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Decorative light string

Abstract

A decorative light string comprises a plurality of lamp bodies and an electric wire connected to the lamp bodies; the lamp body comprises a cover, a bottom plate for sealing an opening of the cover, a circuit board mounted in the cover, and an LED light source mounted on the circuit board; the electric wire is connected to the circuit board and extends out from two sides of the cover; the cover comprises a top wall and a side wall; the top wall is provided with a lens; two sides of the side wall are provided with wire slots; a waterproof step and a first welding rib are arranged on a surface where an end surface of the side wall and the bottom plate are joined; the present invention achieves high waterproof performance, simple structure, easy assembly, high production efficiency, low production cost and high durability.

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Background/Summary

TECHNICAL FIELD

(1) This invention generally relates to the technical field of LED lighting fixtures, and more particularly, to a decorative light string.

BACKGROUND

(2) A decorative light string includes a plurality of lamp bodies and an electric wire connecting the plurality of lamp bodies. The lamp body includes a lamp shell and a light source assembly mounted in the lamp shell. The electric wire penetrates through the lamp shell and is connected to the light source assembly. When the decorative light string is used outdoors, a durable and reliable waterproof structure is needed. One of the waterproof structures of the conventional decorative light string is: the light source assembly and the electric wire are first assembled into a whole, and then a lamp shell is integrally formed outside the light source assembly through an injection molding process. Although the aforesaid structure achieves good waterproof effect, due to the pre-embedded parts during the injection molding of the shell, the production efficiency is low and the manufacturing cost is high. The other waterproof structure adopts a split shell, wherein the light source assembly is first mounted in the lamp shell, and after the lamp shell is assembled, a waterproof adhesive is fed into the lamp shell. This structure has high material consuming and poor durability. In addition, the electric wire of the conventional decorative light string adopts a ribbon wire, and the outer surface of the ribbon wire is composed of a plurality of semi-circular arcs. Thus, a matched wire slot in the lamp shell is required, resulting in a complex structure of the wire slot and high difficulty of wire sealing.

SUMMARY

(3) The purpose of the present invention is to provide a decorative light string, which achieves high waterproof performance, simple structure, easy assembly, high production efficiency, low

production cost and high durability.
(4) To achieve the above purpose, the present invention adopts the following technical solution: a decorative light string comprises a plurality of lamp bodies and an electric wire connected to the plurality of lamp bodies; the lamp body comprises a cover, a bottom plate for sealing an opening of the cover, a circuit board mounted in the cover, and an LED light source mounted on the circuit board; the electric wire is electrically connected to the circuit board and extends out from two sides of the cover; the cover comprises a top wall and a side wall; the top wall is provided with a lens integrally formed with the cover; two sides of the side wall are provided with wire slots in interference fit with the electric wire; a waterproof step and a first welding rib that are clamped to each other are arranged on a surface where an end surface of the side wall and the bottom plate are joined; the first welding rib is welded and fixed to the waterproof step; the electric wire is a flat shielded wire, and the electric wire extends out from the wire slot; the bottom plate tightly presses the electric wire in the wire slot.
(5) Compared with the prior art, the present invention achieves the following benefits: to achieve high waterproof performance of the lamp body, the cover and the bottom plate are assembled, and the assembly surfaces of the cover and the bottom plate are provided with the first welding rib and the waterproof step that are capable of being welded together; by means of this design, high waterproof performance, simple structure, easy assembly, high production efficiency, low production cost and high durability are achieved; moreover, to achieve high waterproof performance of the electric wire, the flat shielded wire and the wire slot in interference fit with the flat shielded wire are adopted, and the electric wire is fixed in the wire slot by using the bottom plate; because the surface of the wire shield is flat, the structure of the wire slot is simple and high sealing performance is realized.
(6) As a further improvement of the present invention, the waterproof step is arranged on an end surface of the side wall of the cover, the first welding rib is arranged on the bottom plate, and the first welding rib is pressed on the electric wire. The bottom plate is provided with a protruding platform corresponding to the wire slot, and the protruding platform is clamped into the wire slot and pressed on the electric wire. Corners on both sides of the electric wire are configured to be rounded, a bottom wall and a side wall of the wire slot are joined to form a rounded corner corresponding to the electric wire, and two sides of the protruding platform are provided with arc protection edges corresponding to the electric wire. A plurality of first waterproof ribs extending from the bottom wall to the side wall of the wire slot are sequentially arranged in the wire slot from inside to outside. The first waterproof rib on the innermost side is aligned with the first welding rib, second waterproof ribs aligned with the the rest of first waterproof ribs are arranged on the protruding platform, and the first waterproof ribs and the second waterproof ribs are pressed on the electric wire. Two sides of the protruding platform are provided with a second welding rib, and the second welding rib is welded and fixed to the wire slot. The top ends of the first welding rib and the second welding rib are conical structures. A plurality of support plates are erected on the bottom plate, a support rib is arranged on an inner side of the cover, and the circuit board is clamped between the support plates and the support rib. An outer side surface of the support plate abuts against an inner side of the side wall of the cover, so that the waterproof step between the end surface of the side wall and the bottom plate is aligned with the first welding rib. A plurality of positioning ribs are arranged on the inner side of the side wall of the cover, guide inclined surfaces are arranged on the end surfaces of the positioning ribs, and the positioning ribs abut against a side surface of the circuit board, so that the light source on the circuit board is located in the center of the lens. A support rib is arranged on the inner side of the cover, and a support platform is arranged in the center of the inner side of the bottom plate. An outer side of the bottom plate is provided with an inwardly recessed blind hole corresponding to the support platform. The circuit board is clamped between the support plate and the support rib. The decorative light string further comprises a ground inserting portion, and the ground inserting portion comprises an inserting rod.

An upper portion of the inserting rod is provided with a connecting portion in interference fit with the blind hole in the bottom plate, and the connecting portion is inserted into the blind hole. A limiting rib is arranged below the connecting portion, and the limiting rib abuts against the outside of the blind hole. The connecting portion is provided with a plurality of grooves extending along its axial direction and a mating rib protruding out from a surface of the connecting portion. The mating rib is in interference fit with the blind hole. A middle portion of the inserting rod is provided with asymmetric anti-slip teeth, a lower portion of the inserting rod is provided with a hook, and a tail portion of the inserting rod is configured to be a tip.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) FIG. **1** is a schematic diagram illustrating the assembly of the lamp body;
(2) FIG. **2** is another schematic diagram illustrating the assembly of the lamp body;
(3) FIG. **3** is a schematic diagram illustrating the structure of the ground inserting portion;
(4) FIG. **4** is a schematic diagram illustrating the structure after the lamp body and the ground inserting portion is assembled;
(5) FIG. **5** is a schematic diagram illustrating a sectional view along line A-A in FIG. **4**;
(6) FIG. **6** is a schematic diagram illustrating a sectional view along line B-B in FIG. **4**; and
(7) FIG. **7** is a schematic diagram illustrating a sectional view along line C-C in FIG. **4**.

DETAILED DESCRIPTION

(8) To allow the features, technical means, purposes and functions of the present invention to be better understood, the following provides a detailed description of the present invention in conjunction with the drawings and specific embodiments. The description of the positional relationship between components themselves and components described in the present invention (including but not limited to upper, lower, inner, outer, left, right, top, and bottom, etc.) is only based on the relative relationship of the relevant components in the positions shown in the drawings and does not indicate an absolute limitation on the scope of the present invention. Those skilled in the art should understand that, when the view orientation of a component changes, the description of the above positional relationship may change, but the essential relationship of its mechanical structure does not change.

(9) Referring to FIGS. **1-2**, the decorative light string comprises a plurality of lamp bodies, an electric wire **4** connected to the plurality of lamp bodies, and a ground inserting portion **5** for supporting the lamp bodies. The lamp body comprises a cover **1**, a bottom plate **2** for sealing an opening of the cover **1**, a circuit board **3** mounted in the cover **1**, and an LED light source **31** mounted on the circuit board **3**. The electric wire **4** is electrically connected to the circuit board **3** and extends out from two ends of the cover **1**.

(10) Referring again to FIGS. **1-2**, the cover **1** comprises a top wall **11** and a side wall **12** surrounding the top wall **11**. The center of the top wall **11** is provided with a lens **13** integrally formed with the cover **1**, and an inner side of the top wall **11** is provided with support ribs **14** surrounding the lens **13**. The lens **13** and the top wall **11** are integrally formed, thereby achieving high waterproof performance and high mounting convenience. Two sides of the side wall **12** are provided with wire slots **15** protruding out from the side wall **12**, and a bottom wall and a side wall of the wire slot **15** are joined to form a rounded corner **152**. A plurality of first waterproof ribs **151** extending from the bottom wall to the side wall of the wire slot **15** are sequentially arranged in the wire slot **15** from the inside out, and a waterproof step **17** is arranged on an end surface of the side wall **12** of the cover. A plurality of positioning ribs **18** are arranged on an inner side of the side wall **12**, and a guide slope **181** is arranged at a top end of the positioning rib **18**. The guide slope is used for guiding the circuit board **3** into an area defined by the positioning ribs **18**, so that the LED light

source **31** on the circuit board **3** is located in the center of the lens **13**.

(11) Referring again to FIGS. **1-2**, an annular first welding rib **21** for interacting with the waterproof step **17** of the cover **1** is arranged on an inner side of the bottom plate **2**. A top end of the first welding rib **21** is configured to be a conical structure **211**, namely, the width of the top end being smaller than the width of the bottom end. The aforesaid arrangement not only ensures that the top end of the first welding rib **21** is fully welded with the waterproof step **17** of the cover during the process, but also ensures that the bottom end of the first melting rib **21** is clamped with the waterproof step **17** to achieve sufficient strength. Four support plates **22** are erected in an area surrounded by the first welding rib **21** on the inner side of the bottom plate **2**, and an outer side surface **221** of the support plate **22** interacts with the inner side of the side wall **12** of the cover, so that the first welding rib **21** is aligned with the waterproof step **17** on the cover **1**. An end portion of the support plate **22** is provided with a guide inclined surface **222**, and the guide inclined surface **222** allows the bottom plate **2** and the cover **1** to be conveniently assembled. The center of the inner side of the bottom plate **2** is provided with a support platform **23**, an outer side of the bottom plate **2** where the support platform **23** is located is provided with an inwardly recessed blind hole **24**, and the blind hole **24** facilitates the connection to the ground inserting portion **5**. A magnetic block **25** is attached to the outer side of the bottom plate **2** around the periphery of the blind hole **24**, and the magnetic block **25** allows the lamp body to be attracted to a magnetic metal such as iron. A hanging lug **26** is arranged outside an area surrounded by the first welding rib **21** on the bottom plate **2**, and a protruding platform **27** for interacting with the wire slot **15** of the cover is arranged on the hanging lug **26**. Two edges of the protruding platform **27** are configured to be arc protection edges **271**, and a plurality of second waterproof ribs **272** aligned with the first waterproof ribs **151** are arranged on the surface of the protruding platform **27**. Second welding ribs **261** are arranged on both sides of the protruding platform **27** on the hanging lug **26**, and a top end of the second welding rib **261** is configured to be a conical structure. The hanging lug **26** is further provided with a mounting hole **28**, and the lamp body may be mounted on a fixing member by screws through the mounting hole **28**. Because the bottom plate **2** is provided with the blind hole **24**, the magnetic block **25** and the mounting hole **28**, there are various mounting ways such that a wider application range is achieved.

(12) Referring again to FIGS. **1-2**, a circuit is arranged on the circuit board **3**, the LED light source **31** is installed in the center of the front surface of the circuit board **3**, and two rows of binding posts **32** are arranged on the rear surface of the circuit board **3**. The electric wire **4** is a flat shielded wire in interference fit with the wire slot **15**, comprising a flat shield and a plurality of wires arranged in the shield. The electric wire **4** is connected to the binding post **32**, and both sides of the shield of the electric wire **5** are configured to be rounded corners.

(13) Referring to FIG. **3**, the ground inserting portion **5** comprises an inserting rod **51** having a cross-shaped cross section. An upper portion of the inserting rod **51** is provided with a connecting portion **52** in interference fit with the blind hole **24** in the bottom plate **2**, and a lower portion of the connecting portion **52** is further provided with a limiting rib **53**. The connecting portion **52** is provided with a plurality of grooves **521** extending along its axial direction and a mating rib **522** protruding out from a surface of the connecting portion **52**. The groove **521** is capable of reducing the weight of the ground inserting portion **5** while improving the elasticity of the connecting portion **52**, and the mating rib **522** is capable of improving the mating precision between the connecting portion **52** and the blind hole while reducing the manufacturing difficulty. When the connecting portion **52** is inserted into the blind hole **24** in the bottom plate of the lamp body, the limiting rib **53** abuts against the outside of the blind hole **24**. A middle portion of the inserting rod **51** is provided with asymmetric anti-slip teeth **54**, a lower portion of the inserting rod **51** is provided with a hook **55**, and a tail portion of the inserting rod **51** is configured to be a tip **56**. The anti-slip teeth **54** and the hook **55** increase the friction, thereby preventing the ground inserting portion **5** from being lifted due to the growth of plants. The asymmetric design of the anti-slip teeth

54 protects the strength of the inserting rod **51** from being excessively weakened.
(14) Referring to FIGS. **2-5**, the assembly process of the lamp body is as follows: first, the LED light source **31** and the electric wire **4** are mounted on the circuit board **3**, the inner side of the cover **1** faces upwards, the LED light source **31** on the circuit board **3** is placed downwards into the cover **1**, the circuit board **2** is guided onto the support ribs **14** of the cover **1** through the guide inclined surfaces **181** on the positioning ribs **18** of the cover **1**, and the plurality of positioning ribs **14** abut against the periphery of the circuit board **3**, so that the LED light source **31** is fixed at the center of the lens **13**; subsequently, the electric wire **4** is clamped into the wire slot **15**, the bottom plate **2** is assembled to the cover **1**, and the outer side surface of the support plate **22** of the bottom plate **2** abuts against the inner side of the side wall **12** of the cover **1**, so that the conical structure at the top end of the first welding rib **21** abuts against the bottom surface of the waterproof step **17** and the electric wire **4**; the bottom end of the first welding rib **21** abuts against the side surface of the waterproof step **17**, and the protruding platform **27** is clamped into the wire slot **15** to press the electric wire **4**; finally, the first welding rib **21** and the waterproof step **17** are welded and fixed by using ultrasonic welding or other hot melting techniques, and the second welding rib **261** and the end surface of the side wall of the wire slot **15** are welded and fixed.
(15) Referring to FIG. **5**, the first welding rib **21** is arranged on the bottom plate **2** to press the electric wire **4**, so that the local pressing force imposed on the electric wire **4** is increased. The first waterproof rib **151** on the innermost side of the wire slot **15** is aligned with the first welding rib **21**, and the rest of first waterproof ribs **151** are aligned with the second waterproof ribs **21**, thereby increasing the pressing force imposed on the electric wire **4** on a plurality of sections such that the waterproof effect is significantly improved. Referring to FIG. **7**, the corners of the shield of the electric wire are rounded, the bottom wall and the side wall of the wire slot **15** are joined to form a rounded corner, and the two edges of the protruding platform **27** are arc protection edges, so that the shield of the electric wire **4** is fully attached to the wire slot **15** and the protruding platform **27**. The two sides of the protruding platform **27** are provided with the second welding ribs **261**, which are welded with the end surface of the side wall of the wire slot **15**. In this way, the connection strength between the wire slot **15** and the protruding platform **27** is increased and the waterproof performance as well as durability of the electric wire is improved.
(16) Referring to FIG. **6**, as an improvement of the present invention, the waterproof step **17** is arranged on the bottom plate **2**, and the first welding rib **21** is arranged on an end surface of the side wall **12** of the cover **1**. As a further improvement of the present invention, the circuit board **3** may also be clamped between the support platform **23** of the bottom plate **2** and the support rib **14** of the cover. Thus, the support plate **22** is unnecessary and the structure of the bottom plate becomes simpler. Meanwhile, the heat of the circuit board **3** is dissipated through the blind hole outside the support platform **24**, thereby achieving ideal heat dissipation effect. The circuit board **3** is arranged on the support plate **22** or the support platform **23** in the lamp body. In this way, even if a small amount of water enters the lamp body, the circuit board **3** is protected from being immersed in water, achieving better waterproof effect. In addition, the aforesaid structure also provides a larger heat dissipation space for the LED light source **31**.
(17) Referring to FIGS. **3-5**, to achieve high waterproof performance of the lamp body, the cover and the bottom plate are assembled, and the assembly surfaces of the cover and the bottom plate are provided with the first welding rib and the waterproof step that are capable of being welded together. By means of this design, high waterproof performance, simple structure, easy assembly, high production efficiency, low production cost and high durability are achieved. Moreover, to achieve high waterproof performance of the electric wire, the flat shielded wire and the wire slot in interference fit with the flat shielded wire are adopted, and the electric wire is fixed in the wire slot by using the bottom plate. Because the surface of the wire shield is flat, the structure of the wire slot is simple and high sealing performance is realized.
(18) The above are merely preferred embodiments of the present invention. Although the

description is specific and detailed, it cannot be understood as a limitation to the scope of the present invention. For those skilled in the art, modifications and improvements may be made without departing from the concept of the present invention, and all of which shall therefore fall within the scope defined by the claims of the present invention.

Claims

1. A decorative light string, comprising: a plurality of lamp bodies, and an electric wire connected to the plurality of lamp bodies, wherein the lamp body comprises: a cover, a bottom plate for sealing an opening of the cover, a circuit board mounted in the cover, and an LED light source mounted on the circuit board, wherein the electric wire is electrically connected to the circuit board and extends out from two sides of the cover, wherein the cover comprises a top wall and a side wall, wherein the top wall is provided with a lens integrally formed with the cover, wherein two sides of the side wall are provided with wire slots in interference fit with the electric wire, wherein a waterproof stepping portion and a first welded rib that are clamped to each other are arranged on a surface where an end surface of the side wall and the bottom plate are joined, wherein the first welded rib is welded and fixed to the waterproof step stepping portion, wherein the electric wire is a flat shielded wire, wherein the electric wire extends out from the wire slot, and wherein the bottom plate tightly presses the electric wire in the wire slot.
2. The decorative light string of claim 1, wherein the waterproof stepping portion is arranged on an end surface of the side wall of the cover, wherein the first welded rib is arranged on the bottom plate, and wherein the first welded rib is pressed on the electric wire.
3. The decorative light string of claim 2, wherein the bottom plate is provided with a protruding platform corresponding to the wire slot, and wherein the protruding platform is clamped into the wire slot and pressed on the electric wire.
4. The decorative light string of claim 3, wherein corners on both sides of the electric wire are configured to be rounded, wherein a bottom wall and a side wall of the wire slot are joined to form a rounded corner corresponding to the electric wire, and wherein two sides of the protruding platform are provided with arc protection edges corresponding to the electric wire.
5. The decorative light string of claim 4, wherein a plurality of first waterproof ribs extending from the bottom wall to the side wall of the wire slot are sequentially arranged in the wire slot from inside to outside, wherein the first waterproof rib on the innermost side is aligned with the first welded, wherein second waterproof ribs aligned with the rest of first waterproof ribs are arranged on the protruding platform, and wherein the first waterproof ribs and the second waterproof ribs are pressed on the electric wire.
6. The decorative light string of claim 5, wherein two sides of the protruding platform are provided with a second welded rib, and wherein the second welded rib is welded and fixed to the wire slot.
7. The decorative light string of claim 6, wherein the top ends of the first welded rib and the second welded rib are conical structures.
8. The decorative light string of claim 2, wherein the decorative light string further comprises a ground inserting portion, wherein the ground inserting portion comprises an inserting rod, wherein an upper portion of the inserting rod is provided with a connecting portion in interference fit with the blind hole in the bottom plate, and wherein the connecting portion is inserted into the blind hole.
9. The decorative light string of claim 8, wherein a limiting rib is arranged below the connecting portion, wherein the limiting rib abuts against the outside of the blind hole, wherein the connecting portion is provided with a plurality of grooves extending along its axial direction and a mating rib protruding out from a surface of the connecting portion, and wherein the mating rib is in interference fit with the blind hole.
10. The decorative light string of claim 9, wherein a middle portion of the inserting rod is provided

with asymmetric anti-slip teeth, wherein a lower portion of the inserting rod is provided with a hook, and wherein a tail portion of the inserting rod is configured to be a tip.

11. The decorative light string of claim 1, wherein a plurality of support plates are erected on the bottom plate, wherein a support rib is arranged on an inner side of the cover, wherein the circuit board is clamped between the support plates and the support rib, and wherein an outer side surface of the support plate abuts against an inner side of the side wall of the cover, so that the waterproof stepping portion between the end surface of the side wall and the bottom plate is aligned with the first welded rib.

12. The decorative light string of claim 1, wherein a plurality of positioning ribs are arranged on the inner side of the side wall of the cover, wherein guide inclined surfaces are arranged on the end surfaces of the positioning ribs, and wherein the positioning ribs abut against a side surface of the circuit board, so that the light source on the circuit board is located in the center of the lens.

13. The decorative light string of claim 1, wherein a support rib is arranged on the inner side of the cover, wherein a support platform is arranged in the center of the inner side of the bottom plate, and wherein an outer side of the bottom plate is provided with an inwardly recessed blind hole corresponding to the support platform.

14. The decorative light string of claim 13, wherein the circuit board is clamped between the support plate and the support rib.