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CONNECTOR

Abstract

A connector includes: a housing into which a mating connector is fitted; and a water stop member mounted in the housing and configured to stop water between the mating connector and the housing, in which the housing has a tubular assembly space and includes a locking protrusion protruding from an outer peripheral wall portion of the assembly space, the water stop member includes a retaining portion that is arranged in the assembly space and protrudes toward an outer peripheral side from an annular main body portion, and the retaining portion is engaged with the locking protrusion to suppress the water stop member from coming out of the assembly space, has a surface intersecting the fitting direction and entirely functioning as a pressing surface.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION(S)

[0001] The present application claims priority to and incorporates by reference the entire contents of Japanese Patent Application No. 2024-019099 filed in Japan on Feb. 13, 2024.

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0002] The present invention relates to a connector.

2. Description of the Related Art

[0003] Hitherto, as a connector, for example, a connector in which an annular assembly space is formed around a terminal accommodation portion as described in Japanese Patent Application Laid-open No. 2006-147474 has been known. In the connector, a water stop member is mounted in the assembly space and stops water between the connector and a fitted mating connector.

[0004] There is room for improvement in the connector in that it is not easy to mount the water stop member. For example, the water stop member needs to be locked so as not to be easily removed from the assembly space in a state of being mounted in the assembly space. For this reason, a mounting force for the water stop member becomes large in order to mount the water stop member in a state of being locked to the assembly space, and thus, a large stress is applied to the water stop member. As a result, appropriate assembly may be difficult.

SUMMARY OF THE INVENTION

[0005] Therefore, an object of the present invention is to provide a connector that enables appropriate assembly of a water stop member.

[0006] A connector according to one aspect of the invention includes a housing into which a mating connector is fitted; and a water stop member mounted in the housing and configured to stop water between the mating connector and the housing, wherein the housing has a tubular assembly space in which a facing surface of the housing that faces the mating connector is recessed in a fitting direction, and includes a locking protrusion protruding from an outer peripheral wall portion of the assembly space, the water stop member includes a retaining portion that is arranged in the assembly space and protrudes toward an outer peripheral side from an annular main body portion, and the retaining portion is engaged with the locking protrusion to suppress the water stop member from coming out of the assembly space, has a surface intersecting the fitting direction and entirely functioning as a pressing surface, and has a uniform thickness from the pressing surface in the fitting direction along an outer edge of the water stop member.

[0007] The above and other objects, features, advantages and technical and industrial significance of this invention will be better understood by reading the following detailed description of presently preferred embodiments of the invention, when considered in connection with the accompanying drawings.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. **1** is an exploded perspective view of a connector according to an embodiment;

[0009] FIG. **2** is a view illustrating a housing of the connector according to the embodiment;

[0010] FIG. **3** is a cross-sectional view of the housing taken along line III-III of FIG. **2**;

[0011] FIG. **4** is a perspective view of a water stop member of the connector according to the embodiment;

[0012] FIG. **5** is a plan view of the water stop member of the connector according to the embodiment;

[0013] FIG. **6** is a front view of the water stop member of the connector according to the embodiment;
[0014] FIG. **7** is a perspective view of the connector according to the embodiment;
[0015] FIG. **8** is a cross-sectional view of the connector taken along line VI-VI of FIG. **5**;
[0016] FIG. **9** is an explanatory view of assembly of the connector according to the embodiment;
[0017] FIG. **10** is an explanatory view of the assembly of the connector according to the embodiment;
[0018] FIG. **11** is an explanatory view of the assembly of the connector according to the embodiment; and
[0019] FIG. **12** is an explanatory view of the assembly of the connector according to the embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0020] Hereinafter, an embodiment according to the present invention will be described in detail with reference to the drawings. Note that the present invention is not limited by the embodiment. In addition, constituent elements in the following embodiment include those that can be easily replaced by those skilled in the art or those that are substantially the same.

Embodiment

[0021] The present embodiment relates to a connector. In the following description, a first direction is referred to as a "connection direction X", a second direction is referred to as a "width direction Y", and a third direction is referred to as a "height direction Z", the first direction, the second direction, and the third direction intersecting one another. Here, the connection direction X, the width direction Y, and the height direction Z are orthogonal to each other. The connection direction X corresponds to a connection direction and a fitting direction of the connector and a mating connector. The width direction Y and the height direction Z correspond to directions intersecting with the connection direction X. In addition, each direction used in the following description represents a direction in a state where the parts are assembled unless otherwise specified. The term "orthogonal" as used herein includes being substantially orthogonal.
[0022] As illustrated in FIG. **1**, a connector **1** is a connector used for connection with a mating connector **90**, and includes a housing **2** and a water stop member **3**. The connector **1** is mounted on a vehicle, for example, and is used as a component of a wire harness WH.
[0023] The housing **2** is a part that accommodates and holds a terminal **11**, and includes a terminal accommodation portion **21** extending in the connection direction X. The terminal accommodation portion **21** is a cylindrical body extending in the connection direction X, and a distal end side end portion of the terminal accommodation portion **21** that faces the mating connector **90** is opened. An outer tubular portion **22** is provided around the terminal accommodation portion **21**. The outer tubular portion **22** is formed so as to cover an outer periphery of the terminal accommodation portion **21**, and is provided so as to form multiple layers with the terminal accommodation portion **21** internally and externally.
[0024] As illustrated in FIGS. **2** and **3**, an assembly space **23** is formed between the terminal accommodation portion **21** and the outer tubular portion **22**. FIG. **2** is a front view of the housing **2** when the housing **2** is viewed from a side of a facing surface **2**A that faces the mating connector **90**. The assembly space **23** is a space to which the water stop member **3** is assembled, and is a space into which the mating connector **90** is inserted and fitted. The assembly space **23** is a tubular space in which the facing surface **2**A facing the mating connector **90** is recessed in the fitting direction. That is, the assembly space **23** has an opening portion **23**A formed at an end portion of the assembly space **23** that faces the mating connector **90**, and is formed in a tubular shape between the terminal accommodation portion **21** and the outer tubular portion **22**. The mating connector **90** includes a tubular fitting portion that can be inserted into the assembly space **23**.
[0025] The housing **2** includes a locking protrusion **4**. The locking protrusion **4** is a protrusion protruding from an outer peripheral wall portion of the assembly space **23**. The locking protrusion

4 is engaged with the water stop member **3** to suppress the water stop member **3** arranged in the assembly space **23** from moving from an arrangement position. For example, two locking protrusions **4** are formed with the terminal accommodation portion **21** interposed therebetween. The locking protrusion **4** protrudes from an inner wall surface **221** of the outer tubular portion **22** toward the terminal accommodation portion **21**. In addition, the locking protrusion **4** is formed to be inclined such that the assembly space **23** is tapered toward a back side (a lower side in FIG. **3**) of the assembly space **23**. That is, an inner wall surface **41** of the locking protrusion **4** is a tapered surface tapering the assembly space **23** toward the back side. Therefore, in a case where the water stop member **3** is assembled to the assembly space **23**, the locking protrusion **4** smoothly moves and guides the water stop member **3** to the back side of the assembly space **23**.

[0026] The housing **2** has a protruding portion **5** formed in the assembly space **23**. The protruding portion **5** is a portion protruding from an inner peripheral wall portion of the assembly space **23** toward an outer peripheral side, and comes into contact with a retaining portion **32** of the water stop member **3** assembled to the assembly space **23**. The protruding portion **5** protrudes from an outer wall surface **211** of the terminal accommodation portion **21** toward the outer tubular portion **22**. The protruding portion **5** is formed on a back side of the locking protrusion **4** in the assembly space **23**. The protruding portion **5** has a tapered surface **51** obtained by chamfering a corner portion on an inlet side. Therefore, in a case where the water stop member **3** is assembled to the assembly space **23**, the protruding portion **5** smoothly moves and guides the water stop member **3** to the back side of the assembly space **23**.

[0027] As illustrated in FIG. **4**, the water stop member **3** is a packing member that is mounted on the housing **2** and stops water between the mating connector **90** and the housing **2**. The water stop member **3** is formed of, for example, a deformable elastic member. The water stop member **3** is mounted in the assembly space **23** of the housing **2**. The water stop member **3** includes a main body portion **31** and the retaining portion **32**. The main body portion **31** is a portion that is formed in an annular shape and stops water. An outer peripheral lip portion **311** is formed on an outer peripheral surface of the main body portion **31**, and an inner peripheral lip portion **312** is formed on an inner peripheral surface of the main body portion **31**. For example, a plurality of outer peripheral lip portions **311** and a plurality of inner peripheral lip portions **312** are provided in the connection direction X.

[0028] As illustrated in FIGS. **5** and **6**, the retaining portion **32** is formed in the water stop member **3**. The retaining portion **32** protrudes from the main body portion **31** toward an outer peripheral side. For example, the retaining portion **32** is formed at an end portion of the main body portion **31** in the connection direction X. The retaining portion **32** is engaged with the locking protrusion **4** in a state of being arranged in the assembly space **23**, and suppresses the water stop member **3** from moving from the arrangement position. In addition, the retaining portion **32** functions as a pressing portion that receives an insertion force or a mounting force in a case where the water stop member **3** is inserted into the assembly space **23**. For example, the retaining portion **32** has a pressing surface **323**, and receives the insertion force by the pressing surface **323** to move the water stop member **3** to the back side of the assembly space **23**. The pressing surface **323** is a surface formed in a direction intersecting the fitting direction (the connection direction X) and is a surface facing the opening portion **23**A of the assembly space **23**. The pressing surface **323** is a flat surface, and is a flat or substantially flat surface. That is, the pressing surface **323** has no significant irregularities and is a surface that can entirely apply a pressure.

[0029] The retaining portion **32** is formed such that a thickness T from the pressing surface **323** in the fitting direction is uniform along an outer edge of the water stop member **3**. That is, the retaining portion **32** has substantially no irregularities along the outer edge of the water stop member **3**, and has the same thickness T in the fitting direction. Here, the uniform and same thickness includes the substantially uniform and same thickness. A direction along the outer edge of the water stop member **3** is a direction along the height direction Z in FIGS. **5** and **6**. Since the

thickness T of the retaining portion **32** in the fitting direction is uniform, the entire retaining portion **32** can receive the insertion force in a case where the insertion force is applied to the pressing surface **323**, so that concentration of a stress can be suppressed.

[0030] As illustrated in FIG. **7**, the water stop member **3** is inserted into and assembled to the assembly space **23** of the housing **2**. That is, the water stop member **3** is inserted into the assembly space **23** from the side of the facing surface **2**A that faces the mating connector **90**, is provided so as to cover the outer periphery of the terminal accommodation portion **21**, and is arranged at a back side position in the assembly space **23**.

[0031] As illustrated in FIG. **8**, the inner peripheral lip portion **312** of the water stop member **3** comes into contact with an outer peripheral surface of the terminal accommodation portion **21**. The outer peripheral lip portion **311** comes into contact with the mating connector **90** inserted into the assembly space **23**. Accordingly, the water stop member **3** stops water between the housing **2** and the mating connector **90**.

[0032] The retaining portion **32** of the water stop member **3** is a portion that prevents the water stop member **3** arranged in the assembly space **23** from moving from the arrangement position, and is engaged with the locking protrusion **4**. That is, when the water stop member **3** is inserted into the assembly space **23**, the retaining portion **32** passes through the inside of the locking protrusion **4**, moves to a position on the back side of the locking protrusion **4**, and is engaged with the locking protrusion **4**. For example, two retaining portions **32** are formed with the main body portion **31** interposed therebetween, are provided with the terminal accommodation portion **21** interposed therebetween when the water stop member **3** is mounted, and are arranged at positions corresponding to the locking protrusions **4**.

[0033] The main body portion **31** of the water stop member **3** has a cavity portion **313** on a distal end side of a proximal end portion of the retaining portion **32**. The cavity portion **313** is a space portion formed at the proximal end portion of the retaining portion **32** protruding toward the outer tubular portion **22**, and facilitates deformation of the retaining portion **32** when the water stop member **3** is assembled.

[0034] The retaining portion **32** has a curved surface **321** formed at a corner portion that comes into contact with the locking protrusion **4** in a state where the water stop member **3** is mounted in the assembly space **23**. For example, the curved surface **321** is formed at a distal end portion of the retaining portion **32**, and comes into contact with the tapered inner wall surface **41** of the locking protrusion **4** when the water stop member **3** is mounted.

[0035] In the retaining portion **32**, a tapered portion **322** is formed at a corner portion that comes into contact with the tapered surface **51** in a state where the water stop member **3** is mounted in the assembly space **23**. The tapered portion **322** is formed, for example, at the distal end portion of the retaining portion **32**, and is provided so as to be parallel or substantially parallel to the tapered surface **51** of the protruding portion **5** when the water stop member **3** is mounted.

[0036] Next, assembly of the connector **1** according to the present embodiment will be described.

[0037] As illustrated in FIG. **1**, the assembly of the connector **1** is performed by assembling the water stop member **3** to the housing **2**. In the assembly of the connector **1**, parts or members other than the water stop member **3** may also be assembled to the housing **2**.

[0038] First, the water stop member **3** is arranged so as to face the housing **2**, and the water stop member **3** is inserted into the assembly space **23**. The water stop member **3** is inserted with the retaining portion **32** at the front such that the retaining portion **32** is arranged on the back side of the assembly space **23**.

[0039] As illustrated in FIG. **9**, mounting of the water stop member **3** in the assembly space **23** is performed using, for example, a jig **8**. The jig **8** is a tubular body or a rod-like body that can be inserted into the assembly space **23**, and has a thin tip portion **81** at a tip of the jig **8**. The tip portion **81** has an inner diameter capable of covering an outer periphery of the main body portion **31** of the water stop member **3** and is formed to have the same length as the main body portion **31** in the

connection direction X, and a distal end side end portion of the tip portion **81** comes into contact with the pressing surface **323** of the retaining portion **32**.

[0040] The pressing surface **323** of the retaining portion **32** of the water stop member **3** is pressed by the jig **8**, so that the water stop member **3** is inserted to reach the back side of the assembly space **23**. The water stop member **3** moves in the connection direction X in a state where the inner peripheral lip portion **312** is in contact with the outer peripheral surface of the terminal accommodation portion **21** and the retaining portion **32** is in contact with an inner peripheral surface of the outer tubular portion **22**. At this time, since the pressing surface **323** is a flat surface, the insertion force from the jig **8** can be received by the entire retaining portion **32**, so that partial concentration of the stress on the retaining portion **32** is suppressed. In addition, the thickness T of the retaining portion **32** in the fitting direction is uniform, and the insertion force applied to the pressing surface **323** can thus be uniformly received by the entire retaining portion **32**. Therefore, concentration of the stress can be suppressed. Accordingly, it is possible to prevent the water stop member **3** from being greatly deformed or damaged due to concentration of the stress on the retaining portion **32**, and it is thus possible to appropriately assemble the water stop member **3**. Once the retaining portion **32** moves to the position corresponding to the locking protrusion **4**, the retaining portion **32** comes into contact with the inner wall surface **41** of the locking protrusion **4**. When the retaining portion **32** comes into contact with the locking protrusion **4**, an insertion resistance against the water stop member **3** increases.

[0041] As illustrated in FIG. **10**, when the water stop member **3** is further pushed by the jig **8**, the retaining portion **32** is deformed inward along the inner wall surface **41** of the locking protrusion **4** and moves to the back side of the assembly space **23**. At this time, the inner wall surface **41** is inclined so as to extend inward toward the back side, and the retaining portion **32** has the curved surface **321** at an end portion protruding toward the outer peripheral side. Therefore, the curved surface **321** comes into contact with the inner wall surface **41**, the curved surface **321** slides with respect to the inner wall surface **41**, and the retaining portion **32** moves along the inner wall surface **41**. Therefore, in the connector **1** according to the present embodiment, the water stop member **3** can be easily inserted into the back side of the assembly space **23** at the position where the locking protrusion **4** is formed.

[0042] As illustrated in FIG. **11**, when the water stop member **3** is further pushed by the jig **8**, the retaining portion **32** is deformed so as to be tilted toward the back side. That is, as the retaining portion **32** is pushed by the tip portion **81** of the jig **8**, the retaining portion **32** is deformed so as to fall to the back side of the assembly space **23**. That is, since the cavity portion **313** is formed in the water stop member **3**, the retaining portion **32** has a structure that is easily deformed so as to fall to an end portion side of the water stop member **3**, that is, the back side of the assembly space **23**. Therefore, the retaining portion **32** is deformed so as to fall to the back side of the assembly space **23** and moves to the back side of the locking protrusion **4** through the inside of the locking protrusion **4**.

[0043] The retaining portion **32** that has moved to the back side of the locking protrusion **4** comes into contact with the protruding portion **5**. When the retaining portion **32** comes into contact with the protruding portion **5**, the insertion resistance against the water stop member **3** increases. However, the tapered surface **51** is formed in the protruding portion **5**, and the tapered portion **322** is formed in the retaining portion **32**. Therefore, even when the retaining portion **32** comes into contact with the protruding portion **5**, the retaining portion **32** is guided toward the back side by the tapered surface **51** of the protruding portion **5**. In addition, the tapered portion **322** comes into contact with and slides with respect to the tapered surface **51**, so that the insertion resistance against the water stop member **3** decreases. Therefore, in the connector **1** according to the present embodiment, the water stop member **3** can be easily inserted into the back side of the assembly space **23** at a position where the protruding portion **5** is formed.

[0044] As illustrated in FIG. **12**, when the retaining portion **32** moves to an outer peripheral side of

the protruding portion **5**, the retaining portion **32** is positioned on the back side of the locking protrusion **4**, and the water stop member **3** is arranged at a desired position. The retaining portion **32** is engaged with the locking protrusion **4** to suppress easy movement of the water stop member **3** from the arrangement position. In this way, the assembly of the connector **1** is completed.

[0045] As described above, in the connector **1** according to the present embodiment, the retaining portion **32** of the water stop member **3** has the pressing surface **323** in the direction intersecting the fitting direction and has the uniform thickness T, so that even when the water stop member **3** is inserted into the assembly space **23** of the housing **2** by pressing the pressing surface **323**, concentration of the stress on the retaining portion **32** is suppressed. Therefore, in the connector **1** according to the present embodiment, the water stop member **3** can be appropriately assembled to the housing **2**.

[0046] Further, in the connector **1** according to the present embodiment, since the pressing surface **323** is a flat surface, it is easy to uniformly press the entire pressing surface **323** when the water stop member **3** is assembled to the housing **2** by pressing the pressing surface **323**. Therefore, in the connector **1** according to the present embodiment, the water stop member **3** can be appropriately assembled to the housing **2** by suppressing concentration of the stress on the water stop member **3**.

[0047] The connector according to the present invention is not limited to the above-described embodiment, and various modifications can be made within the scope described in the claims. In addition, the connector **1** according to the present embodiment may be configured by appropriately combining the constituent elements of each embodiment described above and the modifications.

[0048] For example, although a case where the connector **1** according to the embodiment described above is mounted on a vehicle has been described, the connector **1** may be used without being mounted on a vehicle.

[0049] With the connector according to the present embodiment, the water stop member can be appropriately assembled.

[0050] Although the invention has been described with respect to specific embodiments for a complete and clear disclosure, the appended claims are not to be thus limited but are to be construed as embodying all modifications and alternative constructions that may occur to one skilled in the art that fairly fall within the basic teaching herein set forth.

Claims

1. A connector comprising: a housing into which a mating connector is fitted; and a water stop member mounted in the housing and configured to stop water between the mating connector and the housing, wherein the housing has a tubular assembly space in which a facing surface of the housing that faces the mating connector is recessed in a fitting direction, and includes a locking protrusion protruding from an outer peripheral wall portion of the assembly space, the water stop member includes a retaining portion that is arranged in the assembly space and protrudes toward an outer peripheral side from an annular main body portion, and the retaining portion is engaged with the locking protrusion to suppress the water stop member from coming out of the assembly space, has a surface intersecting the fitting direction and entirely functioning as a pressing surface, and has a uniform thickness from the pressing surface in the fitting direction along an outer edge of the water stop member.

2. The connector according to claim 1, wherein the pressing surface is a flat surface.