu\text{m}$ sind, wodurch ein geeigneter Widerstand in Bezug auf geometrische Abweichungen auf Grund einer Temperaturerhöhung mindesten bis zu 120°C sichergestellt wird.
4. Reflektor nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** mindestens ein Teil davon und zwar mindestens das Gebiet der Wand (10) der Schale (3) aus einem thermoplastischen Polymer, entweder ohne Füllstoffe oder mit Füllstoffen besteht, die kleiner als $3\ \mu\text{m}$ sind, wodurch ein geeigneter Widerstand in Bezug auf geometrische Abweichungen auf Grund einer Temperaturerhöhung mindesten bis zu 120°C sichergestellt wird.
5. Reflektor nach Anspruch 1 oder 2, bestehend aus einem amorphen Polymer ohne Füllstoffe, das zur Gruppe der Polycarbonate, Polyethersulphone oder Polyetherimide gehört.
6. Reflektor nach Anspruch 1 oder 2, bestehend mindestens im Wesentlichen, besonders im Bereich der Wand (10) der Schale (3), aus einem amorphen Polymer ohne Füllstoffe, das zur Gruppe der Polycarbonate, Polyethersulphone oder Polyetherimide gehört.
7. Reflektor nach einem der Ansprüche 1 bis 6, **dadurch gekennzeichnet, dass** die Reflexionsschicht (101) auf der inneren Oberfläche (13) der Schale (3) eine metallisierte Schicht ist.
8. Reflektor nach einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, dass** die Dicke (D_1) der

Wand (10) im oberen Gebiet (11) der Schale (3) des Reflektors (1) oberhalb des Bereiches (100) der Einführung der Lichtquelle (4) von 1 bis 2 mm beträgt, während die Dicke (D_2) der Wand (10) im unteren Bereich (12) des Schale (3) des Reflektors (1) unter dem Bereich (100) der Einführung der Lichtquelle (4) zwischen 1,6 und 4 mm beträgt.

9. Reflektor nach einem der Ansprüche 1 bis 7, **dadurch gekennzeichnet, dass** die Dicke (D_1) der Wand (10) im oberen Bereich (11) der Schale (3) des Reflektors (1) oberhalb des Bereiches (100) der Einführung der Lichtquelle (4) von 1,4 bis 1,8 mm beträgt, während die Dicke (D_2) der Wand (10) im unteren Bereich (12) des Schale (3) des Reflektors (1) unter dem Gebiet (100) der Einführung des Leuchtkolbens (4) von 2,2 bis 3 mm beträgt.

10. Reflektor nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** er mindestens eine Öffnung (22) oder ähnliche Durchlässe umfasst, die im oberen Bereich (11) in einer Position angeordnet sind, die in einer Maximalentfernung über der Äquatorialebene (3), oder angrenzend an diesen Bereich angeordnet sind, nämlich entweder in einem Verbindungselement (31), wenn es zwischen der Schale (3) und dem Trägerring (2) oder sogar im besagten Trägerring (2) über der konvexen externen Oberfläche (32) der Schale (3) zur Verfügung steht, wobei der nach oben geschlossene keilförmige Raum (23) zur Verfügung steht, so dass der besagte keilförmige Raum (23) über der externen Oberfläche (32) der Schale (3) und über dem Trägerring (2) mit Hilfe der besagten Öffnung (22) jeweils mit der Außenseite des externen Umfangs des besagten Rings (2) oder dem Verbindungselement (21) verbunden wird.

11. Reflektor nach Anspruch 10, **dadurch gekennzeichnet, dass** die Öffnung (22) im oberen Gebiet des Trägerrings (2) vorgesehen ist, die in einer Maximalentfernung von der Äquatorialebene (30) oder angrenzend an dieses Position angeordnet ist und dass die Dicke (D_1) der Wand (10) der Schale (3) im Bereich (11) oberhalb der Äquatorialebene (30) kleiner ist als die Dicke (D_2) der Wand (10) der Schale (3) im Bereich (12) unterhalb der Äquatorialebene (30).

12. Reflektor nach Anspruch 10, **dadurch gekennzeichnet, dass** die Öffnung (22) im oberen Gebiet des Verbindungselements (21) zwischen dem Trägerring (2) und der Schale (3) vorgesehen ist, die in einer Maximalentfernung von der Äquatorialebene (30) angeordnet ist und dass die Dicke (D_1) der Wand (10) der Schale (3) im Gebiet (11) oberhalb der Äquatorialebene (30) kleiner ist als die Dicke (D_2) der Wand (10) der Schale (3) im Gebiet (12) unter

der Äquatorialebene (30).

13. Reflektor nach Anspruch 10, **dadurch gekennzeichnet, dass** die Öffnung im oberen Gebiet des Trägerrings (2) und im oberen Gebiet des Verbindungselements (21) zwischen dem Trägerring (2) und der Schale (3) vorgesehen ist, die in einer Maximalentfernung von der Äquatorialebene (30) angeordnet sind und dass die Dicke (D_1) der Wand (10) der Schale (3) im Gebiet (11) oberhalb der Äquatorialebene (30) kleiner ist als die Dicke (D_2) der Wand (10) der Schale (3) im Gebiet (12) unter der Äquatorialebene (30).

14. Reflektor nach einem der Ansprüche 10 bis 13, **dadurch gekennzeichnet, dass** die Öffnung (22) eine einzelne Öffnung ist.

15. Reflektor nach einem der Ansprüche 10 bis 13, **dadurch gekennzeichnet, dass** die Öffnung (22) aus einer gewünschten Anzahl von getrennt angeordneten Öffnungen besteht.

16. Reflektor nach irgendeinem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die Rauigkeit (Δ) der externen Oberfläche (14) der Schale (3) zwischen 0,003 und 0,01 mm liegt.

17. Reflektor nach Anspruch 16, **dadurch gekennzeichnet, dass** die Rauigkeit (Δ) der externen Oberfläche (14) der Schale (3) mindestens im oberen Gebiet (11) des Reflektors (1) oberhalb der Äquatorialebene (3) zwischen 0,003 und 0,01 mm liegt.

18. Reflektor nach Anspruch 16 oder 17, **dadurch gekennzeichnet, dass** die Rauigkeit (Δ) der externen Oberfläche (14) der Schale (3) mindestens im oberen Bereich (11) des Reflektors (1) oberhalb der Äquatorialebene (3), mindestens im Wesentlichen angrenzend an den Ort der Lichtquelle (4), zwischen 0,003 und 0,01 mm liegt.

19. Reflektor nach irgendeinem der Ansprüche 16 bis 18, **dadurch gekennzeichnet, dass** die Rauigkeit (Δ) der externen Oberfläche (14) der Schale (3) des Reflektors (1) mit Hilfe der Anwesenheit von punktförmigen Hohlräumen und/oder Vorsprüngen mit relativ geneigten dreieckigen oder trapezförmigen länglichen Querschnitt auf der besagten Oberfläche (14) erhalten wird.

20. Reflektor nach irgendeinem der Ansprüche 16 bis 18, **dadurch gekennzeichnet, dass** die Rauigkeit (Δ) der externen Oberfläche (14) der Schale (3) des Reflektors (1) mit Hilfe der Anwesenheit von linienförmigen Hohlräumen und/oder Vorsprüngen mit relativ geneigten dreieckigen oder trapezförmigen

länglichen Querschnitt auf der besagten Oberfläche (14) erhalten wird.

21. Reflektor nach irgendeinem der Ansprüche 16 bis 18, **dadurch gekennzeichnet, dass** die Rauigkeit (Δ) der externen Oberfläche (14) der Schale (3) des Reflektors (1) mit Hilfe der Anwesenheit von punktförmigen und linienförmigen Hohlräumen und/oder Vorsprüngen mit relativ geneigten dreieckigen oder trapezförmigen länglichen Querschnitt auf der besagten Oberfläche (14) erhalten wird.

Revendications

1. Réflecteur composé d'un matériau polymérique qui résiste aux modifications de forme et de dimensions possibles s'il est exposé à une température élevée, et comprenant un anneau (2) continu ou discontinu destiné à monter le réflecteur (1) dans un boîtier correspondant et dans lequel réflecteur, une coque (3) est entourée dans la direction circonférentielle et dans lequel réflecteur, la coque (3) comprend un membre tubulaire destiné à l'insertion d'une ampoule (4) dans sa zone centrale (100) et lequel réflecteur comprend une surface interne (13) qui s'étend à côté de l'ampoule (4) et est pourvu d'une couche de réflexion (101); l'épaisseur (D_0) de la paroi (10) de la coque (3) dans ladite zone centrale (100) étant suffisante pour fixer de façon stable de l'ampoule (4), **caractérisé en ce que** l'épaisseur (D_1) de la paroi (10) dans la zone supérieure (11) de la coque (3) du réflecteur (1) situé au dessus de la zone (100) d'insertion de l'ampoule (4) est inférieure à l'épaisseur (D_2) de la paroi (10) dans la zone inférieure (12) de la coque (3) située en dessous de la zone (100) d'insertion de l'ampoule (4).
2. Réflecteur selon la revendication 1, **caractérisé en ce que** l'épaisseur (D_2) de la paroi (10) dans la zone inférieure (12) de la coque (3) du réflecteur (1), en dessous de la zone (100) d'insertion de l'ampoule (4) est 1,5 à 2 fois supérieure à l'épaisseur (D_1) de la paroi (10) dans la zone supérieure (11) de la coque (3) du réflecteur (1), au dessus de la zone (100) d'insertion de l'ampoule (4).
3. Réflecteur selon la revendication 1 ou 2, **caractérisé en ce qu'il** est composé d'un polymère thermoplastique sans agents de remplissage ou avec agents de remplissage inférieurs à $3 \mu\text{m}$, et dont la résistance appropriée aux modifications géométriques à cause d'une augmentation de la température est assurée au moins jusqu'à des valeurs de températures de 120°C .
4. Réflecteur selon la revendication 1 ou 2, **caractérisé en ce qu'au** moins une partie de celui-ci, à savoir la

zone de la paroi (10) de la coque (3), est composée d'un polymère thermoplastique sans agents de remplissage ou avec agents de remplissage inférieurs à $3 \mu\text{m}$, dont la résistance appropriée aux modifications géométriques à cause d'une augmentation de la température est assurée au moins jusqu'à des valeurs de températures de 120°C .

5. Réflecteur selon les revendications 1 ou 2, comprenant un polymère amorphe sans agents de remplissage, lequel polymère appartient au groupe des polycarbonates, des polyéthersulphones ou des polyétherimides.
6. Réflecteur selon la revendication 1 ou 2, comprenant au moins essentiellement, un polymère amorphe, à savoir dans la zone de la paroi (10) de la coque (3), sans agents de remplissage, lequel polymère appartient au groupe des polycarbonates, des polyéthersulphones ou des polyétherimides.
7. Réflecteur selon une des revendications 1 à 6, **caractérisé en ce que** la couche de réflexion (101) sur la surface interne (13) de la coque (3) est une couche métallisée.
8. Réflecteur selon une des revendications 1 à 7, **caractérisé en ce que** l'épaisseur (D_1) de la paroi (10) dans la zone supérieure (11) de la coque (3) du réflecteur (1), au dessus de la zone (100) d'insertion de l'ampoule (4), est de 1 ou 2 mm, alors que l'épaisseur (D_2) de la paroi (10) dans la zone inférieure (12) de la coque (3) du réflecteur (1) en dessous de la zone (100) d'insertion de l'ampoule (4) est de 1,6 à 4 mm.
9. Réflecteur selon une des revendications 1 à 7, **caractérisé en ce que** l'épaisseur (D_1) de la paroi (10) dans la zone supérieure (11) de la coque (3) du réflecteur (1), au dessus de la zone (100) d'insertion de l'ampoule (4), est de 1,4 à 1,8 mm, alors que l'épaisseur (D_2) de la paroi (10) dans la zone inférieure (12) de la coque (3) du réflecteur (1) en dessous de la zone (100) d'insertion de l'ampoule (4) est de 2,2 ou de 3 mm.
10. Réflecteur selon une des revendications précédentes, **caractérisé en ce qu'il** comprend au moins une ouverture (22) ou un passage similaire disposé dans la zone supérieure (11) dans une position située à la distance maximale, au dessus du plan (30) équatorial ou à côté de cette zone, à savoir à l'intérieur d'un élément d'un liaison (31), s'il existe, entre la coque (3) et l'anneau de support (2) ou même à l'intérieur dudit anneau (2), au dessus de la surface (32) externe convexe de la coque (3) où il existe un espace (23) fermé en forme de cale ; ladite ouverture (22) permettant audit espace (23) en forme de cale

au dessus de la surface (32) externe de la coque (3) et au dessus de l'anneau de support (2) d'être relié à l'extérieur de la circonférence dudit anneau (2) ou de l'élément de liaison (21), respectivement.

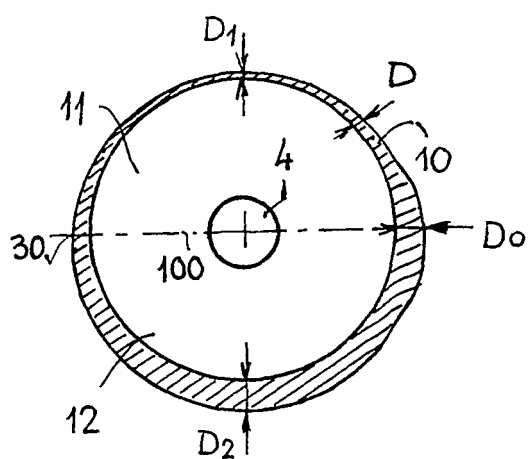
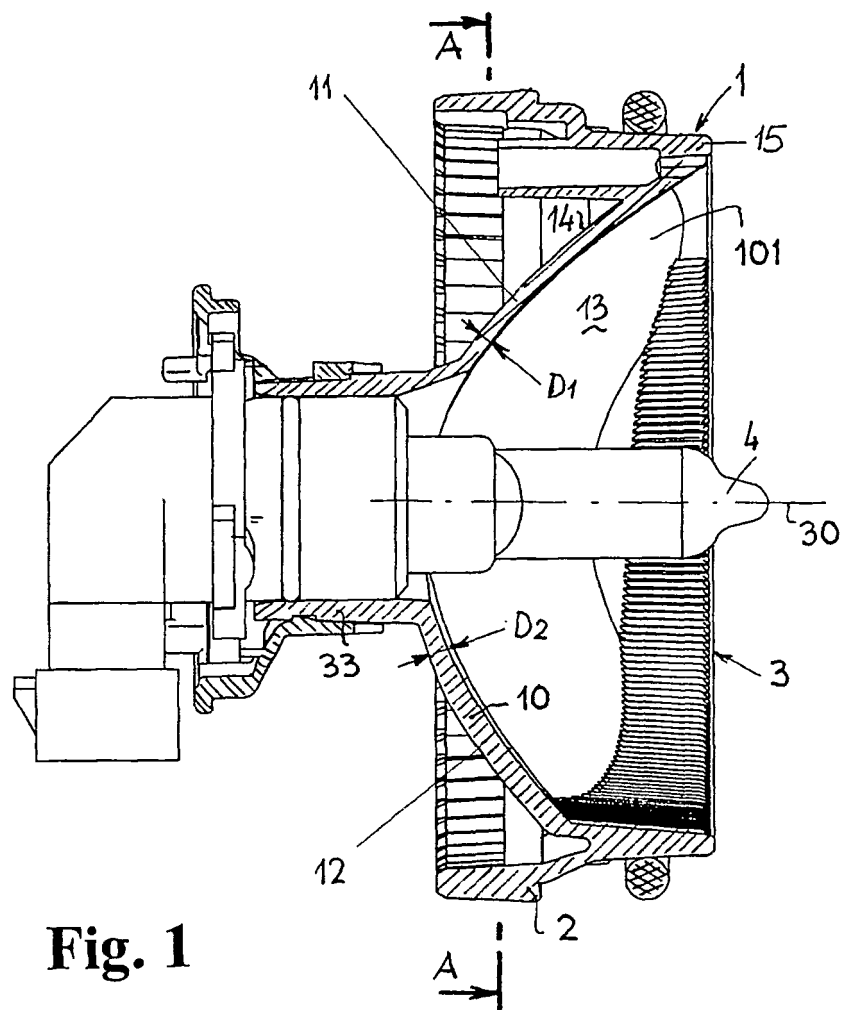
11. Réflecteur selon la revendication 10, **caractérisé en ce que** l'ouverture (22) est prévue dans la zone supérieure de l'anneau de support (2), laquelle ouverture est placée à la distance maximale par rapport au plan (30) équatorial, ou à côté d'une telle position et **en ce que** l'épaisseur (D1) de la paroi (10) de la coque (3) dans la zone (11) au dessus du plan (30) équatorial est inférieure à l'épaisseur (D2) de la paroi (10) de la coque (3) dans la zone (12) en dessous du plan (30) équatorial. 5
12. Réflecteur selon la revendication 10, **caractérisé en ce que** l'ouverture (22) est prévue dans la zone supérieure de l'élément de liaison (21) entre l'anneau de support (2) et la coque (3), laquelle ouverture est placée à la distance maximale par rapport au plan (30) équatorial, et **en ce que** l'épaisseur (D1) de la paroi (10) de la coque (3) dans la zone (11) au dessus du plan (30) équatorial, est inférieure à l'épaisseur (D2) de la paroi (10) de la coque (3) dans la zone (12) en dessous du plan (30) équatorial. 20
13. Réflecteur selon la revendication 10, **caractérisé en ce que** l'ouverture (22) est prévue dans la zone supérieure de l'anneau de support (2) et également dans la zone supérieure de l'élément de liaison (21), laquelle ouverture est placée à la distance maximale par rapport au plan (30) équatorial ou à côté d'une telle position, et **en ce que** l'épaisseur (D1) de la paroi (10) de la coque (3) dans la zone (11) au dessus du plan (30) équatorial, est inférieure à l'épaisseur (D2) de la paroi (10) de la coque (3) dans la zone (12) en dessous du plan (30) équatorial. 30
14. Réflecteur selon une des revendications 10 à 13, **caractérisé en ce que** l'ouverture (22) est une ouverture unique. 40
15. Réflecteur selon une des revendications 10 à 13, **caractérisé en ce que** l'ouverture (22) comprend un nombre souhaité d'ouvertures disposées séparément. 45
16. Réflecteur selon une des revendications précédentes, **caractérisé en ce que** la rugosité (Δ) de la surface (14) externe de la coque (3) se situe entre 0,003 et 0,01 mm. 50
17. Réflecteur selon la revendication 16, **caractérisé en ce que** la rugosité (Δ) de la surface (14) externe de la coque (3), au moins dans la zone supérieure (11) du réflecteur (1), au dessus du plan (30) équatorial, se situe entre 0,003 et 0,01 mm. 55

18. Réflecteur selon la revendication 16 ou 17, **caractérisé en ce que** la rugosité (Δ) de la surface (14) externe de la coque (3), au moins dans la zone supérieure (11) du réflecteur (1), au dessus du plan (30) équatorial, au moins essentiellement à côté de la localisation de l'ampoule (4), se situe entre 0,003 et 0,001 mm.

19. Réflecteur selon une des revendications 16 à 18, **caractérisé en ce que** la rugosité (Δ) sur la surface (14) externe de la coque (3) du réflecteur (1) est obtenue grâce à la présence de cavités en forme de points et / ou de saillies à la section transversale longitudinale en forme de triangle ou de trapèze relativement inclinés sur ladite surface (14).

20. Réflecteur selon une des revendications 16 ou 18, **caractérisé en ce que** la rugosité (Δ) sur la surface (14) externe de la coque (3) du réflecteur (1) est obtenue grâce à la présence de cavités en forme de points et / ou de saillies à la section transversale longitudinale en forme de triangle ou de trapèze relativement inclinés sur ladite surface (14).

21. Réflecteur selon une des revendications 16 ou 18, **caractérisé en ce que** la rugosité (Δ) sur la surface (14) externe de la coque (3) du réflecteur (1) est obtenue grâce à la présence de cavités en forme de points et linéaires et / ou de saillies d'une section transversale longitudinale en forme de triangle ou de trapèze relativement inclinés sur ladite surface (14).



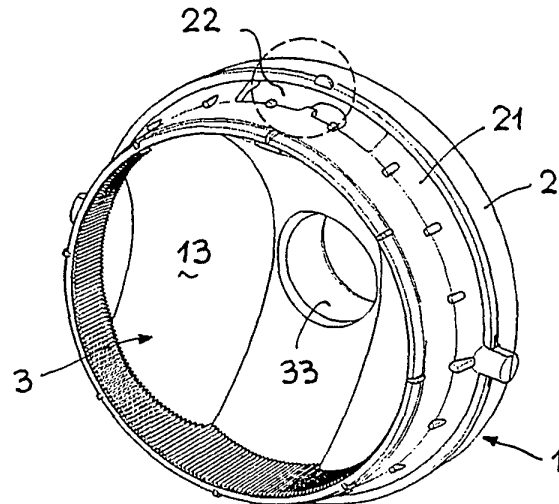


Fig. 3

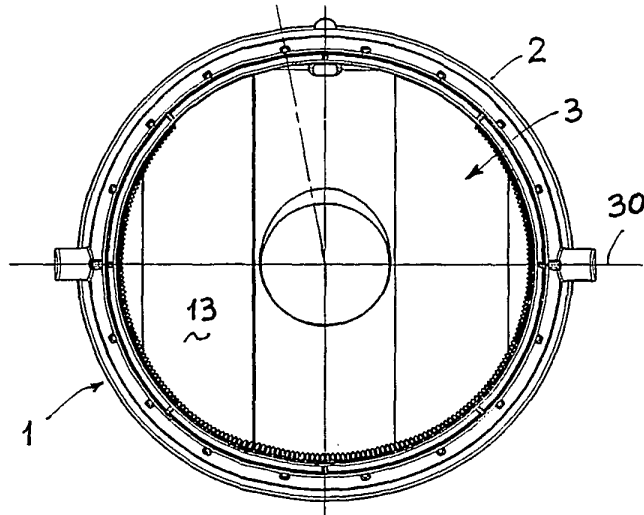


Fig. 4

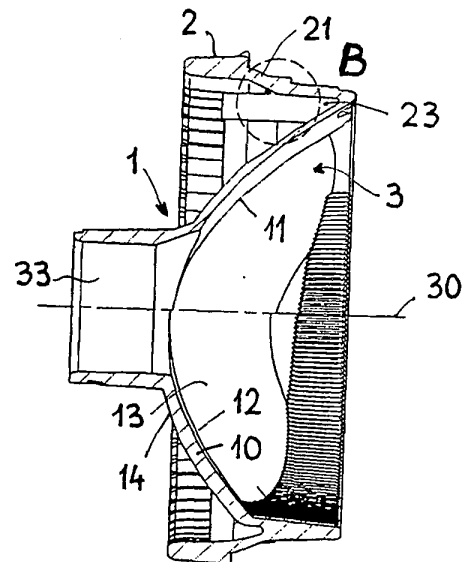


Fig. 6

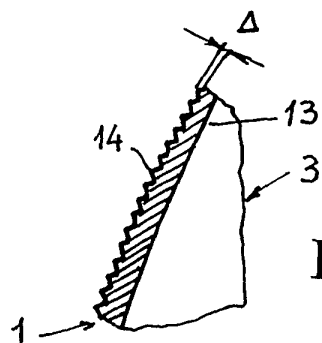


Fig. 5