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GROMMET

Abstract

A hard resin base member of a grommet includes an annular flange. An elastically deformable soft resin grommet body includes an annular body. An annular lip is brought into tight contact with a first annular wall surface of the flange on an outer peripheral edge portion side at an assembly completion position. A first annular portion is coaxially disposed to face an outer peripheral edge portion of the annular body on an outer peripheral edge portion side of the flange with a gap therebetween. A second annular portion connects the outer peripheral edge portion of the annular body to an outer peripheral edge portion of the first annular portion. The first annular portion is hooked to the outer peripheral edge portion of the flange from a second annular wall surface side on a back side of the first annular wall surface over an entire circumference.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION [0001] This application is a continuation application of International Application No. PCT/JP2024/008411 filed on Mar. 6, 2024 which claims the benefit of priority from Japanese Patent Application No. 2023-062329 filed on Apr. 6, 2023 and designating the U.S., the entire contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION
1. Field of the Invention
[0002] The present invention relates to a grommet.
2. Description of the Related Art
[0003] Conventionally, in a wire harness, a wiring member such as an electric wire is inserted into a through hole provided in an insertion object (e.g., a panel of a vehicle body in a vehicle or the like), so that the wiring member is drawn from one space to the other space, the one space and the other space being separated by the insertion object. For this reason, in order to protect the wiring member from a peripheral edge of the through hole and to prevent liquid from entering a gap between the through hole and the wiring member, a grommet that closes the gap is attached to the insertion object. For example, the grommet is made of a hard synthetic resin material, and includes a base member allowing a wiring member to pass thereinto between one space and the other space, and an annular grommet body made of a synthetic resin material having flexibility such as rubber. The grommet is inserted into the through hole to bring the grommet body into tight contact with the peripheral edge of the through hole in the insertion object. In this grommet, the base member and the grommet body are integrally formed by an integral molding technique such as two-color molding. This type of grommet is disclosed in, for example, Japanese Patent Application Laid-open No. JP H08-251 769 A.
[0004] Incidentally, in the conventional grommet, when a mold for integrally molding the base member and the grommet body is removed, it is necessary to suppress deterioration in quality of the flexible grommet body by reducing a load applied to the grommet body from the mold. However, in this grommet, since the wiring member passes into the base member between one space and the other space, the size of the base member is larger than that of the grommet body, and the shape of the base member tends to be complicated. Therefore, depending on the shapes of the base member and the grommet body, it may be impossible to avoid an excessive load from the mold to the grommet body. Therefore, in this case, the base member and the grommet body may be prepared as separate parts, and the base member and the grommet body may be assembled together to reduce the load from the mold when molding the grommet body. However, in this grommet, it is necessary to keep the base member and the grommet body at an assembly completion position.
SUMMARY OF THE INVENTION
[0005] Therefore, an object of the present invention is to provide a grommet capable of keeping a base member and a grommet body at an assembly completion position.
[0006] In order to solve the above mentioned problems and achieve the object, a grommet according to one aspect of the present invention includes a cylindrical base member into which a conductive wiring member is inserted to pass from one space to another space through a through hole of an insertion object, the base member being made of a hard synthetic resin material; and an

annular grommet body coaxially assembled to the base member, and disposed in the one space at an attachment completion position with respect to a peripheral edge portion of the through hole of the insertion object, wherein the base member includes: an annular flange disposed in the one space at the attachment completion position and having an outer peripheral edge portion coaxially disposed to face the annular peripheral edge portion with a gap therebetween; and a cylindrical body protruding coaxially from the flange toward the another space and inserted into the through hole at the attachment completion position, the grommet body is an annular water-blocking member made of an elastically deformable synthetic resin material softer than the base member to be coaxially brought into tight contact with the outer peripheral edge portion of the flange at an assembly completion position with respect to the base member, and coaxially brought into tight contact with the peripheral edge portion at the attachment completion position, the grommet body includes: an annular body coaxially disposed to face a first annular wall surface of the flange on an outer peripheral edge portion side at the assembly completion position with a gap therebetween, and coaxially disposed to face the peripheral edge portion at the attachment completion position with a gap therebetween; an annular lip protruding coaxially from the annular body, and elastically deformed at the assembly completion position to be brought into tight contact with the first annular wall surface of the flange on the outer peripheral edge portion side over an entire circumference; a first annular portion coaxially disposed to face an outer peripheral edge portion of the annular body on an outer peripheral edge portion side of the flange with a gap therebetween; and a second annular portion protruding coaxially from the outer peripheral edge portion of the annular body toward the flange, and connecting the outer peripheral edge portion of the annular body to an outer peripheral edge portion of the first annular portion, and the first annular portion is hooked to the outer peripheral edge portion of the flange from a second annular wall surface side on a back side of the first annular wall surface over an entire circumference at the assembly completion position.

[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 a perspective view illustrating a grommet according to an embodiment;

[0009] FIG. **2** is a perspective view of the grommet according to the embodiment before being attached to an insertion object as viewed from another angle;

[0010] FIG. **3** is a plan view of the grommet according to the embodiment as viewed from a cylindrical body side;

[0011] FIG. **4** is a plan view of the grommet according to the embodiment as viewed from a tubular body side;

[0012] FIG. **5** is a view illustrating a cross section taken along line X-X of FIG. **4** together with an insertion object before being attached;

[0013] FIG. **6** is an exploded perspective view illustrating the grommet according to the embodiment;.

[0014] FIG. **7** is an exploded perspective view of the grommet according to the embodiment as viewed from another angle;

[0015] FIG. **8** is an exploded perspective view separately illustrating two base members after being assembled and a grommet body of the grommet according to the embodiment;

[0016] FIG. **9** is an exploded perspective view of a base member and a waterproof member according to the embodiment; and

[0017] FIG. **10** is a partial cross-sectional view illustrating a part of a mold for forming a grommet body according to the embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0018] Hereinafter, an embodiment of a grommet according to the present invention will be described in detail with reference to the drawings. Note that the present invention is not limited by this embodiment.

Embodiment

[0019] One embodiment of a grommet according to the present invention will be described with reference to FIGS. **1** to **10**.

[0020] Reference numeral **1** in FIGS. **1** to **8** denotes a grommet according to the present embodiment. The grommet **1** protects a conductive wiring member We passing from one space S**1** to the other space S**2** through a through hole **502** of an insertion object **501** from a peripheral edge portion **503** of the through hole **502** in the insertion object **501**, and prevents entry of liquid (water or the like) into a gap between the annular peripheral edge portion **503** and the wiring member We (FIGS. **2** and **5**). Therefore, the grommet **1** is attached to the peripheral edge portion **503** of the through hole **502** of the insertion object **501** after the wiring member We is inserted into the grommet **1**.

[0021] Here, the wiring member We is, for example, an electric wire (an electric wire as a communication wire, an electric wire as a power supply wire, or the like). The insertion object **501** is a member for inserting the wiring member We, and indicates, for example, a wall body such as a panel of a vehicle body in a vehicle. The wiring member We is inserted into the through hole **502** of the insertion object **501**, and is thereby routed between one space S**1** and the other space S**2** separated by the insertion object **501**. For example, the wiring member We serves to communicate between a device in one space S**1** and a device in the other space S**2**, or serves to supply power to an electric device in one space S**1** from a power source in the other space S**2**.

[0022] The peripheral edge portion **503** of the through hole **502** of the insertion object **501** includes a flat plate portion having an annular shape (hereinafter referred to as an “annular flat plate portion”) **504**, and a protruding portion having an annular shape (hereinafter referred to as an “annular protruding portion”) **505** protruding from an end portion of an inner peripheral edge of the annular flat plate portion **504** (an inner peripheral edge portion **504***a*) toward the other space S**2** (FIGS. **2** and **5**). The grommet **1** is attached to the annular flat plate portion **504** and the annular protruding portion **505** in the peripheral edge portion **503**. For example, the insertion object **501** is formed by press molding, and the annular flat plate portion **504** and the through hole **502** are formed at that time. In the insertion object **501**, the annular protruding portion **505** is formed by burring the peripheral edge of the through hole **502**. Here, since the through hole **502** is formed in a circular shape, each of the annular flat plate portion **504** and the annular protruding portion **505** is formed in an annular shape.

[0023] The grommet **1** includes a cylindrical base member **10**X into which the wiring member We is inserted (FIGS. **1** to **9**). The base member **10**X may be formed of one member, or may be formed by assembling a plurality of members. The base member **10**X illustrated here includes two base members (a first base member and a second base member) assembled to each other. The two base members may be members having different shapes, or may be identical members having the same shape. In the grommet **1** illustrated here, identical members (base members **10** and **10**) having the same shape are used for the two base members (FIGS. **1** to **9**).

[0024] The base member **10**X includes at least an annular flange **20** and a cylindrical body **30** coaxially, and the wiring member We is inserted thereinto (FIGS. **1** and **2**). The base member **10**X illustrated here includes a tubular body **40** coaxial with the flange **20** and the cylindrical body **30** in addition to the flange **20** and the cylindrical body **30**, and the wiring member We is inserted thereinto (FIGS. **1** and **2**). Here, on the same axis, the cylindrical body **30** protrudes from the flange **20** toward one side, and the tubular body **40** protrudes from the flange **20** toward the other side.

[0025] In the base member **10**X illustrated here, as will be described later, the annular flange **20**, the cylindrical body **30**, and the tubular body **40** are coaxially formed by the base members **10** and **10** assembled to each other. Therefore, a holding mechanism (hereinafter referred to as a "base holding mechanism") **50** for holding the two base members **10** and **10** in an assembled state therebetween is provided between the two base members (FIGS. **1** to **3** and FIGS. **6** to **8**).
[0026] In addition, the grommet **1** includes an annular grommet body **60** coaxially assembled to the base member **10**X (the base members **10** and **10** assembled to each other) (FIGS. **1** to **8**). The grommet body **60** is disposed in the one space S**1** at an attachment completion position of the grommet **1** with respect to the peripheral edge portion **503** in order to prevent liquid (water or the like) from entering from one space S**1** to the other space S**2** through the through hole **502** (FIGS. **2** and **5**). In the following description, when the "attachment completion position" is simply written, this indicates the attachment completion position of the grommet **1** with respect to the peripheral edge portion **503**.
[0027] The base member **10**X (the base members **10** and **10**) is formed using an insulating hard synthetic resin material (hereinafter referred to as a "hard resin"). Here, for example, the base member **10**X (the base members **10** and **10**) is formed using a hard resin such as plastic.
[0028] The two base members **10** and **10** are assembled by combining their joint surfaces **10***a* (FIGS. **3**, **4**, **6**, and **7**). In a state where the two base members **10** and **10** are assembled together, the wiring member We is sandwiched therebetween, and the wiring member We is inserted therebetween. Here, the annular flange **20**, the cylindrical body **30** having a shape like a circular cylinder, and the tubular body **40** having a shape like a circular tube are formed by assembling the two base members **10** and **10**. Here, the tubular body **40** that is a straight tube is taken as an example. However, the tubular body **40** may be bent after protruding from the flange **20**.
[0029] The flange **20** is disposed in one space S**1** at the attachment completion position, with an outer peripheral edge portion **20***a* thereof being coaxially disposed to face the peripheral edge portion **503** with a gap therebetween (FIG. **5**). Then, the wiring member We is inserted inside an inner peripheral edge portion **20***b* of the flange **20** (FIG. **5**). The flange **20** has an annular wall surface **20***c* on the peripheral edge portion **503** side (hereinafter referred to as a "first annular wall surface") and an annular wall surface **20***d* on the back side thereof (hereinafter referred to as a "second annular wall surface") (FIGS. **5** to **8**). Specifically, the flange **20** is disposed such that the first annular wall surface **20***c* on the outer peripheral edge portion **20***a* side coaxially faces an annular flat surface **503***a* of the peripheral edge portion **503** on one space S**1** side with a gap therebetween. The annular flat surface **503***a* is provided on the annular flat plate portion **504**. The annular flat surface **503***a* illustrated here is an annular flat surface itself on the one space S**1** side of the annular flat plate portion **504**. The flange **20** is formed in an annular plate shape in which the first annular wall surface **20***c* and the second annular wall surface **20***d* are annular flat surfaces. For example, the flange **20** is formed in a shape similar to the annular flat surface **503***a* having an annular shape. The flange **20** illustrated here is disposed such that the first annular wall surface **20***c* on the annular outer peripheral edge portion **20***a* side faces the annular flat surface **503***a* on the inner peripheral edge portion **504***a* side of the annular flat plate portion **504**, with the wiring member We being inserted inside the annular inner peripheral edge portion **20***b*.
[0030] Each of the two base members **10** and **10** has a split flange **11** that forms the flange **20** by combining the joint surfaces **10***a* of the two base members **10** and **10** to each other (FIGS. **1** to **8**). The split flange **11** illustrated here is obtained by dividing the flange **20** in half along the central axis, and is formed in a semicircular arc shape.
[0031] The cylindrical body **30** protrudes coaxially from the flange **20** toward the other space S**2**, and is inserted into the through hole **502** at the attachment completion position (FIGS. **2** and **5**). That is, a distal end of the cylindrical body **30** protruding from the flange **20** is disposed in the other space S**2**. The cylindrical body **30** is formed in a shape like a circular cylinder. For example, a cross section of the cylindrical body **30** orthogonal to the hole axis of the through hole **502** is

formed in a shape similar to a cross section of the annular protruding portion **505** orthogonal to the hole axis. The cylindrical body **30** illustrated here protrudes from the inner peripheral edge portion **20***b* side, rather than the outer peripheral edge portion **20***a* side, of the first annular wall surface **20***c* of the flange **20**, and the wiring member We is inserted thereinto (FIG. **5**).

[0032] Each of the two base members **10** and **10** has a split cylinder **12** that forms the cylindrical body **30** by combining the joint surfaces **10***a* of the two base members **10** and **10** to each other (FIGS. **2** and **4** to **8**). The split cylinder **12** illustrated here is obtained by splitting the cylindrical body **30** in half along the central axis, and is formed in a semicircular arc shape.

[0033] The tubular body **40** protrudes coaxially from the flange **20** in a direction opposite to the cylindrical body **30** (FIG. **5**). The tubular body **40** is formed in a shape like a circular tube. For example, a cross section of the tubular body **40** orthogonal to the hole axis of the through hole **502** is formed in a shape similar to a cross section of the annular protruding portion **505** orthogonal to the hole axis. The tubular body **40** illustrated here protrudes from the inner peripheral edge portion **20***b* of the flange **20**, and the wiring member We is inserted thereinto (FIG. **5**).

[0034] Each of the two base members **10** and **10** has a split tube **13** that forms the tubular body **40** by combining the joint surfaces **10***a* of the two base members **10** and **10** to each other (FIGS. **1** to **3** and **5** to **8**). The split tube **13** illustrated here is obtained by splitting the tubular body **40** in half along the central axis, and is formed in a semicircular arc shape.

[0035] As described above, the main parts (the split flanges **11**, the split cylinders **12**, and the split tubes **13**) of the two base members **10** and **10** have high hardness so as to be hardly elastically deformed. For this reason, the two base members **10** and **10** may form fine gaps between their joint surfaces **10***a*, for example, due to the surface roughness of the joint surfaces **10***a*. Therefore, the grommet **1** according to the present embodiment includes, on at least one of the joint surfaces **10***a* of the two base members **10** and **10**, a waterproof member **71** that is made of a synthetic resin material softer than the hard resin of the base member **10** and is elastically deformable (hereinafter referred to as a "soft resin") to eliminate gaps between the joint surfaces **10***a* (FIGS. **6**, **7**, and **9**).

[0036] The waterproof member **71** is formed using, for example, a synthetic resin material such as an elastomer. The waterproof member **71** is provided, for example, on the joint surface **10***a* over the split flange **11**, the split cylinder **12**, and the split tube **13**. In the base member **10** illustrated here, a groove portion **10***b* is formed in one of the two joint surfaces **10***a* from the split flange **11** to the split tube **13**, and the waterproof member **71** is fitted into the groove portion **10***b* (FIG. **9**). The waterproof member **71** protrudes from the groove portion **10***b*. For example, the waterproof member **71** is formed integrally with the base member **10** by two-color molding with the base member **10** or by insert molding with respect to the base member **10** housed in a mold. In addition, the waterproof member **71** may be formed as a component separate from the base member **10**, and may be attached to the groove portion **10***b* of the base member **10** using an adhesive or the like. In the base member **10**X, by assembling the two base members **10** and **10**, the waterproof member **71** protruding from the groove portion **10***b* of the one joint surface **10***a* of the one base member **10** is brought into tight contact with the other joint surface **10***a* of the other base member **10**.

[0037] A base holding mechanism **50** is a holding mechanism for holding the two base members **10** and **10** in a state where their joint surfaces **10***a* are combined together. The base holding mechanisms **50** are provided at a plurality of positions between the two base members **10** and **10**. For example, the base holding mechanism **50** illustrated here includes a piece portion **51** protruding from the joint surface **10***a* of one of the two base members **10** and **10**, and a claw-shaped first locking portion **52** protruding from a wall surface of the piece portion **51** (FIGS. **6** and **7**). Further, the base holding mechanism **50** illustrated here includes: an insertion port **53** provided in the joint surface **10***a* of the other one of the two base members **10** and **10** to allow the piece portion **51** and the first locking portion **52** formed on the one base member **10** to be inserted thereinto; a flexible portion **54** provided in the other one of the two base members **10** and **10**, bent when pushed by the first locking portion **52** inserted from the insertion port **53**, and unbent when the joint surfaces **10***a*

are combined together and the first locking portion **52** is separated; and a second locking portion **55** provided in the other one of the two base members **10** and **10** and disposed to face the first locking portion **52** when the joint surfaces **10***a* are combined together to hold the two base members **10** and **10** in a state where their joint surfaces **10***a* are combined together (FIGS. **6** and **7**).

[0038] Each of the two base members **10** and **10** illustrated here includes a set of a piece portion **51** and a first locking portion **52** at one end of the split cylinder **12** in the circumferential direction, and a set of an insertion port **53**, a flexible portion **54**, and a second locking portion **55** at the other circumferential end of the split cylinder **12**. In a state where the joint surfaces **10***a* of the two base members **10** and **10** are combined together, the first locking portion **52** at one end of the one split cylinder **12** and the second locking portion **55** at the other end of the other split cylinder **12** are locked, and the second locking portion **55** at the other end of the one split cylinder **12** and the first locking portion **52** at one end of the other split cylinder **12** are locked. That is, in the two base members **10** and **10**, the base holding mechanisms **50** that connect the split cylinders **12** to each other to hold the two base members **10** and **10** in the connected state are provided at two locations. Furthermore, each of the two base members **10** and **10** includes a set of a piece portion **51** and a first locking portion **52** at one end of the split tube **13** in the circumferential direction, and includes a set of an insertion port **53**, a flexible portion **54**, and a second locking portion **55** at the other circumferential end of the split tube **13**. In a state where the joint surfaces **10***a* of the two base members **10** and **10** are combined together, the first locking portion **52** at one end of the one split tube **13** and the second locking portion **55** at the other end of the other split tube **13** are locked, and the second locking portion **55** at the other end of the one split tube **13** and the first locking portion **52** at one end of the other split tube **13** are locked. That is, in the two base members **10** and **10**, the base holding mechanisms **50** that connect the split tubes **13** to each other to hold the two base members **10** and **10** in the connected state are provided at two locations.

[0039] The grommet body **60** is an annular water-blocking member made of a soft resin (that is, an elastically deformable synthetic resin material softer than the hard resin of the base member **10**X (base member **10**)). The grommet body **60** is formed using, for example, a synthetic resin material such as an elastically deformable elastomer softer than the hard resin of the base member **10**X (base member **10**).

[0040] The grommet body **60** includes an annular body **61** coaxially disposed to face the outer peripheral edge portion **20***a* of the flange **20** with a gap therebetween at the assembly completion position with respect to the base member **10**X (the base members **10** and **10** assembled to each other), and coaxially disposed to face the peripheral edge portion **503** with a gap therebetween at the attachment completion position (FIGS. **1**, **2**, and **5** to **8**). The grommet body **60** is formed in an annular shape. Therefore, the annular body **61** is formed in an annular plate shape. In the following description, when the "assembly completion position" is simply written, this indicates the assembly completion position of the grommet body **60** with respect to the base member **10**X (the base members **10** and **10** assembled to each other).

[0041] The grommet body **60** is coaxially brought into tight contact with the outer peripheral edge portion **20***a* of the flange **20** at the assembly completion position. For example, in the grommet body **60**, the annular body **61** is coaxially disposed to face the first annular wall surface **20***c* of the flange **20** on the outer peripheral edge portion **20***a* side with a gap therebetween at the assembly completion position (FIG. **5**). Therefore, the grommet body **60** has an annular lip **62** (hereinafter referred to as a "first lip") protruding coaxially from the annular body **61** to be elastically deformed and brought into tight contact with the outer peripheral edge portion **20***a* of the flange **20** over the entire circumference at the assembly completion position (FIGS. **5**, **6**, and **8**). The first lip **62** is elastically deformed and brought into tight contact with the first annular wall surface **20***c* of the flange **20** on the outer peripheral edge portion **20***a* side over the entire circumference at the assembly completion position.

[0042] In addition, the grommet body **60** is coaxially brought into tight contact with the peripheral

edge portion **503** at the attachment completion position. For example, in the grommet body **60**, the annular body **61** is coaxially disposed to face the annular flat surface **503***a* of the peripheral edge portion **503** with a gap therebetween at the attachment completion position (FIG. **5**). Therefore, the grommet body **60** has an annular lip **63** (hereinafter referred to as a "second lip") protruding coaxially from the annular body **61** to be elastically deformed and brought into tight contact with the peripheral edge portion **503** over the entire circumference at the attachment completion position (FIGS. **1**, **2**, and **4** to **8**). The second lip **63** is elastically deformed and brought into tight contact with the annular flat surface **503***a* of the peripheral edge portion **503** over the entire circumference at the attachment completion position.

[0043] The grommet body **60** includes, as the second lip **63**, an outer peripheral lip **63**A provided on an outer peripheral edge portion **61***a* side of the annular body **61** and coaxial with the annular body **61**, and an inner peripheral lip **63**B provided on an inner peripheral edge portion **61***b* side of the annular body **61** and coaxial with the annular body **61** (FIGS. **2**, **4**, **5**, and **7**).

[0044] The grommet body **60** includes a first annular portion **64** coaxially disposed to face the outer peripheral edge portion **61***a* of the annular body **61** on the outer peripheral edge portion **20***a* side of the flange **20** with a gap therebetween, and a second annular portion **65** coaxially protruding from the outer peripheral edge portion **61***a* of the annular body **61** toward the flange **20** and connecting the outer peripheral edge portion **61***a* of the annular body **61** to an outer peripheral edge portion of the first annular portion **64** (FIGS. **1**, **5**, **6**, and **8**). The first annular portion **64** and the second annular portion **65** serve as one end of a holding mechanism that holds the base member **10**X (the base members **10** and **10** assembled to each other) and the grommet body **60** at their assembly completion positions, and function together with the first lip **62** and the outer peripheral edge portion **20***a* of the flange **20** (FIGS. **1**, **3**, **5**, **6**, and **8**).

[0045] The holding mechanism keeps the base member **10**X (the base members **10** and **10** assembled to each other) and the grommet body **60** at their assembly completion positions by sandwiching the outer peripheral edge portion **20***a* of the flange **20** between the first annular portion **64** and the first lip **62** (FIG. **5**). Therefore, the first annular portion **64** is hooked to the outer peripheral edge portion **20***a* of the flange **20** from the second annular wall surface **20***d* side over the entire circumference at the assembly completion position. At the assembly completion position, the first lip **62** is elastically deformed and brought into tight contact with the first annular wall surface **20***c* of the flange **20** on the outer peripheral edge portion **20***a* side over the entire circumference. Therefore, the outer peripheral edge portion **20***a* of the flange **20** is sandwiched between the first annular portion **64** and the first lip **62** at the assembly completion position.

[0046] Specifically, the outer peripheral edge portion **20***a* of the flange **20** has a concentric annular groove portion **14** recessed from the outer peripheral surface on the second annular wall surface **20***d* side (FIGS. **5** to **8**). The outer peripheral edge portion **20***a* illustrated here has a concentric annular groove portion **14** as if an annular corner portion on the outer peripheral surface side and on the second annular wall surface **20***d* side is cut away. The first annular portion **64** is inserted into the annular groove portion **14** at the assembly completion position, and is hooked to the outer peripheral edge portion **20***a* of the flange **20** in the annular groove portion **14** over the entire circumference from the second annular wall surface **20***d* side.

[0047] In the grommet **1**, when the base member **10**X (the base members **10** and **10** assembled to each other) and the grommet body **60** are assembled together, the first annular portion **64** is inserted into the annular groove portion **14** while being bent, and the first annular portion **64** and the second annular portion **65** are covered with the outer peripheral edge portion **20***a* of the flange **20**. As a result, in the grommet **1**, the outer peripheral edge portion **20***a* of the flange **20** is sandwiched between the first annular portion **64** and the first lip **62** at the assembly completion position, and the grommet body **60** is held by the outer peripheral edge portion **20***a*. Therefore, the grommet **1** can keep the base member **10**X (the base members **10** and **10** assembled to each other) and the grommet body **60** at the assembly completion position.

[0048] In the grommet body **60**, the annular body **61**, the first lip **62**, the first annular portion **64**, and the second annular portion **65** are formed by a first mold **601**, and the second lip **63** (the outer peripheral lip **63**A and the inner peripheral lip **63**B) is formed by a second mold **602** (FIG. **10**). After forming the grommet body **60**, the first mold **601** is removed in a removal direction M**1** toward one side in the axial direction of the annular body **61**. After forming the grommet body **60**, the second mold **602** is removed in a removal direction M**2** toward the other side in the axial direction of the annular body **61**.

[0049] The first lip **62** is formed in an annular shape in such a manner as to bulge from the annular body **61** in the removal direction M**1** of the first mold **601** and have an arc-shaped outer wall surface orthogonal to the circumferential direction. The second annular portion **65** protrudes from the annular body **61** in the removal direction M**1** of the first mold **601**. Therefore, in the grommet body **60**, the load applied to the annular body **61**, the first lip **62**, and the second annular portion **65** from the first mold **601** can be reduced when the first mold **601** is removed in the removal direction M**1**.

[0050] On the other hand, the first annular portion **64** protrudes from the second annular portion **65** toward the axis of the second annular portion **65** over the entire circumference, and is coaxially disposed to face the outer peripheral edge portion **61***a* of the annular body **61** with a gap therebetween, so that an annular space is formed between the annular body **61** and the second annular portion **65**. The annular space serves as an undercut portion when the first mold **601** is removed in the removal direction M**1**. Therefore, the first annular portion **64** protrudes from the second annular portion **65** by a minimum protrusion amount within a range in which the first annular portion **64** can be kept hooked to the outer peripheral edge portion **20***a* of the flange **20**, and the depth (the depth in the direction orthogonal to the axis) of the annular space (undercut portion) is made as shallow as possible.

[0051] In the grommet body **60**, by coaxially disposing the annular first annular portion **64** to face the outer peripheral edge portion **61***a* of the annular body **61** with a gap therebetween, the inner diameter of the first annular portion **64** is larger than the inner diameter of the annular body **61**. In the grommet body **60**, the outer diameter of the annular body **61** is the same as the outer diameter of the flange **20**, and by hooking the first annular portion **64** to the outer peripheral edge portion **20***a* of the flange **20** on the outer peripheral surface side, the position of the inner peripheral surface of the first annular portion **64** can be brought close to the outer peripheral edge portion **61***a* of the annular body **61** on the outer peripheral surface side in the radial direction. That is, in the grommet body **60**, the inner diameter of the first annular portion **64** is significantly larger than the inner diameter of the annular body **61**. Therefore, in the grommet body **60**, the depth of the annular space (undercut portion) can be made as shallow as possible. Therefore, in the grommet body **60**, the load applied to the annular body **61**, the first lip **62**, the first annular portion **64**, and the second annular portion **65** from the first mold **601** can be reduced when the first mold **601** is removed in the removal direction M**1**.

[0052] The outer peripheral lip **63**A protrudes to be separated from the axis of the annular body **61** (the hole axis of the through hole **502**) as the distance from the annular body **61** increases in the removal direction M**2** of the second mold **6 602**. The outer peripheral lip **63**A has two annular sub lip portions **63***b* on a radially inner wall surface **63***a*, the two annular sub lip portions **63***b* coaxially protruding from the wall surface **63***a* in the removal direction M**2** of the second mold **602** (FIG. **10**). The outer peripheral lip **63**A is flexurally deformed from the root on the annular body **61** side at the attachment completion position, and the two sub lip portions **63***b* are brought into tight contact with the annular flat surface **503***a* of the peripheral edge portion **503**. A radially outer wall surface **63***c* of the outer peripheral lip **63**A is formed by at least two third molds **603** removed in a removal direction M**3** toward the radially outward direction. As a result, the load applied to the grommet body **60** from the third molds **603** can be reduced when the third molds **603** are removed in the removal direction M**3**.

[0053] The inner peripheral lip **63**B has an inner peripheral surface **63***d* inclined to be separated from the axis of the annular body **61** (the hole axis of the through hole **502**) as the distance from the annular body **61** increases in the removal direction M**2** of the second mold **602**, and an outer peripheral surface **63***e* parallel to the removal direction M**2** of the second mold **602** (FIG. **10**).
[0054] The shape of the second lip **63** (the outer peripheral lip **63**A and the inner peripheral lip **63**B) makes it possible to reduce the load applied to the grommet body **60** from the second mold **602** when the second mold **602** is removed in the removal direction M**2**.
[0055] The grommet **1** configured as described above includes a holding mechanism **80** that holds the base member **10**X (the base members **10** and **10** assembled to each other) and the grommet body **60** assembled to each other in the peripheral edge portion **503** of the through hole **502** in the insertion object **501** (FIGS. **2** and **4** to **8**). The holding mechanism **80** illustrated here uses a resilient force caused by the elastic deformation of the second lip **63** (the outer peripheral lip **63**A and the inner peripheral lip **63**B) of the grommet body **60**, and sandwiches the peripheral edge portion **503** between the second lip **63** (the outer peripheral lip **63**A and the inner peripheral lip **63**B) and a locking portion **81** provided in the base member **10**X (base member **10**), which will be described below, to hold the grommet **1** in the peripheral edge portion **503**.
[0056] The base member **10**X has a locking portion **81** that protrudes beyond an outer peripheral surface **30***a* of the cylindrical body **30** in the other space S**2** at the attachment completion position, and comes into contact with the peripheral edge portion **503** from the other space S**2** side in the other space S**2** at the attachment completion position (FIGS. **2** and **5** to **8**). The locking portion **81** locks a portion of the peripheral edge portion **503** in the circumferential direction. Therefore, the base member **10**X has a plurality of locking portions **81** in the circumferential direction of the cylindrical body **30**.
[0057] In addition, the base member **10**X has a cantilevered locking piece portion **82** with the locking portion **81** provided at its free end in the other space S**2** at the attachment completion position for each locking portion **81** (FIGS. **2** and **4** to **8**). The locking piece portion **82** protrudes from the outer peripheral surface **30***a* of the cylindrical body **30** on a free end side, the free end being a tip protruding from a fixed end on the outer peripheral surface **30***a* side of the cylindrical body **30** toward the one space S**1** in the other space S**2** at the attachment completion position (initial shape). The locking piece portion **82** is formed to have flexibility so that it is flexurally deformable to change an amount of protrusion from the outer peripheral surface **30***a* on the free end side. The locking piece portion **82** moves back and forth through a cutout portion **30***b* obtained by cutting out a part of the cylindrical body **30** due to the flexurally deformation (FIGS. **2** and **4** to **8**). A plurality of sets each being a combination of the locking portion **81**, the locking piece portion **82**, and the cutout portion **30***b* are provided at equal intervals in the circumferential direction in the cylindrical body **30**. In the cylindrical body **30** illustrated here, four sets each being a combination of the locking portion **81**, the locking piece portion **82**, and the cutout portion **30***b* are provided at equal intervals in the circumferential direction. Here, two sets each being a combination of the locking portion **81**, the locking piece portion **82**, and the cutout portion **30***b* are provided in the split cylinder **12** of each base member **10**.
[0058] When the cylindrical body **30** is inserted into the through hole **502** from the one space S**1**, the locking piece portion **82** receives a force from the annular protruding portion **505** of the peripheral edge portion **503**, and is flexurally deformed from its initial shape toward the cutout portion **30***b*. When the locking piece portion **82** passes through the position of the annular protruding portion **505**, and advances to a distal end **505***a* (hereinafter referred to as a "locking end portion") of the annular protruding portion **505** (FIGS. **2** and **5**), and the locking piece portion **82** starts to return to the initial shape as the force received from the annular protruding portion **505** is released. Therefore, the locking piece portion **82** is disposed at the locking end portion **505***a* of the annular protruding portion **505** together with the locking portion **81**. On the other hand, when a series of movements of the locking portion **81** and the locking piece portion **82** occurs, the second

lip **63** (the outer peripheral lip **63**A and the inner peripheral lip **63**B) of the grommet body **60** abuts against the peripheral edge portion **503** on the annular flat surface **503***a* side and is flexurally deformed. Therefore, when the force (so-called insertion force) for inserting the grommet **1** into the through hole **502** is released, the grommet **1** returns toward the one space S**1** due to the resilient force caused by the elastic deformation of the second lip **63** (the outer peripheral lip **63**A and the inner peripheral lip **63**B). Accordingly, the locking portion **81** comes into contact with the locking end portion **505***a* of the annular protruding portion **505**, and is locked by the locking end portion **505***a* (FIG. **5**). That is, the annular protruding portion **505** locks the locking portion **81** at the distal end (the locking end portion **505***a*) protruding from the annular flat plate portion **504**. The annular locking end portion **505***a* locks the locking portion **81** at each location in the circumferential direction. Therefore, the peripheral edge portion **503** is sandwiched by the second lip **63** (the outer peripheral lip **63**A and the inner peripheral lip **63**B) of the grommet body **60** and the locking portions **81** of the base member **10**X (the base members **10** and **10**).

[0059] In the grommet **1** according to the present embodiment described above, in a state where the first lip **62** is brought into tight contact with the first annular wall surface **20***c* of the flange **20** on the outer peripheral edge portion **20***a* side, the first annular portion **64** is hooked to the outer peripheral edge portion **20***a* of the flange **20** from the second annular wall surface **20***d* side, and the outer peripheral edge portion **20***a* of the flange **20** is sandwiched between the first annular portion **64** and the first lip **62**. Therefore, in the grommet **1**, since the grommet body **60** is held by the outer peripheral edge portion **20***a* of the flange **20** at the assembly completion position, the base member **10**X (the base members **10** and **10** assembled to each other) and the grommet body **60** can be kept at their assembly completion positions. In the grommet body **60** according to the present embodiment, the inner diameter of the first annular portion **64** can be made significantly larger than the inner diameter of the annular body **61**, and the depth of the annular space (undercut portion) between the annular body **61**, the first annular portion **64**, and the second annular portion **65** can be made as shallow as possible. Therefore, in the grommet body **60**, the first mold **601** can be removed in the removal direction M**1** without applying an excessive load to the annular body **61**, the first lip **62**, the first annular portion **64**, and the second annular portion **65**, and the second mold **602** can be removed in the removal direction M**2** without applying an excessive load to the second lip **63** (the outer peripheral lip **63**A and the inner peripheral lip **63**B) (FIG. **10**). Therefore, the grommet **1** according to the present embodiment can include the grommet body **60** in which deterioration in quality is suppressed.

[0060] In the grommet according to the present embodiment, in a state where the first lip is brought into tight contact with the first annular wall surface of the flange on the outer peripheral edge portion side, the first annular portion is hooked to the outer peripheral edge portion of the flange from the second annular wall surface side, and the outer peripheral edge portion of the flange is sandwiched between the first annular portion and the first lip. Therefore, in the grommet, since the grommet body is held by the outer peripheral edge portion of the flange at the assembly completion position, the base member and the grommet body can be kept at their assembly completion positions.

[0061] 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 grommet comprising: a cylindrical base member into which a conductive wiring member is inserted to pass from one space to another space through a through hole of an insertion object, the base member being made of a hard synthetic resin material; and an annular grommet body

coaxially assembled to the base member, and disposed in the one space at an attachment completion position with respect to a peripheral edge portion of the through hole of the insertion object, wherein the base member includes: an annular flange disposed in the one space at the attachment completion position and having an outer peripheral edge portion coaxially disposed to face the annular peripheral edge portion with a gap therebetween; and a cylindrical body protruding coaxially from the flange toward the another space and inserted into the through hole at the attachment completion position, the grommet body is an annular water-blocking member made of an elastically deformable synthetic resin material softer than the base member to be coaxially brought into tight contact with the outer peripheral edge portion of the flange at an assembly completion position with respect to the base member, and coaxially brought into tight contact with the peripheral edge portion at the attachment completion position, the grommet body includes: an annular body coaxially disposed to face a first annular wall surface of the flange on an outer peripheral edge portion side at the assembly completion position with a gap therebetween, and coaxially disposed to face the peripheral edge portion at the attachment completion position with a gap therebetween; an annular lip protruding coaxially from the annular body, and elastically deformed at the assembly completion position to be brought into tight contact with the first annular wall surface of the flange on the outer peripheral edge portion side over an entire circumference; a first annular portion coaxially disposed to face an outer peripheral edge portion of the annular body on the outer peripheral edge portion side of the flange with a gap therebetween; and a second annular portion protruding coaxially from the outer peripheral edge portion of the annular body toward the flange, and connecting the outer peripheral edge portion of the annular body to an outer peripheral edge portion of the first annular portion, and the first annular portion is hooked to the outer peripheral edge portion of the flange from a second annular wall surface side on a back side of the first annular wall surface over an entire circumference at the assembly completion position.

2. The grommet according to claim 1, wherein the outer peripheral edge portion of the flange has a concentric annular groove portion recessed from an outer peripheral surface on the second annular wall surface side, and the first annular portion is inserted into the annular groove portion at the assembly completion position, and is hooked to the outer peripheral edge portion of the flange in the annular groove portion over the entire circumference from the second annular wall surface side.

3. The grommet according to claim 1, wherein the outer peripheral edge portion of the flange has a concentric annular groove portion like cutting away an annular corner portion on the outer peripheral surface side and on the second annular wall surface side, and the first annular portion is inserted into the annular groove portion at the assembly completion position, and is hooked to the outer peripheral edge portion of the flange in the annular groove portion over the entire circumference from the second annular wall surface side.