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Junction box assembly having a rib for water mitigation

Abstract

A junction box assembly and an upper case is provided. The upper case includes a peripheral wall and an interior wall having an outer wall and an inner wall. The outer wall is dimensioned to define a u-shaped structure. The inner wall is dimensioned to define a closed loop. The inner wall is disposed within and spaced apart from the outer wall. The upper case further includes a rib disposed on an outer surface of an inner back wall. The rib extends longitudinally along the inner back wall and is dimensioned to contact an inner surface of a top cover of the junction box assembly so as to prevent water from entering the upper case.

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Background/Summary

TECHNICAL FIELD

(1) This disclosure relates to a junction box assembly having an outer wall and a rib configured to prevent water from entering the junction box.

BACKGROUND

(2) With reference now to FIG. **1**, a conventional junction box assembly **500** is provided. The junction box assembly **500** includes an upper case **502** and a lower case **504**. The upper case **502** includes an outer wall **506** that bounds an inner wall **508**. The inner wall **508** includes a first wall **508***a* spaced apart from a second wall **508***b* so as to form a double-wall structure. The outer wall **506** forms a continuous loop and the inner wall **508** forms a continuous loop. The inner wall **508** is spaced apart from the outer wall **506** to form a groove **510**. The groove **510** is a continuous loop and is configured to prevent water from entering the interior space of the upper case **502**.

(3) With reference now to FIG. **2**, the upper case **502** is covered by a top cover **512** which is configured to prevent water from entering the upper case **502**. The top cover **512** includes a top wall **514** and an outer lip **516**. The top wall **514** is a generally planar member having a surface area configured to cover the top of the upper case **502**. The outer lip **516** bounds the top wall **514** so as to surround a top portion of the periphery of the upper case **502** when the top cover **512** is mounted onto the upper case **502**. The top cover **512** includes a pair of interior panels **516***a*, **516***b*. Interior panel **516***b* has a generally smooth and continuous exterior surface and is fitted between a first wall

508*a* and a second wall **508***b*.
(4) With the increase of electrification, additional electric components may be required; however, the cross-sectional area of the junction box assembly must remain the same to accommodate packaging requirements. In such an event, a portion of the inner wall **514** is removed, which eliminates a corresponding portion of the groove **510**, which degrades the water mitigation. As a result, water may enter the space between the first wall **508***a* and interior panel **516***b* and flow into the space where electric components reside, as indicated by the arrow. In such an event, the electric components stored in the junction box assembly **500** may be damaged.
(5) Accordingly, it remains desirable to have a junction box assembly configured to prevent water from entering the space where electric components reside.

SUMMARY

(6) In one aspect, an upper case is provided. The upper case is configured to accommodate electronic components. The upper case includes a peripheral wall defining a periphery of the upper case. The peripheral wall bounds a space for accommodating the electronic components. The peripheral wall includes a back wall, a pair of side walls, and a front wall. The upper case further includes an interior wall disposed within the peripheral wall. The interior wall is spaced apart from an interior surface of the peripheral wall. The interior wall includes an outer wall and an inner wall. The outer wall includes a pair of outer side walls, an outer front wall, and an open back portion so as to define a u-shaped structure. The inner wall includes an inner front wall, a pair of inner side walls, and an inner back wall so as to define a closed loop. The inner wall is disposed within and spaced apart from the outer wall to define a groove having a u-shape. The upper case further includes a rib disposed on an outer surface of the inner back wall. The outer surface is opposite of an inner surface of the peripheral wall. The rib extends longitudinally along the inner back wall.
(7) In one aspect, the inner back wall extends beyond a distal end of the pair of outer side walls. In such as aspect, the inner wall may include a pair of inner legs, a pair of projections, and a back wall portion and the rib is disposed on the back wall portion. Optionally, one of the pair of inner legs is disposed on a distal end of one of the pair of inner side walls and the other of the pair of legs is disposed on a distal end of the other one of the pair of inner side walls, the pair of legs extending towards each other. In such an aspect, one of the pair of projections is disposed on a distal end of one of the pair of legs and the other of the pair of projections is disposed on a distal end of the other one of the pair of legs. The back wall portion may interconnect the pair of projections to each other.
(8) In another aspect, the upper case may further include a drain hole disposed underneath the rib.
(9) In another aspect, the rib is disposed on a top portion of the inner back wall. Alternatively or in addition, the rib may be spaced apart from a top surface of the inner back wall. The rib may be continuous from a first end of the inner back wall to a second end of the inner back wall.
(10) In yet another aspect of the disclosure, a junction box assembly is provided. The junction box assembly is configured to accommodate electronic components. The junction box assembly includes a top cover having a top wall and a lip which bounds a periphery of the top wall. The junction box assembly further includes an upper case. The upper case includes a peripheral wall and an interior wall. The peripheral wall defines a periphery of the upper case. The peripheral wall bounds a space for accommodating the electronic components. The outer wall includes a back wall, a pair of side walls, and a front wall.
(11) The interior wall is disposed within the peripheral wall and spaced apart from an interior surface of the peripheral wall. The interior wall includes an outer wall and an inner wall. The outer wall includes a pair of outer side walls, an outer front wall and an open back portion so as to define a u-shaped structure. The inner wall includes an inner front wall, a pair of inner side walls, and an inner back wall so as to define a closed loop. The inner wall is disposed within and spaced apart from the outer wall to define a groove having a u-shape. The upper case further includes a rib disposed on an outer surface of the inner back wall. The outer surface is opposite an inner surface of the peripheral wall. The rib extends longitudinally along the inner back wall and contacts the lip

of the top cover so as to prevent water from entering the upper case.
(12) In one aspect, the inner back wall extends beyond a distal end of the pair of outer side walls. In such an aspect, the inner wall includes a pair of inner legs, a pair of projections, and a back wall portion. The rib is disposed on the back wall portion. One of the pair of inner legs may be disposed on a distal end of one of the pair of inner side walls and the other of the pair of legs may be disposed on a distal end of the other one of the pair of inner side walls. The pair of legs may extend towards each other. In such an aspect, one of the pair of projections is disposed on a distal end of one of the pair of legs and other of the pair of projections is disposed on a distal end of the other one of the pair of legs. The back wall portion may interconnect the pair of projections to each other so as to form the closed loop.
(13) In another aspect, the upper case may further include a drain hole disposed underneath the rib.
(14) In yet another aspect, wherein the rib is disposed on a top portion of the inner back wall. Alternatively or in addition, the rib may be spaced apart from a top surface of the inner back wall. The rib may be continuous from a first end of the inner back wall to a second end of the inner back wall.
(15) Accordingly, an upper case and a junction box is provided which includes a rib configured to prevent water from entering the upper case so as to protect the electric components housed in the upper case.

Description

DESCRIPTION OF DRAWINGS
(1) FIG. **1** is a top down view of a conventional junction box assembly.
(2) FIG. **2** is a partial cross-sectional view of the junction box assembly shown in FIG. **1** with a top cover.
(3) FIG. **3** is a top down view of a junction box assembly according to the principles of the present disclosure.
(4) FIG. **4** is a view of FIG. **3** showing the top cover removed.
(5) FIG. **5** is an exploded view of FIG. **3**;
(6) FIG. **6** is a cross-sectional view of FIG. **3** taken along line **6**-**6**.
(7) FIG. **7** is a view of FIG. **6** showing the path of water.
DETAILED DESCRIPTION
(8) A junction box assembly and an upper case is provided. The upper case is dimensioned to accommodate electronic components. The upper case includes a peripheral wall and an interior wall. The peripheral wall defines a periphery of the upper case and the interior wall is disposed within and spaced apart from an interior surface of the peripheral wall. The interior wall includes an outer wall and an inner wall. The outer wall is dimensioned to define a u-shaped structure. The inner wall is dimensioned to define a closed loop. The inner wall is disposed within and spaced apart from the outer wall to define a groove having a u-shape. The upper case further includes a rib disposed on an outer surface of an inner back wall. The rib extends longitudinally along the inner back wall and is dimensioned to contact an inner surface of a top cover of the junction box assembly so as to prevent water from entering the upper case.
(9) Directional terms as used herein—for example “up”, “down”, “right”, “left”, “front”, “back”, “top”, “bottom”—are made only with reference to the figures as drawn and are not intended to imply absolute orientation. As such, terms such as “upper”, “lower”, “height” and “width” are taken in context of the directional terms and the drawings.
(10) With reference now to FIGS. **3**-**7** an illustrative depiction of a junction box assembly **100** according to one or more embodiments disclosed herein is provided. The junction box assembly **100** includes a junction box **10** having an upper case **12** and a lower case **14**. The junction box

assembly **100** may further include a top cover **16** configured to cover the upper case **12**. The upper case **12**, the lower case **14**, and the top cover **16** may be formed of any material suitable for injection molding, illustratively including polypropylene, Acrylonitrile butadiene styrene, polyoxymethylene, polycarbonate, and the like.

(11) The Upper Case

(12) The upper case **12** is shown as being generally rectangular; however, it should be appreciated that the dimensions of the upper case **12** may deviate from what is shown without limiting the scope of the appended claims. The upper case **12** includes a peripheral wall **18** bounding an interior space **20** for accommodating electronic components **22***a*. Some of the electronic components **22***a* are mounted on a circuit board **22***b* which is generally seated into the upper case **12** from the bottom of the upper case **12**. Additional electronic components (not shown), such as terminal pins, fuses, and relays may be mounted onto the electronic components mounted on the circuit board from the top of the upper case **12**.

(13) The peripheral wall **18** is a generally planar member forming a continuous loop. The peripheral wall **18** includes a front wall **18***a*, a pair of side walls **18***b*, **18***c*, and a back wall **18***d* which are generally the same height. The back wall **18***d* defines a back of the junction box **10**, the side walls **18***b*, **18***c* form a respective left and right side of the junction box **10**, and the front wall **18***a* forms the front of the junction box **10**, as indicated by the directional arrows shown in FIG. **3**. An exterior surface of the peripheral wall **18** may include attachment features for coupling with the top cover **16** and the lower case **14**. Such attachment features are well known, and any attachment feature currently known or later developed may be modified for incorporation herein.

(14) The upper case **12** further includes an interior wall **24** disposed within the peripheral wall **18**. The interior wall **24** is spaced apart from an interior surface of the peripheral wall **18**. The interior wall **24** includes an outer wall **26** and an inner wall **28**. The outer wall **26** and the inner wall **28** are generally planar members which extend upright from a bottom wall **30** of the upper case **12**. The outer wall **26** includes an outer front wall **26***a*, a pair of outer side walls **26***b*, **26***c*, and an open back portion **26***d* so as to define a u-shaped structure. The inner wall **28** includes an inner back wall **28***d*, a pair of inner side walls **28***b*, **28***c*, and an inner front wall **28***d* so as to define a closed loop bounding a storage space **20***a* of the upper case **12**. The electronic components are disposed in the storage space **20***a*.

(15) The inner wall **28** is disposed within and spaced apart from the outer wall **26** to define a groove **32** having a u-shape. The groove **32** has a generally constant width and height and is open at the distal ends of the groove **32**. The groove **32** is configured to collect water so as to prevent water from entering the storage space **20***a* of the upper case **12** and damaging the electronic components disposed therein. A pair of first drain holes **34** may be disposed within the groove **32** so as to allow water to drain to the environment.

(16) With reference now to FIG. **4**, the inner back wall **28***d* of the inner wall **28** extends beyond a distal end of the pair of outer side walls **26***b*, **26***c* of the outer wall **26**. In one embodiment, the inner wall **28** includes a pair of inner legs **36**, a pair of projections **38**, and a back wall portion **40** connected together to form a u-shape. The inner legs **36**, the projections **38** and the back wall portion **40** are elongated planar sheet-like structures. In particular, each inner leg **36** is disposed on a distal end of a corresponding inner side walls **28***b*, **28***c* of the inner wall **28** and is generally orthogonal to the corresponding inner side walls **28***b*, **28***c*. The pair of inner legs **36** extend towards each other.

(17) The projections **38** are disposed on a distal end of a corresponding inner leg **36**. The projections **38** are orthogonal to the corresponding inner leg **36** and have a thickness that is generally the same as a thickness of the inner leg **36**. The back wall portion **40** interconnects the pair of projections **38** to each other so as to form a closed loop with the inner side walls **28***b*, **28***c* and the inner front wall **28***a* of the inner wall **28**.

(18) The upper case **12** further includes a rib **42** disposed on an outer surface of the inner back wall

28*d*. The outer surface of the inner back wall **28***d* is opposite of an inner surface of the peripheral wall **18**. The rib **42** extends longitudinally along the inner back wall **28***d*. The rib **42** may be disposed on a top portion of the inner back wall **28***d*. In one aspect, the rib **42** is spaced apart from a top surface of the inner back wall **28***d*. Preferably, the rib **42** is continuous from a first end (**1**E) of the inner back wall **28***d* to a second end (**2**E) of the inner back wall **28***d*. The rib **42** includes a thickness which may be uniform along the length of the rib **42**.

(19) The upper case **12** further includes a bottom wall **30**. The bottom wall **30** is formed on a bottom of the upper case **12** and extends between the peripheral wall **18** and the inner wall **28**. The bottom wall **30** is a planar sheet-like structure which forms a continuous loop bounding the inner wall **28**. The bottom wall **30** includes a second drain hole **44** disposed on a back side of the upper case **12** underneath the rib **42**. The second drain hole **44** extends through the bottom wall **30**. The second drain hole **44** may have a width (W**2**) greater than a width of the rib **42** (W**1**), as shown in FIG. **6**. The second drain hole **44** may be a continuous elongated hole having a length greater than a length of the rib **42**, as shown in FIG. **3**.

(20) The Lower Case

(21) With reference again to FIGS. **4**-**7**, an illustrative depiction of the lower case **14** is provided. The lower case **14** is configured to be seated underneath the upper case **12**. The lower case **14** includes a lower outer wall **46**, which bounds the periphery of the lower case **14**.

(22) The lower case **14** further includes a terminal support portion **48**. The terminal support portion **48** is illustratively shown as being a cuboidal member disposed on a front portion **14***a* of the lower case **14** and projects beyond the front wall **18***a* of the peripheral wall **18** of the upper case **12**. The terminal support portion **48** is a platform for supporting one end of a terminal (not shown) which is electrically coupled to an electric device on the other end. The terminal themselves are electrically conductive members which are connected to predetermined electrical components disposed within both the storage space **20***a* of the upper case **12** and the lower case **14**. The terminals are configured to engage a stud so as to secure the terminal to a predetermined position within the terminal support portion **48**.

(23) The Top Cover

(24) The top cover **16** includes a top wall **50** and a lip **52**, which bounds the periphery of the top wall **50**. The top wall **50** is a generally planar member having a surface area which is greater than the surface area of the upper case **12** so as to cover the interior space **20** and the storage space **20***a* of the upper case **12**. The lip **52** projects downwardly from the periphery of the top cover **16** and may include a shoulder portion **54** so as to define an upper lip portion **52***a* and a lower lip portion **52***b*, wherein the lower lip portion **52***b* is laterally offset from the upper lip portion **52***a*.

(25) The interior surface of the top cover **16** may include a plurality of interior panels **56** which project downwardly from the interior surface of the top cover **16**. In one aspect, the top cover **16** includes a first interior panel **56***a* and a second interior panel **56***b* spaced apart from the first interior panel **56***a*. The first interior panel **56***a* and the second interior panel **56***b* extend continuously along the interior surface of the top cover **16** to form a loop. The first interior panel **56***a* is disposed within an outer gap **58***a* disposed between the peripheral wall **18** and the outer wall **26** of the interior wall **24**, and the second interior panel **56***b* is disposed behind the back wall portion **40** of the inner wall **28**. Accordingly, the back wall portion **40** is disposed between the first interior panel **56***a* and the second interior panel **56***b*, as shown in FIG. **6**.

(26) With reference now to FIG. **7**, an operation of the junction box assembly **100** is provided. The upper case **12** is attached to the lower case **14** by a stud extending through the upper and lower case **14**. The top cover **16** is seated onto the upper case **12** and may be secured to the upper case **12** by attachment features, such as snap-fit tabs. When properly seated, the lip **52** of the top cover **16** surrounds an upper portion of the peripheral wall **18** and the top surface of the peripheral wall **18** is pressed against the interior surface of the shoulder portion **54**.

(27) The first interior panel **56***a* is disposed within the outer gap and an interior surface of the upper

lip portion **52***a* is seated against the rib **42**. FIG. **7** shows the path of water, as illustrated by directional arrows, entering the junction box assembly **100**. As shown, the water path is indicative of water splashing up into the junction box assembly **100** between the lower lip **52** of the top cover **16** and the peripheral wall **18**. Water splashing upwardly from the bottom wall **30** is blocked by the rib **42** and directed down into the second drain hole **44**. Water escapes the upper case **12** through the second drain hole **44** through a gap in the lower case **14** and into the environment. Accordingly, an upper case **12** and a junction box **10** is provided which includes a rib **42** configured to prevent water from entering the interior space **20** of the upper case **12** and allow for water to drain through the upper case **12** into the environment.

(28) While particular embodiments have been illustrated and described herein, it should be understood that various other changes and modifications may be made without departing from the spirit and scope of the claimed subject matter. Moreover, although various aspects of the claimed subject matter have been described herein, such aspects need not be utilized in combination. It is therefore intended that the appended claims cover all such changes and modifications that are within the scope of the claimed subject matter.

Claims

1. An upper case for accommodating electronic components, the upper case comprising: a peripheral wall defining a periphery of the upper case, the peripheral wall bounding a space for accommodating the electronic components, the peripheral wall including a back wall, a pair of side walls and a front wall; an interior wall disposed within the peripheral wall and spaced apart from an interior surface of the peripheral wall, the interior wall including an outer wall and an inner wall, the outer wall having a pair of outer side walls, an outer front wall and an open back portion so as to define a u-shaped structure, the inner wall including an inner front wall, a pair of inner side walls and an inner back wall so as to define a closed loop, the inner wall disposed within and spaced apart from the outer wall to define a groove, the groove have a u-shape; and a rib disposed on an outer surface of the inner back wall, the outer surface opposite an inner surface of the peripheral wall, the rib extending longitudinally along the inner back wall.

2. The upper case as set forth in claim 1, wherein the inner back wall extends beyond a distal end of the pair of outer side walls.

3. The upper case as set forth in claim 1, wherein the inner wall includes a pair of inner legs, a pair of projections and a back wall portion, the rib disposed on the back wall portion.

4. The upper case as set forth in claim 3, wherein one of the pair of inner legs is disposed on a distal end of one of the pair of inner side walls and the other of the pair of inner legs is disposed on a distal end of the other one of the pair of inner side walls, the pair of inner legs extending towards each other.

5. The upper case as set forth in claim 4, wherein the one of the pair of projections is disposed on a distal end of one of the pair of inner legs and other of the pair of projections is disposed on a distal end of the other one of the pair of inner legs.

6. The upper case as set forth in claim 5, wherein the back wall portion interconnects the pair of projections to each other.

7. The upper case as set forth in claim 1, further including a drain hole disposed underneath the rib.

8. The upper case as set forth in claim 1, wherein the rib is disposed on a top portion of the inner back wall.

9. The upper case as set forth in claim 1, wherein the rib is spaced apart from a top surface of the inner back wall.

10. The upper case as set forth in claim 1, wherein the rib is continuous from a first end of the inner back wall to a second end of the inner back wall.

11. A junction box assembly for accommodating electronic components, the junction box assembly

comprising: a top cover having a top wall and a lip bounding a periphery of the top wall; and an upper case including a peripheral wall and an interior wall, the peripheral wall defining a periphery of the upper case, the peripheral wall bounding a space for accommodating the electronic components, the peripheral wall including a back wall, a pair of side walls and a front wall, the interior wall disposed within the peripheral wall and spaced apart from an interior surface of the peripheral wall, the interior wall including an outer wall and an inner wall, the outer wall having a pair of outer side walls, an outer front wall and an open back portion so as to define a u-shaped structure, the inner wall including an inner front wall, a pair of inner side walls and an inner back wall so as to define a closed loop, the inner wall disposed within and spaced apart from the outer wall to define a groove, the groove have a u-shape, the upper case further including a rib disposed on an outer surface of the inner back wall, the outer surface opposite an inner surface of the peripheral wall, the rib extending longitudinally along the inner back wall and contacting the lip of the top cover so as to prevent water from entering the upper case.

12. The junction box assembly as set forth in claim 11, wherein the inner back wall extends beyond a distal end of the pair of outer side walls.

13. The junction box assembly as set forth in claim 11, wherein the inner wall includes a pair of inner legs, a pair of projections and a back wall portion, the rib disposed on the back wall portion.

14. The junction box assembly as set forth in claim 13, wherein one of the pair of inner legs is disposed on a distal end of one of the pair of inner side walls and the other of the pair of inner legs is disposed on a distal end of the other one of the pair of inner side walls, the pair of inner legs extending towards each other.

15. The junction box assembly as set forth in claim 14, wherein the one of the pair of projections is disposed on a distal end of one of the pair of inner legs and other of the pair of projections is disposed on a distal end of the other one of the pair of inner legs.

16. The junction box assembly as set forth in claim 15, wherein the back wall portion interconnects the pair of projections to each other.

17. The junction box assembly as set forth in claim 11, further including a drain hole disposed underneath the rib.

18. The junction box assembly as set forth in claim 11, wherein the rib is disposed on a top portion of the inner back wall.

19. The junction box assembly as set forth in claim 11, wherein the rib is spaced apart from a top surface of the inner back wall.

20. The junction box assembly as set forth in claim 11, wherein the rib is continuous from a first end of the inner back wall to a second end of the inner back wall.