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(54) Reflector substrate for illumination device and reflector for illumination device

(57) A reflector substrate 1 for an illumination device comprises an aromatic polyimide film or aromatic polyamide film molded article.

In addition, a reflector 8 for an illumination device is comprised of a reflecting layer 10 generated by vapor depositing a reflecting material on a reflector substrate comprising an aromatic polyimide film or an aromatic polyamide film molded article. The reflector substrate of the invention is light in weight and excellent in surface smoothness, safety, moldability, heat resistance, and handling characteristics. The reflector substrate requires no pre-treatment when the reflector layer is generated and it is suitable for mass production.

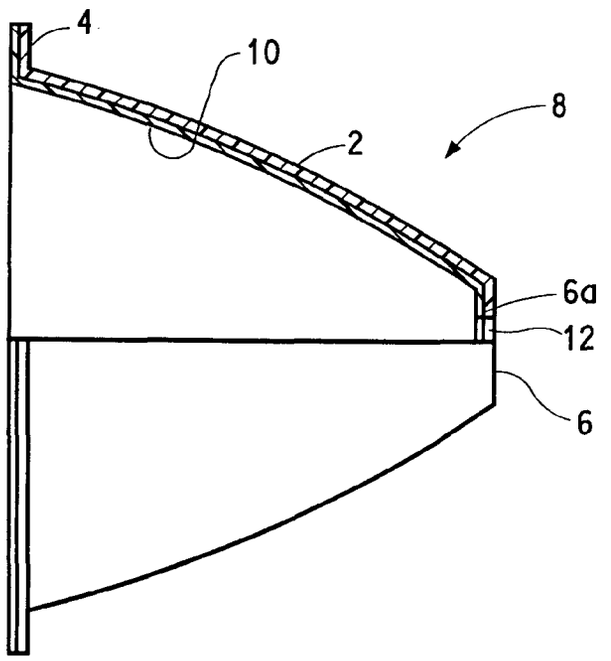

FIG. 2

EP 0 947 763 A2

Description

FIELD OF THE INVENTION

[0001] The present invention relates to a reflector substrate for an illumination device used as a lamp reflector, mainly for an automobile headlight or fog light and to a reflector for an illumination device made from said substrate.

BACKGROUND OF THE INVENTION

[0002] Automobile headlight (front lights) or fog light reflectors (lamp-reflectors) mainly comprise a reflector substrate that is made of glass, aluminium or a similar metal and an injection molded or compression molded polyphenylene sulfide, unsaturated polyester resin, or the like. A metal reflector layer is formed thereon, where the metal reflector layer uses as a reflecting material, aluminum, nickel-chromium alloy, titanium oxide, or the like.

[0003] Automotive headlights (front lights) and fog lights use as a light source, a halogen lamp, a xenon lamp, or the like, which may raise the temperature near the socket for the light bulb to 200°C or higher. Therefore, the reflector substrate must use an injection molded or compression molded plastic (reinforced resin molded article), the heat resistance of which has been improved by incorporating an inorganic reinforcing agent such as metal or glass fibers, calcium carbonate, and the like.

[0004] However, those systems using glass as a reflector substrate have been deficient because of their heavy weight and their fragility.

[0005] Those using reflector substrates comprising a metal and a reinforced resin molded article have been deficient in addition to being heavy because of the large number of manufacturing steps, These are necessitated by the need for a secondary processing step such as a resin coating prior to the vapor deposition of a reflecting substance for improved reflector mirror surface performance (smoothness).

[0006] However, those systems using a reinforced resin molded article as reflector substrate have been deficient in that although they are lighter in weight compared to those using a metal as a reflector substrate, they require a considerable thickness in view of the substrate strength and limitations in the forming technology. This results in reduced heat dissipation for the substrate itself so that there has been a concern about the heat resistance with respect to shape retention in a lamp having a structure that tends to accumulate heat such as in a projector type. There is also a concern that accelerated rise in temperature within the housing could shorten the lifetime of the lamp bulb itself.

[0007] Those systems using a reinforced resin molded article as a reflector substrate have been additionally deficient in that some of them have generated a vapor comprising a chlorine compound when the lamp is turned on resulting in it heating up. The vapor adheres to and solidifies on the front lens of a headlight or the like, which has made the lens cloudy, thus reducing lamp performance,

[0008] Japanese Utility Model Publication S60-10887 discloses a sheet reflector comprised of an aluminum-vapor deposited-mirror surface treated film sheet which eliminates a pre-treatment such as de-greasing to attain the mirror surface of the sheet reflector. However, the film sheet used is made of polyethylene, which is inferior in heat resistance, which makes it impossible to use such a sheet reflector as a reflector for a headlamp employing a high heat generation lamp such as a halogen lamp in terms of heat resistance and shape retention.

[0009] Japanese Patent Application Publication H5-88481 describes a reflector mirror obtained by generating a visual light reflecting infrared transmitting multi-layer film on a reflector substrate made of a polyimide resin and a polyether ketone resin film. In addition to its light weight and resistance to breakage of the film substrate, the use of polyimide resin can provide resistance to heat generation from a halogen lamp or the like. Because this reflector mirror is made on a visual light reflecting infrared transmitting multi-layer film, it has not been possible to use such a product in practice as a reflector for an automobile headlight and fog light.

SUMMARY OF THE INVENTION

[0010] The present invention resulted from studies of the problem of solving the above mentioned prior art deficiencies.

[0011] Therefore, it is the first object of this invention to provide a reflector substrate for an illumination device which is lightweight and excellent in surface smoothness, safety, moldability, heat resistance, and handling.

[0012] It is the second object of this invention to provide a reflector for an illumination device that is suitable for mass production in that it does not require a pre-treatment when a reflector layer is generated. It is also desirable that the reflector be light in weight, high in mirror surface characteristics, excellent in heat resistance, heat dissipation, safety, and handling, and is low cost and high quality.

[0013] In order to achieve the first objective, the reflector substrate for an illumination device in this invention comprises an aromatic polyimide film or aromatic polyamide film molded article.

[0014] The reflector substrate for an illumination device in this invention is made up of an inherently heat resistant specific plastic film molded article so that it has good surface smoothness and requires no pre-treatment when a reflector layer is formed. It can be obtained at low cost by a simple forming method such as hot mold compression forming, and it is, in addition, extremely light in weight and difficult to break, thereby offering excellent safety and handling characteristics.

[0015] The reflector substrate for an illumination device in this invention comprises a molded article formed by hot mold compression of a film, wherein the molded article has a main body generating a reflecting surface, an exterior flange portion and an interior flange portion. Meeting these conditions can further enhance the above-mentioned effect of this invention.

[0016] In order to achieve the above objective, the reflector for an illumination device in this invention is comprised of a reflecting layer generated by vapor depositing a reflecting material on a reflector substrate comprising an aromatic polyimide film or an aromatic polyamide film molded article.

[0017] The reflector for an illumination device in this invention is generated by forming a reflector layer by vapor depositing on a reflector substrate made up of an inherently heat resistant and highly surface smooth specific plastic film molded article. This makes pre-treatment such as a resin coating unnecessary before vapor depositing a reflector layer and the reflector can be obtained at low cost by mass production. In addition, the reflector is extremely light in weight and resists breakage and does not cause any de-gassing, which otherwise would be a hindrance in practical application when turning on the lamp. This makes this product not only excellent in heat dissipation, safety, and handling, but it also has enhanced heat resistance and mirror surface characteristics, thereby providing a high quality performance as a lamp reflector.

[0018] The reflector for an illuminating device in this invention comprises a molded article having a main body constituting a reflector surface, an exterior flange portion, and an interior flange portion, wherein the main body has at least a reflector layer generated thereon comprising vapor deposition of aluminum or silver. This reflector is useful as a lamp reflector. Meeting these conditions can further enhance the above effect of this invention.

[0019] The reflector substrate for an illumination device and reflector for an illumination device of this invention are further described more specifically by referring to the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] Figure 1 is a partially broken down perspective view illustrating a reflector substrate for an illumination device of this invention.

[0021] Figure 2 is a partially broken down side view illustrating a reflector for an illumination device of this invention.

Explanation of Symbols:	
1	Reflector substrate for illumination device
2	Main body
4	Exterior flange portion
6	Interior flange portion
6a	Interior flange
8	Reflector for illumination device
10	Reflecting layer
12	Light bulb insert opening

DETAILED DESCRIPTION OF THE INVENTION

[0022] As illustrated in Figure 1, a reflector substrate 1 for the illumination device of this invention comprises a molded article obtained by a hot mold compression of an aromatic polyimide film or aromatic polyamide film. It further comprises a main body 2 that constitutes a reflecting section, an exterior flange portion 4 and an interior flange portion 6. This example illustrates a construction as a lamp reflector base for an automobile headlight.

[0023] In the reflector substrate 1 for an illumination device, the main portion 2 has the surface smoothness which carries over the smoothness of the film and has satisfactory performance for the production of a projector reflecting surface, even with no pre-treatment.

[0024] If the strength of the main body 2 is an issue, it can be readily reinforced by mounting an injection molded plastic, pressed metal, or FRP frame on the exterior side of the main body portion 2.

[0025] The example shown in Figure 1 was illustrated for the main portion 2 as a simple reflector configuration assuming a rotary parabolic face, but based on the objective, any configuration can be adopted as long as it is moldable, such as a polyhedral main body 2.

[0026] Furthermore, the reflector 8 for an illumination device illustrated in Figure 2 has a reflector layer 10 generated by vapor depositing a reflecting material such as aluminum by a known means onto the interior circumference surface of the reflector substrate 1. In the step of forming this reflector substrate 1, which retains its smoothness as a film, it is unnecessary to carry out any pre-treatment such as resin coating, de-greasing, or the like.

[0027] In the reflector substrate 2 for an illumination device shown in Figure 2, a lamp reflector is constructed by opening an inlet 12 for a light bulb (not shown) in the center of the interior flange portion 6 and having an interior flange 6a formed circumscribing the inlet 12.

[0028] In the reflector substrate 1, illustrated in Figure 1, the exterior flange portion 4 was molded into the final shape of the reflector 8 given in Figure 2, but industrially, it is possible to mold an array of a plurality of reflector substrates on a single sheet of film, This is followed by vapor depositing and conditioning the outer shape of the exterior flange portions 4, and cutting them apart.

[0029] In the above construction, an inherently heat resistant aromatic polyimide film or aromatic polyamide

film is used as a film for forming the reflector substrate 2 for an illumination device and it is possible to use such a film with a thickness of about several μm to several hundred μm. Films in the above thickness are commercially available.

[0030] Any film, either stretched or unstretched, can be used, but it is not preferred to use a film having an inorganic or organic additive incorporated therein for improving processability, because that will reduce in general the surface smoothness of the reflector substrate 1.

[0031] The reflector substrate 1 for an illumination device of this invention can be obtained by forming the above film into the desired shape by means such as the hot mold compression, vacuum forming, high pressure gas blow forming, and the like. There is no limitation as to the means used as long as the forming method does not damage the substrate surface. A hot mold compression is most particularly advantageous in terms of production steps.

[0032] The metal used for vapor depositing on the reflector substrate 1 or an illumination device as a reflector material is most suitably aluminum or silver in view of reflectivity, but a chemically stable metal compound can be suitably used. Chromium and a nickel chromium alloy and the like may also be used as a reflector material or as a base for improving adhesion strength.

[0033] The means for vapor deposition to generate a reflecting layer 10 that can be used include vacuum deposition, sputtering, electron beam, ion plating, and similar processes, but these are not particularly limiting in this invention. It is permissible to form a protective film on top of the resultant reflecting layer by coating or vapor deposition and the like.

[0034] The shape of the reflector 8 for the illumination device of this invention may be any that is used in headlights or fog lights, or else the reflecting layer 10 may be generated only on the needed area for reflecting on the reflector substrate 1.

[0035] The reflecting layer 10 can be generated on a side opposite to the light bulb with respect to the reflector substrate. Mounting a reflecting layer 10 on the exterior of the light bulb can produce reflected light as a yellow color, which is the inherent color of the aromatic polyimide film and aromatic polyamide film.

EXAMPLES

[0036] Examples are given below to further specifically explain this invention.

[0037] "Kapton™" (a tradename of U.S. DuPont Company: aromatic polyimide film; thickness 75 to 125 μm) was subjected to a hot mold compression to generate an automotive headlight reflector substrate (lamp reflector substrate) with a shape illustrated in Figure 1.

[0038] The resultant lamp reflector substrate had a surface smoothness where the smoothness of the film was retained, which was satisfactory for the production of a projector reflecting surface,

[0039] Aluminum was vapor deposited onto the above lamp reflector substrate by a known vacuum vapor deposition process to generate a 0.3 μm thick reflecting layer. The reflecting layer formation steps did not include pre-treatment such as resin coating or de-greasing, or the like; still a smooth vapor deposited surface was capable of being formed.

[0040] An inlet was opened for a light bulb in the center of the interior flange portion and an interior flange was generated circumscribing the inlet opening.

[0041] The resulting reflecting layer, with extremely high smoothness, sufficiently produced a reflecting light when put into practical use as a headlight lamp reflector.

[0042] The reflector for an illumination device was extremely light in weight when compared to other parts of a headlight. The aromatic polyimide film, which is excellent in heat dissipation and is thin, can reduce the amount of lamp heat accumulated within the reflector, whereby the durability of the reflector and the lamp can be improved.

Advantageous Effect of the Invention

[0043] The reflector substrate for the illumination device of this invention as explained above was made up of an inherently heat resistant specific plastic film with good smoothness, making it unnecessary to have a pretreatment when a reflecting layer was generated. It can be obtained at low cost by a simple forming method such as a hot mold compression forming or the like, and which is yet extremely light in weight and resists breakage, offering excellent safety and handling characteristics.

[0044] Low cost mass production of the reflector for an illumination device of this invention is possible because the reflector substrate can have a reflecting layer vapor deposited on it without requiring prior pre-treatment such as resin coating or the like. The reflector substrate is an inherently heat resistant and highly surface smooth specific plastic film molded article. The reflector is extremely light in weight and undergoes no de-gassing when the lamp is turned on which would have been a practical problem. It offers not only excellent heat dissipation, safety. and handling characteristics, but also high heat resistance, mirror surface properties and quality performance so that the product can be advantageously used as a lamp reflector for automotive headlights or fog lights or else, for a large projector.

Claims

1. A reflector substrate for an illumination device comprising an aromatic polyimide film or aromatic polyamide film molded article.

2. The reflector substrate for an illumination device of Claim 1 wherein said molded article is made by hot mold compression forming or vacuum forming said

film.

3. The reflector substrate for an illumination device of Claim 1 or Claim 2 wherein the molded article comprises a main body which forms a reflecting surface, an exterior flange portion, and interior flange portion.

4. A reflector for an illumination device comprised of a reflecting layer generated by vapor depositing a reflecting material on a reflector substrate comprising an aromatic polyimide film or an aromatic polyamide film molded article.

5. The reflector for an illumination device of Claim 4 wherein said reflecting layer is generated by vapor depositing aluminium or silver.

6. The reflector for an illumination device of Claim 4 or Claim 5 wherein said molded article comprises a main body forming a reflecting surface, an exterior flange portion, and an internal flange portion, wherein said main body at least has a reflecting layer generated thereon.

7. The reflector for an illumination device of any one of Claims 4 to 6 wherein said reflector is used as a lamp reflector.

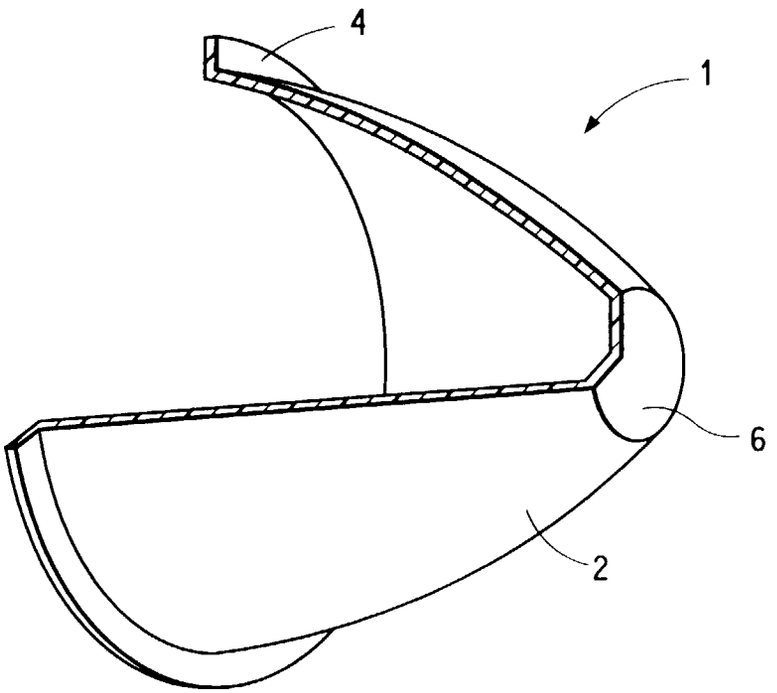

FIG. 1

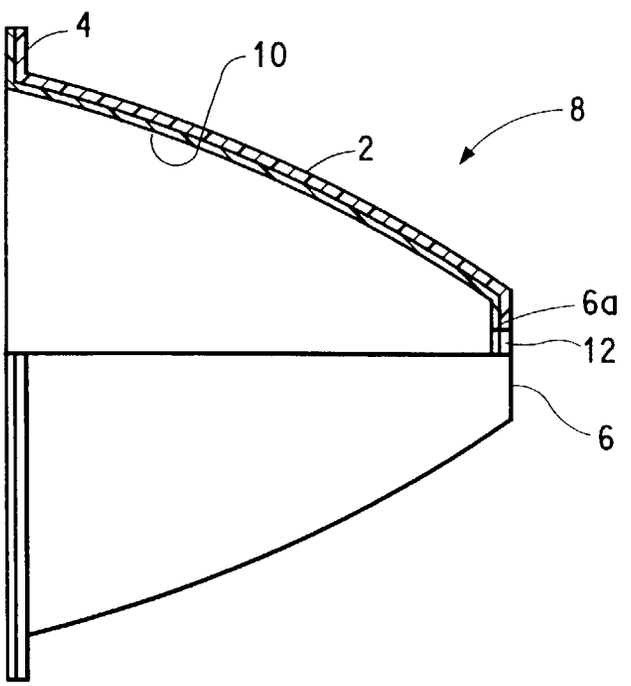

FIG. 2