

DESCRIPTION

CAP, NUTRIENT CONTAINER USING THE SAME, AND NUTRIENT SUPPLY
SET

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Technical Field

[0001] The present invention relates to a cap to be secured to a mouth portion through which a liquid material filled in a container main body portion of a nutrient container flows out, a nutrient container with the cap secured to a container main body portion, and a nutrient supply set.

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Background Art

[0002] As a method for administering a nutrient or a drug to a patient parenterally, a transintestine nutrition therapy and an intravenous nutrition therapy are known. According to the transintestine nutrition therapy, a liquid material such as a nutrient, a liquid diet, or a drug (generally called a "transintestine nutrient") is administered through a tube running from the nasal cavity to the stomach or the duodenum of a patient (generally called a "nasotracheal tube") or through a tube inserted in a gastric fistula (the operation for forming a gastric fistula is called "Percutaneous Endoscopic Gastrostomy") formed in the abdomen of the patient (generally called a "PEG tube").

Further, according to the intravenous nutrition therapy, a liquid material containing a nutrient component such as glucose or a drug component (generally called an "infusion solution") is administered through an infusion solution line (liquid sending circuit) inserted in the vein of a patient.

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[0003] FIG. 16 is a schematic view showing an exemplary configuration of a transintestine nutrient set used for a conventional transintestine nutrition therapy. A container main body 101 of a nutrient container 100 is filled with a nutrient. A thin film (not shown) is attached to a mouth portion 102 through which the nutrient in the container main body 101 flows out, thereby sealing the container main body 101. In order to administer the nutrient into a body, a plastic connecting needle 104 is inserted into a cap 105 secured to the mouth portion so as to pierce the thin film. As a result, the nutrient can be delivered into the body through a tube connected to the connecting needle 104.

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[0004] FIG. 17 is a schematic view showing an exemplary configuration of an infusion set used for a conventional intravenous nutrition therapy. A bag body 111 of a bag 110 is filled with a liquid material containing a nutrient component or a drug component. In order to administer the liquid material into a body, a connecting
5 needle 114 is inserted into a port 113 for the connecting needle. As a result, the liquid material can be delivered into the body through a tube connected to the connecting needle 114 (see Patent Document 1).

Prior Art Document

Patent Document

10 [0005] Patent Document 1: JP 2000-176023 A

Disclosure of Invention

Problem to be Solved by the Invention

[0006] As described above, a conventional transintestine nutrition therapy, similarly to an intravenous nutrition therapy, may employ a technique of inserting a
15 sharp-pointed connecting needle into an object to be connected, thereby delivering a nutrient into a body. Thus, the connecting needle 114 can be inserted into the cap 105. In this case, the connecting needle 114 penetrates the cap 105 and the thin film to reach the inside of the mouth portion 102. However, if such an improper connection is made, a nutrient or the like to be supplied to a stomach or intestines is supplied by
20 mistake to a vein, which raises the possibility of medical accidents.

[0007] The present invention solves the above-described problem of an improper connection and provides a cap that makes it possible to provide a nutrient container that allows a liquid material such as a nutrient to be supplied sanitarily in a simple manner, a nutrient container using the same, and a nutrient supply set.

25 Means for Solving Problem

[0008] A cap according to the present invention is to be secured to a mouth portion of a container main body portion of a nutrient container through which a liquid material filled in the container main body portion flows out, and a connector can be connected thereto. A thin film that seals the container main body portion is attached to the
30 mouth portion. The cap includes: a cap main body portion including: a top plate portion that faces an opening of the mouth portion; a side wall portion that surrounds an outer peripheral surface of the mouth portion when the cap is secured to the mouth

portion; and a tubular portion that protrudes outward from the top plate portion; a flow path opening member attached to the tubular portion; and a connection maintaining structure that can maintain a connected state with respect to the connector. The flow path opening member includes: a communication portion
5 including a piercing portion that can pierce the thin film and a flow path through which the liquid material filled in the container main body portion can flow out of the nutrient container; and a cylindrical portion that is arranged integrally with and around the communication portion, and the flow path opening member can assume a first attachment state and a second attachment state with respect to the tubular
10 portion as follows: in the first attachment state, the flow path opening member is attached to the tubular portion such that an end of the piercing portion is held at a position not in contact with the thin film or in contact with the thin film without pressing the thin film, while in the second attachment state, the flow path opening member is attached to the tubular portion such that the thin film is broken by the
15 piercing portion and an inner peripheral surface of the cylindrical portion is held in contact with an outer peripheral surface of the tubular portion.

[0009] A nutrient container according to the present invention includes: a container main body portion including a mouth portion; a liquid material filled in the container main body portion; a thin film that is attached to the mouth portion to seal the
20 container main body portion; and the cap according to the present invention that is secured to the mouth portion.

[0010] A nutrient supply set according to the present invention includes: the nutrient container according to the present invention; and a liquid-sending circuit that includes: a connector including an engagement portion capable of being engaged with the
25 connection maintaining structure of the cap; and a liquid-sending tube connected to the connector.

Effects of the Invention

[0011] According to the present invention, it is possible to solve a problem that a liquid-sending circuit for use in an intravenous nutrition therapy is connected by
30 mistake to a nutrient container and to provide a cap that makes it possible to provide a nutrient container that allows a liquid material such as a nutrient to be supplied sanitarily in a simple manner, a nutrient container using the same, and a nutrient

supply set.

Brief Description of Drawings

[0012] [FIG. 1] FIG. 1 is a partial perspective view showing an example of a nutrient container according to Embodiment 1.

5 [FIG. 2] FIG. 2 is an exploded perspective view of the nutrient container shown in FIG. 1.

[FIG. 3A] FIG. 3A is an enlarged perspective view showing an example of a cap of the present invention that constitutes the nutrient container shown in FIG. 1.

[FIG. 3B] FIG. 3B is a plan view of the cap shown in FIG. 3A.

10 [FIG. 3C] FIG. 3C is a bottom view of the cap shown in FIG. 3A.

[FIG. 3D] FIG. 3D is a side view of the cap shown in FIG. 3A.

[FIG. 3E] FIG. 3E is another side view of the cap shown in FIG. 3A.

[FIG. 3F] FIG. 3F is an enlarged cross-sectional view of the cap shown in FIG. 3A.

15 [FIG. 3G] FIG. 3G is a partially enlarged view of the cap shown in FIG. 3F.

[FIG. 3H] FIG. 3H is a partially enlarged view of a cap for explaining another example of a flow path opening member.

[FIG. 4A] FIG. 4A is a cross-sectional perspective view for explaining a flow path opening member of the cap shown in FIG. 3A.

20 [FIG. 4B] FIG. 4B is a bottom view of the flow path opening member shown in FIG. 4A.

[FIG. 4C] FIG. 4C is a cross-sectional perspective view for explaining another example of the flow path opening member.

25 [FIG. 4D] FIG. 4D is a cross-sectional perspective view for explaining another example of the flow path opening member.

[FIG. 4E] FIG. 4E is a cross-sectional perspective view for explaining another example of the flow path opening member.

[FIG. 4F] FIG. 4F is a cross-sectional perspective view for explaining another example of the flow path opening member.

30 [FIG. 4G] FIG. 4G is a cross-sectional perspective view for explaining another example of the flow path opening member.

[FIG. 5A] FIG. 5A is a cross-sectional view for explaining a state immediately

before a liquid-sending circuit is connected to the nutrient container shown in FIG. 1.

[FIG. 5B] FIG. 5B is a cross-sectional view for explaining a state where the liquid-sending circuit is being attached to the nutrient container shown in FIG. 1 and a state where a thin film is broken by the flow path opening member.

5 [FIG. 5C] FIG. 5C is a cross-sectional view for explaining a state where the liquid-sending circuit is being attached to the nutrient container shown in FIG. 1 and a state where a protruding portion of the cap is inserted completely into an insertion portion of a connector of the liquid-sending circuit.

[FIG. 5D] FIG. 5D is a partially enlarged view of FIG. 5C.

10 [FIG. 6A] FIG. 6A is a perspective view of an example of the connector to be connected to the cap shown in FIG. 3A.

[FIG. 6B] FIG. 6B is a plan view of the connector shown in FIG. 6A.

[FIG. 6C] FIG. 6C is a bottom view of the connector shown in FIG. 6A.

[FIG. 6D] FIG. 6D is a side view of the connector shown in FIG. 6A.

15 [FIG. 6E] FIG. 6E is another side view of the connector shown in FIG. 6A.

[FIG. 7] FIG. 7 is a partial perspective view showing an example of a nutrient container according to Embodiment 2.

[FIG. 8] FIG. 8 is an exploded perspective view of the nutrient container shown in FIG. 7.

20 [FIG. 9A] FIG. 9A is a partially enlarged cross-sectional view of the nutrient container shown in FIG. 7.

[FIG. 9B] FIG. 9B is a partially enlarged cross-sectional schematic view of a cap shown in FIG. 9A.

[FIG. 9C] FIG. 9C is a partially enlarged view of the cap shown in FIG. 9A.

25 [FIG. 10A] FIG. 10A is a cross-sectional perspective view for explaining a flow path opening member of the cap shown in FIG. 9A.

[FIG. 10B] FIG. 10B is a bottom view of the flow path opening member shown in FIG. 10A.

[FIG. 11A] FIG. 11A is a cross-sectional view showing a state where a thin film is broken by the flow path opening member in the nutrient container shown in FIG. 9A.

[FIG. 11B] FIG. 11B is a cross-sectional view showing a state where a

liquid-sending circuit is being attached to the nutrient container shown in FIG. 11A.

[FIG. 12A] FIG. 12A is a partial cross-sectional perspective view showing an example of a nutrient container according to Embodiment 3.

[FIG. 12B] FIG. 12B is a partially enlarged cross-sectional schematic view of
5 the nutrient container shown in FIG. 12A.

[FIG. 13] FIG. 13 is a partial perspective view showing an example of a nutrient container according to Embodiment 4.

[FIG. 14] FIG. 14 is an exploded perspective view of the nutrient container shown in FIG. 13.

10 [FIG. 15A] FIG. 15A is a perspective view of a protection cover constituting the nutrient container shown in FIG. 14.

[FIG. 15B] FIG. 15B is a top view of the protection cover shown in FIG. 15A.

[FIG. 15C] FIG. 15C is a bottom view of the protection cover shown in FIG.
15A.

15 [FIG. 15D] FIG. 15D is a side view of the protection cover shown in FIG. 15A.

[FIG. 15E] FIG. 15E is another perspective view of the protection cover shown in FIG. 15A.

[FIG. 16] FIG. 16 is a schematic view showing an exemplary configuration of a transintestine nutrient set used for a conventional transintestine nutrition therapy.

20 [FIG. 17] FIG. 17 is a schematic view showing an exemplary configuration of an infusion set used for a conventional intravenous nutrition therapy.

Description of the Invention

[0013] In a preferred example of the cap according to the present invention, the communication portion further includes a rib, and the tubular portion further includes
25 an annular groove that is formed on an inner peripheral surface of the tubular portion and into which the rib can be fitted. The first attachment state is maintained by the rib and the annular groove fitted together. According to this preferred example of the cap of the present invention, it is preferable that the flow path opening member can be shifted from the first attachment state to the second attachment state simply by
30 pressing the communication portion in its axis direction.

[0014] In a preferred example of the cap according to the present invention, assuming that the rib is a first rib, the communication portion further includes a

second rib arranged farther from the piercing portion than the first rib. According to this preferred example of the cap of the present invention, it is preferable that due to the fitting between the second rib and the annular groove, it is possible not only to maintain the second attachment state but also to confirm that the flow path opening member has been shifted to the second attachment state because vibrations are created when the second rib is fitted into the annular groove.

[0015] In a preferred example of the cap according to the present invention, assuming that the tubular portion is a first tubular portion, the cap main body portion further includes a second tubular portion that is arranged so as to surround the first tubular portion, protrudes outward from the top plate portion, and is provided with a linear rib formed on an outer peripheral surface of the second tubular portion. Further, assuming that the cylindrical portion is a first cylindrical portion, the flow path opening member further includes a second cylindrical portion that is arranged so as to surround the first cylindrical portion, is arranged outside the second tubular portion, protrudes toward the cap main body portion from a top surface portion of the flow path opening member, and is provided with a linear groove formed on an inner peripheral surface of the second cylindrical portion. A longitudinal direction of the linear rib coincides with an axis direction of the second tubular portion, and the linear rib is inserted slidably in the linear groove. According to this preferred example of the cap of the present invention, since the linear rib is inserted in the linear groove, the flow path opening member is prevented from being rotated around its central axis. Consequently, it is easy to force the flow path opening member toward the thin film and to connect the connector and the cap.

[0016] In a preferred example of the cap according to the present invention, assuming that the tubular portion is a first tubular portion, the cap main body portion further includes a second tubular portion that is arranged so as to surround the first tubular portion, protrudes outward from the top plate portion, and is provided with a linear groove formed on an outer peripheral surface of the second tubular portion. Further, assuming that the cylindrical portion is a first cylindrical portion, the flow path opening member further includes a second cylindrical portion that is arranged so as to surround the first cylindrical portion, is arranged outside the second tubular portion, protrudes toward the cap main body portion from a top surface portion of the

flow path opening member, and is provided with a linear rib formed on an inner peripheral surface of the second cylindrical portion. A longitudinal direction of the linear groove coincides with an axis direction of the second tubular portion, and the linear rib is inserted slidably in the linear groove. According to this preferred

5 example of the cap of the present invention, since the linear rib is inserted in the linear groove, the flow path opening member is prevented from being rotated around its central axis. Consequently, it is easy to force the flow path opening member toward the thin film and to connect the connector and the cap.

[0017] In a preferred example of the cap according to the present invention,

10 assuming that the tubular portion is a first tubular portion, the cap main body portion further includes a second tubular portion that is arranged so as to surround the first tubular portion, protrudes outward from the top plate portion, and is provided with a first hook portion formed at an end of the second tubular portion. Further, assuming that the cylindrical portion is a first cylindrical portion, the flow path opening member

15 further includes a second cylindrical portion that is arranged so as to surround the first cylindrical portion, is arranged outside the second tubular portion, protrudes toward the cap main body portion from a top surface portion of the flow path opening member, and is provided with a second hook portion formed at an end of the second cylindrical portion so as to be engaged with the first hook portion. The

20 communication portion further includes a male thread formed on an outer peripheral surface of the communication portion. The first tubular portion further includes a female thread that is formed on an inner peripheral surface of the first tubular portion and can be screwed with the male thread. In the first attachment state, a surface of the male thread facing the female thread at an end on a screw-starting side is in

25 contact with a surface of the female thread facing the male thread, and the second hook portion is arranged closer to the top plate portion than the first hook portion.

According to this preferred example of the cap of the present invention, it is preferable that the flow path opening member can be shifted from the first attachment state to the second attachment state simply by rotating the flow path opening member around

30 its central axis until the male thread and the female thread are screwed together.

Further, by rotating the flow path opening member around the central axis several times, a screw thread is fitted in a thread groove in the second attachment state.

Thus, the second attachment state is maintained stably. Further, it is preferable that the flow path opening member cannot be shifted from the first attachment state to the second attachment state unless the flow path opening member is rotated around its central axis, and thus the thin film is unlikely to be broken by the piercing portion due to an external force applied to the communication portion when not required.

[0018] In a preferred example of the cap according to the present invention, the communication portion further includes a male thread formed on an outer peripheral surface of the communication portion. The tubular portion further includes a female thread that is formed on an inner peripheral surface of the tubular portion and can be screwed with the male thread. In the first attachment state, a screw-starting side of the male thread and a screw-starting side of the female thread are screwed together so that the flow path opening member cannot be removed from the tubular portion unless the flow path opening member is rotated around a central axis of the flow path opening member in a direction opposite to a direction in which the male thread and the female thread are screwed together. According to this preferred example of the cap of the present invention, it is preferable that the flow path opening member can be shifted from the first attachment state to the second attachment state simply by rotating the flow path opening member around its central axis until the male thread and the female thread are screwed together. Further, by rotating the flow path opening member around the central axis several times, a screw thread is fitted in a thread groove in the second attachment state. Thus, the second attachment state is maintained stably. Further, it is preferable that the flow path opening member cannot be shifted from the first attachment state to the second attachment state unless the flow path opening member is rotated around its central axis, and thus the thin film is unlikely to be broken by the piercing portion due to an external force applied to the communication portion when not required.

[0019] The communication portion includes a plurality of flow paths and is provided with a plurality of holes on an end surface of the communication portion on a side opposite to the thin film. For example, the communication portion preferably includes a protruding portion at an end on a side opposite to the thin film and is provided with holes, each constituting a part of each of the flow paths, in the protruding portion. The presence of a plurality of holes on the end surface can refer to

that one through hole is divided into a plurality of small holes, which makes it difficult to insert a sharp-pointed connecting needle into the through hole. When the communication portion has such a structure that makes it difficult to insert a sharp-pointed connecting needle into the communication portion, it is possible to solve more reliably a problem that a liquid-sending circuit for use in an intravenous nutrition therapy in which a liquid material is delivered into a body solely by inserting a sharp-pointed connecting needle into an object to be connected is connected by mistake to a nutrient container for use in a transintestine nutrition therapy.

[0020] In a preferred example of the cap according to the present invention, the communication portion includes a partition wall that is arranged on a side of the thin film relative to the protruding portion so as to divide a space in a direction of extension of the holes. This is preferable because the communication portion is lightweight as compared with the case where, for example, the communication portion has a substantially columnar outer shape, and the flow path opening member is molded easily.

[0021] A preferred example of the cap according to the present invention further includes a protection cover that covers the flow path opening member in the first attachment state and includes an engagement portion capable of being engaged with the connection maintaining structure. In this case, an external force is prevented from being applied to the communication portion when not required. Consequently, it is possible to prevent the thin film from being broken by the communication portion moved toward the container main body portion by an external force applied to the communication portion when not required.

[0022] (Embodiment 1)

In Embodiment 1, an exemplary cap according to the present invention and an exemplary nutrient container using the cap according to the present invention will be described with reference to FIGs. 1 to 6E.

[0023] FIG. 1 is a partial perspective view showing an example of a nutrient container of the present embodiment. FIG. 2 is an exploded perspective view of the nutrient container shown in FIG. 1. FIG. 3A is an enlarged perspective view showing an example of a cap of the present embodiment that constitutes the nutrient container shown in FIG. 1. FIG. 3B is a plan view of the cap shown in FIG. 3A. FIG. 3C is a

bottom view of the cap shown in FIG. 3A. FIG. 3D is a side view of the cap shown in FIG. 3A. FIG. 3E is another side view of the cap shown in FIG. 3A. FIG. 3F is a cross-sectional view of the cap shown in FIG. 3A. FIG. 3G is a partially enlarged view of the cap shown in FIG. 3F.

5 [0024] As shown in FIGs. 1 and 2, a nutrient container 10, which is a medical nutrient container for use in a transintestine nutrition therapy, includes a bottle main body 11 as a container main body portion, a liquid material (not shown) that contains a nutrient and is filled in the bottle main body 11, and a cap 13 secured to a mouth
10 portion 12 (see FIG. 2) of the bottle main body 11. At the bottom of the bottle main body 11, a hanger (not shown) for hanging the bottle main body 11 on a stand or the like is provided.

[0025] The bottle main body 11 is made of a hard material, for example, and thus its outer shape is maintained unless a specific external force is applied. The bottle main body 11 is obtained by blow molding using a resin material, for example. Examples of
15 the resin material include polyethylene terephthalate (PET), polypropylene (PP), polyvinyl chloride (PVC), nylon, and the like.

[0026] As shown in FIG. 2, on an outer peripheral surface of the mouth portion 12, a male thread 12a to be engaged with a female thread 23 (see FIG. 3F) of the cap 13 is formed. A thin film 16 is attached to the mouth portion 12 so as to block an opening
20 of the mouth portion 12, whereby the bottle main body 11 is sealed with the thin film 16. Consequently, even when the bottle main body 11 to which the thin film 16 is attached is turned so that the mouth portion 12 is directed downward, the liquid material in the bottle main body 11 does not leak from the bottle main body 11.

[0027] Examples of a material for the thin film 16 include an aluminum foil, a laminated film formed of paper and an aluminum foil, a resin film containing the same resin as that of the bottle main body 11, and the like. The resin film may be a monolayer or a laminate formed of a plurality of layers. Above all, a resin film containing the same resin as that of the bottle main body 11 is used preferably for a surface to be in contact with the bottle main body 11, from the viewpoint of ensuring
25 high adhesion of the thin film 16 to the bottle main body 11 by thermal welding.

[0028] The thin film 16 is adhered to an opening end surface 12b of the mouth portion 12, and a rim portion 16a thereof is adhered to the outer peripheral surface of

the mouth portion 12 in the vicinity of the opening end surface 12b. Alternatively, the thin film 16 may be adhered only to the opening end surface 12b of the mouth portion 12. A method of adhering the thin film 16 to the mouth portion 12 is selected suitably in accordance with the material of the thin film 16, the material of the mouth portion 12, and the like.

[0029] As shown in FIG. 2, the cap 13 includes a cap main body portion 22 and a flow path opening member 19 attached to the cap main body portion 22. The flow path opening member 19 is molded separately from the cap main body portion 22 and is attached to the cap main body portion 22.

10 [0030] As shown in FIGs. 3A to 3F, the cap main body portion 22 of the cap 13 includes a base 20 and an attachment portion 21 to which the flow path opening member 19 is attached. The base 20 includes a top plate portion 17 and a side wall portion 18. When the cap 13 is secured to the mouth portion 12 (see FIG. 2), the top plate portion 17 faces the opening of the mouth portion 12, and the side wall portion 18
15 surrounds the outer peripheral surface of the mouth portion 12. On an inner peripheral surface of the side wall portion 18, a female thread 23 (see FIG. 3F etc.) to be screwed with the male thread 12a (see FIG. 2) formed on the outer peripheral surface of the mouth portion 12 is formed.

[0031] As shown in FIG. 3F, the attachment portion 21 includes a first tubular portion 21a and a second tubular portion 21b that protrude from an outer main surface of the top plate portion 17. The second tubular portion 21b is arranged around the first tubular portion 21a at a distance from the first tubular portion 21a. Alternate long and short dashed lines 151 indicate a central axis of the first tubular portion 21a, which is matched with a central axis of the second tubular portion 21b.
25 In the example shown in FIGs. 3A to 3F, the alternate long and short dashed lines 151 are orthogonal to the top plate portion 17.

[0032] On an inner surface of the first tubular portion 21a in the vicinity of an upper end, an annular groove 211 that can be fitted with a first rib 198 and a second rib 199 (see FIG. 4A) of a communication portion 19a described later is formed.

30 [0033] As shown in FIGs. 3A, 3D, 3E, and 3G, on an outer peripheral surface of the second tubular portion 21b, a pair of linear ribs 21c are formed. The pair of linear ribs 21c are symmetrical with respect to the central axis of the second tubular portion 21b.

The longitudinal direction of each of the linear ribs 21c coincides with the direction of the central axis of the second tubular portion 21b. As shown in FIGs. 3F and 3G, on an inner peripheral surface of a second cylindrical portion 19c, a pair of linear grooves 190a are formed to receive the pair of linear ribs 21c slidably. Each of the linear
5 grooves 190a receives a part of each of the linear ribs 21c. This prevents the flow path opening member 19 from being rotated around its central axis. Consequently, rotation for fitting a lock protrusion 197 (see FIG. 3E) into a lock concave portion 321g (see FIG. 6A) of a connector 25 of a liquid-sending circuit 27 (see FIG. 5A etc.) described later is performed easily.

- 10 [0034] The pair of linear ribs 21c and the pair of linear grooves 190a also function as a guide for the flow path opening member 19 to move toward the top plate portion 17.
- [0035] According to the cap shown in FIGs. 3A to 3G, the second tubular portion 21b includes the linear ribs 21c, and the second cylindrical portion 19c includes the linear grooves 190a. However, in another example of the cap of the present invention, as
15 shown in FIG. 3H, the second tubular portion 21b may include a pair of linear grooves 21d, and the second cylindrical portion 19c may include a pair of linear ribs 190b, so that each of the linear ribs 190b is inserted slidably into each of the linear grooves 21d.
- [0036] As shown in FIGs. 3A, 3B, and 3C, the top plate portion 17 of the cap 13 includes two vent holes 29 formed to penetrate the top plate portion 17 in its thickness
20 direction, and a vent filter 28 (see FIG. 3C etc.) is attached to an inner main surface 17a of the top plate portion 17 so as to cover the vent holes 29. The vent filter 28 is surrounded by an annular wall 28a provided on the inner main surface 17a of the top plate portion 17. The vent filter 28 is a hydrophobic vent filter, which transmits gas but not liquid. As the liquid material filled in the bottle main body 11 flows out
25 through the mouth portion 12, the pressure in the bottle main body 11 is lowered. In the case where the bottle main body 11 is made of a soft material, the bottle main body 11 is deformed due to the outflow of the liquid material, allowing the liquid material to flow out continuously. However, the bottle main body 11 made of a hard material hardly can be deformed. In the present embodiment, as the liquid material flows out,
30 air is drawn into the bottle main body 11 through the vent filter 28. Thus, the liquid material can flow out continuously from the bottle main body 11 without the need, for example, to form a hole for ventilation in the bottle main body 11 by inserting a needle

or the like into the bottle main body 11 during a supply of a nutrient into a body.

[0037] The vent filter 28 is not limited particularly in terms of the material or the like as long as it is a known hydrophobic filter used with a connecting needle such as a bottle needle, for example.

5 [0038] As shown in FIGs. 3C, 3F, and 5A to 5C, the cap 13 preferably further includes an annular sealer 171 arranged on the inner main surface 17a of the top plate portion 17. The sealer 171 is sandwiched between the inner main surface 17a of the top plate portion 17 and the opening end surface 12b of the mouth portion 12, thereby
10 improving the airtightness between the cap 13 and the mouth portion 12. This serves to prevent effectively the liquid material from leaking out through a gap between the cap 13 and the mouth portion 12 during a supply of the liquid material to a patient. For the sake of clarity, the sealer 171 is hatched in FIG. 3C.

[0039] Examples of a material for the sealer 171 include isoprene rubber, butylene rubber, thermoplastic elastomer, and the like.

15 [0040] As shown in FIGs. 3F to 3H, 4A, and 4B, the flow path opening member 19 includes the connection portion 19a, a first cylindrical portion 19b, the second cylindrical portion 19c, a top surface portion 19d, and a pair of claw portions 19e. As shown in FIGs. 3D and 3E, the pair of claw portions 19 are formed on an outer peripheral surface of the top surface portion 19d around the second cylindrical portion
20 19c. A surface of the pair of claw portions 19e on a side opposite to the top plate portion is in the same plane as an outer surface (top surface) of the top surface portion 19d. Each of the pair of claw portions 19e includes, on the surface facing the top plate portion 17, the lock protrusion 197 that can be fitted into the lock concave portion 321g (see FIG. 6A) of the connector 25 of the liquid-sending circuit 27 (see FIG. 5A etc.)
25 described later. In other words, the pair of claw portions 19e function as a connection maintaining structure that can maintain a connected state with respect to the connector 25 of the liquid-sending circuit 27 (see FIG. 5B etc.) described later.

[0041] The first cylindrical portion 19b and the second cylindrical portion 19c are arranged around the communication portion 19a in this order at a distance from the
30 communication portion 19a and the first cylindrical portion 19b, respectively. The alternate long and short dashed lines 151 indicate the central axis of the first tubular portion 21a (see FIG. 3F), which also coincides with central axes of the connection

portion 19a, the first cylindrical portion 19b, and the second cylindrical portion 19c.

[0042] The communication portion 19a, the first cylindrical portion 19b, and the second cylindrical portion 19c are connected to one another by the top surface portion 19d. Thus, the flow path opening member 19 is constructed so that the liquid material does not leak from any part other than flow paths of the communication portion 19a of the flow path opening member 19 even when the thin film 16 is broken by a piercing portion 194 of the communication portion 19a, allowing the liquid material filled in the bottle main body 11 (see FIG. 1) as a container main body portion to flow toward the flow path opening member 19.

10 [0043] As shown in FIG. 4A, the communication portion 19a includes a protruding portion 191 at an end on a side opposite to the piercing portion 194. The protruding portion 191 has a circular planer shape and protrudes upward relative to the top surface portion 19d so as to be inserted into the connector described later. The protruding portion 191 includes a plurality of through holes 192 formed to penetrate the protruding portion 191 in its thickness direction.

[0044] Further, as shown in FIG. 4A, the communication portion 19a includes, on a side of the thin film 16 (see FIG. 5A etc.) relative to the protruding portion 191, a plurality of partition walls 193 (see also FIG. 3C) that partition a space on the thin film side into a plurality of regions. The partition walls 193 are arranged so as to divide the space in the direction of an extension of the respective through holes 192. Thus, when the flow path opening member 19 is pressed toward the bottle main body 11, allowing the piercing portion 194 to pierce the thin film 16, a plurality of spaces 196 (see FIG. 4B) that are formed due to the presence of the plurality of partition walls 193 and are open with respect to an internal space of the cap main body portion 22 and the plurality of through holes 192 function as a plurality of flow paths through which the liquid material filled in the bottle main body 11 can flow out of the nutrient container (in the direction of an arrow X). The communication portion 19a shown in FIGs. 4A and 4B includes the four partition walls 193 and accordingly provides four flow paths. The four partition walls 193 are arranged in the peripheral direction at equal angles and are integrated with one another. Thus, as shown in FIG. 4B, a partition formed of the plurality of partition walls 193 has a substantially cross outer shape when the flow path opening member 19 is viewed from a bottom side.

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[0045] The communication portion 19a includes the piercing portion 194 at an end on the thin film 16 side in its axis direction. The piercing portion 194 has a pointed end so as to pierce the thin film 16. In the example shown in FIGs. 4A and 4B, each of the plurality of partition walls 193 includes an inclined surface 195 that is inclined toward
5 the end of the communication portion 19a on the thin film side. The respective inclined surfaces 195 gather at the end of the communication portion 19a on the thin film side to form the piercing portion 194 that can pierce the thin film 16.

[0046] As shown in FIG. 4A, each of the partition walls 193 includes the first rib 198 and the second rib 199 formed on its side. In other words, the first rib 198 and the
10 second rib 199 are formed on a surface facing the inner peripheral surface of the first tubular portion of the communication portion 19a. The plurality of first ribs 198 are arranged at a predetermined distance from the end of the communication portion 19a on the thin film side along a single circumference with a predetermined point on the central axis 151 as a center. The plurality of second ribs 199 are arranged farther
15 from the end of the communication portion 19a on the thin film side than the plurality of first ribs 198 along another single circumference with another predetermined point on the central axis 151 as a center.

[0047] FIG. 5A shows a state where the first ribs 198 are fitted into the annular groove 211, and FIG. 5B shows a state where the second ribs 199 are fitted into the
20 annular groove 211.

[0048] Examples of a material for the cap 13 include polyethylene (PE), polypropylene (PP), polyacetal (POM), polyethylene terephthalate (PET), polycarbonate (PC), and the like.

[0049] Next, an example of the connector to be connected to the cap will be described
25 with reference to FIGs. 6A to 6E.

[0050] FIG. 6A is a perspective view showing an exemplary schematic configuration of the connector 25 to be connected to the cap of the present invention. FIG. 6B is a plan view of the connector 25 shown in FIG. 6A. FIG. 6C is a bottom view of the connector 25 shown in FIG. 6A. FIG. 6D is a side view of the connector 25 shown in
30 FIG. 6A. FIG. 6E is another side view of the connector 25 shown in FIG. 6A.

[0051] As shown in FIGs. 6A to 6E, the female connector 25 includes an insertion portion 33, a liquid-sending tube connecting portion 30, brim portions 32, and holding

portions 31. When being connected to the cap 13 secured to the mouth portion 12 of the bottle main body 1 as a container main body portion, the connector 25 allows the inside of the bottle main body 11 to communicate with a lumen of a flexible tube 26 (see FIGs. 5A to 5C etc.) connected to the connector 25. The alternate long and short

5 dashed lines 151 indicate central axes of the insertion portion 33 and the liquid-sending tube connecting portion 30. The direction of the central axis 151 is defined as an up-and-down direction, and an upper side on the drawing surface (side to be connected to the cap) of FIG. 6A is referred to as an “upper side” and a lower side on the drawing surface is referred to as a “lower side”.

10 [0052] The connector 25 has a substantially cylindrical shape as a whole. The insertion portion 33 in the vicinity of an upper end of the connector 25 has a large-diameter portion 33a with an inner diameter equal to or slightly smaller than a maximum outer diameter of the protruding portion 191 (see FIG. 3F) of the cap 13, and a small-diameter portion 33b with an inner diameter smaller than an outer

15 diameter of the protruding portion 191 (see FIG. 4A etc.) of the flow path opening portion 19 and the inner diameter of the large-diameter portion 33a, on a lower side relative to the large-diameter portion 33a. Since the inner diameter of the large-diameter portion 33a is equal to or slightly smaller than the maximum outer diameter of the protruding portion 191, an outer peripheral surface of the protruding

20 portion 191 comes into intimate contact with an inner peripheral surface of the large-diameter portion 33a when the protruding portion 191 of the cap 13 is forced into the insertion portion 33 of the connector 25, so that the connector 25 and the cap 13 are connected to each other. Thus, the cap 13 and the connector 25 can be connected reliably to each other without causing leakage of the liquid material (see FIG. 5D).

25 [0053] As shown in FIG. 6A, due to the presence of the large-diameter portion 33a and the small-diameter portion 33b, the insertion portion 33 of the connector 25 has a stepped surface 33c between the large-diameter portion 33a and the small-diameter portion 33b. When the connector 25 is connected to the cap 13, the stepped surface 33c comes into contact with an end surface 191a of the protruding portion 191 (see FIG.

30 5D).

[0054] On a lower side relative to the small-diameter portion 33b, the liquid-sending tube connecting portion 30 having a substantially cylindrical shape is provided.

[0055] A pair of the brim portions 32 are formed around the large-diameter portion 33a on an upper side relative to the large-diameter portion 33a. The pair of brim portions 32 are symmetrical with respect to the central axis 151. Each of the brim portions 32 includes an arc-shaped wall 321 substantially along a cylindrical surface with the central axis 151 as a central axis, and a bridge portion 322 that extends in a direction perpendicular to the central axis 151 and connects a lower end of the arc-shaped wall 321 and an upper end of the large-diameter portion 33a.

[0056] As shown in FIGs. 6A and 6B, the arc-shaped wall 321 includes a passage region 321a, an engagement region 321b, and a non-passage region 321c in accordance with the difference in shape of an inner peripheral surface opposed to the central axis 151. As shown in FIG. 6B, an inner peripheral surface of the passage region 321a is a part of a cylindrical surface with a diameter DF21, and an inner peripheral surface of the non-passage region 321c is a part of a cylindrical surface with a diameter DF23 ($DF23 < DF21$). The engagement region 321b between the passage region 321a and the non-passage region 321c includes an engagement wall 321d at an upper end, which extends in the peripheral direction so as to connect an upper end of the passage region 321a and an upper end of the non-passage region 321c. An inner peripheral surface of the engagement wall 321d opposed to the central axis 151 is a part of a cylindrical surface with a diameter DF22 ($DF22 < DF21$). Due to the presence of the engagement wall 321d in the engagement region 321b, a region between the engagement wall 321d and the bridge portion 322 is dented in a concave shape. More specifically, the region between the engagement wall 321d and the bridge portion 322 is recessed relative to the engagement wall 321d in the radial direction with respect to the central axis 151 to form a concave portion 321e. The non-passage region 321c adjacent to the engagement region 321b in the peripheral direction protrudes relative to the concave portion 321e in the central axis 151 direction to form a convex portion 321f. On a lower surface of the engagement wall 321d (a surface on the concave portion 321e side, a surface facing the bridge portion 322) at an end on the non-passage region 321c side, a lock concave portion 321g dented in a concave shape is formed. In a part of the bridge portion 322 facing the engagement wall 321d, a through hole 220 (see FIG. 6C) penetrating the bridge portion 322 in its thickness direction is formed; however, the through hole 220 need not be provided.

[0057] Further, as shown in FIG. 6A, a pair of the holding portions 31 protruding outward (in a direction orthogonal to the central axis 151) from an outer peripheral surface of the insertion portion 33 are formed around the insertion portion 33.

Rotation for engaging the claw portions 19e of the cap with the brim portions 32 (see
5 FIG. 3E etc.) is performed with the pair of holding portions 31 held.

[0058] Next, a method for connecting the connector 25 to the cap 13 will be described.

[0059] FIG. 5A shows a state immediately before the liquid-sending circuit 27 including the connector 25 and the flexible tube 26 connected to the connector 25 is connected to the cap 13. FIG. 5B shows a state where the liquid-sending circuit 27 is
10 being connected to the cap 13 and the thin film 16 is broken. FIG. 5C shows a state where the protruding portion 191 of the cap 13 is inserted completely into the insertion portion 33 (see FIG. 6A) of the connector 25.

[0060] As shown in FIG. 5A, in a state before the connector 25 is connected to the flow path opening member 19, the first rib 198 is fitted in the annular groove 211, and
15 the end of the piercing portion 194 is located not in contact with the thin film 16 or in contact with the thin film 16 without pressing the thin film 16 (first attachment state).

[0061] As shown in FIGs. 5B and 5C, when the flow path opening member 19 is pressed toward the thin film 16 while the protruding portion 191 is press-fitted into the connector 25, the first rib 198 and the annular groove 211 fitted together are
20 released from each other, allowing the flow path opening member 19 to be forced toward the thin film 16, and the second rib 199 is fitted into the annular groove 211. Namely, due to the operation for connecting the connector 25 to the cap 13, the flow path opening member 19 moves toward the bottle main body 11. In this state, the thin film 16 is broken by the piercing portion 194, and an inner peripheral surface of
25 the first cylindrical portion 19b is in intimate contact with an outer peripheral surface of the first tubular portion 21a. Thus, the flow path opening member 19 is attached to the cap main body portion 22 so that no leakage occurs (second attachment state). Further, as shown in FIG. 5D, an outer peripheral surface 191b of the protruding portion 191 comes into intimate contact with the large-diameter portion 33a of the
30 connector 25.

[0062] As shown in FIG. 5C, as the second rib 199 is fitted into the annular groove 211, an end surface of at least one of the first cylindrical portion 19b and the second

cylindrical portion 19c preferably comes into contact with the top plate portion 17. In this case, at least one of an end surface 192b of the first cylindrical portion 19b and an end surface 192c of the second cylindrical portion comes into contact with the top plate portion 17, thereby regulating the movement of the communication portion 19a.

5 Thus, it is preferable that the second rib 199 can be fitted reliably into the annual groove 211 simply by forcing the communication portion 19a toward the thin film 16 until at least one of the end surface 192b of the first cylindrical portion 19b and the end surface 192c of the second cylindrical portion 19c comes into contact with the top plate portion 17.

10 [0063] Then, the connector 25 is rotated further around its central axis with respect to the cap 13 with the holding portions 31 held. Due to the rotation of the connector 25, the lock protrusion 197 (see FIG. 3E etc.) slides over a surface 321h of the engagement wall 321d on the bridge portion 322 side while being pressed against the surface 321h and then is fitted into the lock concave portion 321g (see FIG. 6A). Due to the fitting of the lock protrusion 197 into the lock concave portion 321g, the connected state of the connector 25 with respect to the cap 13 can be maintained stably.

[0064] Since the connector 25 includes the convex portion 321f (see FIG. 6A) adjacent to the lock concave portion 321g in which the lock protrusion 197 is to be stored, by allowing the lock protrusion 197 of the cap 13 to enter the lock concave portion 321g and move further until the claw portion 19e (see FIG. 3E etc.) comes into contact with the convex portion 321f, the claw portion 19e and the engagement wall 321d can be engaged reliably with each other.

25 [0065] Preferably, the claw portion 19e of the cap 13 comes into contact with the convex portion 321f of the connector 25, thereby regulating the rotation of the connector 25 with respect to the cap 13. Thus, the claw portion 19e and the engagement wall 321d can be engaged reliably with each other simply by rotating the connector 25 with respect to the cap 13 until the rotation is regulated.

[0066] Various known structures may be used to maintain the connection between the cap 13 and the connector 25, and any method may be used other than the engagement between the claw portion 19e (see FIG. 3E etc.) including the lock protrusion 197 of the cap 13 as a connection maintaining structure and the

engagement wall 321d (see FIG. 8A) including the lock concave portion 321g of the connector 25. Although the connection maintaining structure is provided in the flow path opening member 19 in the present embodiment, it may be provided in the cap main body portion 22.

5 [0067] The hardness of the connector 25 measured based on JIS-K7202 is preferably R40 to R140, and more preferably R50 to R100, from the viewpoint of enhancing the connection operability of the flexible liquid-sending tube 26 with respect to the liquid-sending tube connecting portion 30.

[0068] The flow path opening member 19 is not limited to that shown in FIGs. 4A and 4B. For example, as shown in FIG. 4C, the flow path opening member 19 may have three through holes in the protruding portion 191 and three partition walls 193 on a side of the thin film relative to the protruding portion 191, thereby providing three flow paths.

[0069] As shown in FIG. 4D, the flow path opening member 19 may have two through holes in the protruding portion 191 and one partition wall 193 on a side of the thin film relative to the protruding portion 191, thereby providing two flow paths.

[0070] As shown in FIGs. 4E to 4G, the communication portion 19a of the flow path opening member 19 may have a substantially cylindrical shape and have two to four through holes 192 with its lumen divided into two to four, thereby providing two to four flow paths. In this case, the first rib 198 and the second rib 199 are formed on a surface of the communication portion 19a facing an inner peripheral surface of the first tubular portion, i.e., an outer peripheral surface of the communication portion 19a.

[0071] In the present embodiment, the cap 13 need not include the second tubular portion 21b and the second cylindrical portion 19c.

25 [0072] (Embodiment 2)

Another exemplary cap according to the present invention and another exemplary nutrient container using the cap according to the present invention will be described with reference to FIGs. 7 to 11B.

[0073] FIG. 7 is a partial perspective view of an example of a nutrient container of the present embodiment. FIG. 8 is an exploded perspective view. FIG. 9A is a partially enlarged cross-sectional view of the nutrient container of the present embodiment. FIG. 9B is a partially enlarged cross-sectional schematic view of FIG.

9A. FIG. 9C is a partially enlarged cross-sectional view of FIG. 9A. FIG. 10A is a cross-sectional perspective view for explaining a flow path opening member of a cap shown in FIG. 9A. FIG. 10B is a bottom view of the flow path opening member shown in FIG. 10A.

5 [0074] As shown in FIGs. 7 to 10B, a cap 43 and a nutrient container 40 of the present embodiment have the same configurations as the cap and the nutrient container of Embodiment 1 except for the maintaining structure of the flow path opening member 19 with respect to the first tubular portion 21a. The same components are denoted with the same reference numerals, and the description
10 thereof will be omitted. Although FIG. 9B is a cross-sectional view, hatching is not given for the sake of clarity.

[0075] In the present embodiment, the communication portion 19a of the flow path opening member 19 includes a male thread 200 formed on its outer peripheral surface (a surface of the communication portion 19a facing the inner peripheral surface of the
15 first tubular portion). As shown in FIGs. 10A and 10B, each part of the male thread 200 is formed on a side surface of each of the partition walls 193, and thus the male thread 200 is not continuous. The first tubular portion 21a includes a female thread 212 that is formed on its inner peripheral surface and can be screwed with the male thread 200. The second tubular portion 21b includes a first hook portion 211b formed
20 at its end, and the second cylindrical portion 19c includes a second hook portion 191c formed at its end.

[0076] As shown in FIG. 9B, in the first attachment state, the male thread 200 may or may not be fitted with the female thread 212 unless the thin film 16 (see FIG. 9A) is broken by the piercing portion 194. However, a surface 200a of the male thread 200
25 facing the female thread 212 at an end on a screw-starting side is in contact with, for example, a surface 212a of the female thread 212 facing the male thread 200 on a screw-starting side. Consequently, unless the flow path opening member 19 is rotated around its central axis, even if a force is applied to the flow path opening member 19 to press the flow path opening member 19 toward the thin film 16, the flow
30 path opening member 19 is prevented from being forced toward the thin film 16 because the surface 200a and the surface 212a collide with each other. Unless the flow path opening member 19 is rotated with respect to the first tubular portion 21a,

the thin film 16 is not broken by the communication portion 19a.

[0077] Further, as shown in FIGs. 9B and 9C, the second hook portion 191c is arranged closer to the top plate portion 17 (see FIG. 9A) than the first hook portion 211b, so that the flow path opening member 19 cannot be removed from the attachment portion 21 unless the second hook portion 191c goes over the first hook portion 211b. In the first attachment state, the second hook portion 191c may be latched by the first hook portion 211b.

[0078] When the flow path opening member 19 in the first attachment state is rotated around its central axis until the male thread 200 and the female thread 212 are screwed together, the thin film 16 is broken by the piercing portion 194 of the communication portion 19a, allowing the liquid material filled in the bottle main body 11 as a container main body portion to flow out of the nutrient container through a plurality of flow paths as shown in FIG. 11A. Simultaneously, the inner peripheral surface of the first cylindrical portion 19b comes into intimate contact with the outer peripheral surface of the first tubular portion 21b, whereby the flow path opening member 19 is attached to the cap main body portion 22 so that no leakage occurs (second attachment state).

[0079] As shown in FIG. 11B, after the protruding portion 191 of the flow path opening member 19 in the second attachment state is press-fitted into the connector 25 of the liquid-sending circuit 27, the connector 25 is rotated around its central axis with respect to the cap 43 with the holding portions 31 held. Due to the rotation of the connector 25, the lock protrusion 197 (see FIG. 3E etc.) slides over the surface 321h of the engagement wall 321d on the bridge portion 322 side while being pressed against the surface 321h and then is fitted into the lock concave portion 321g (see FIG. 6A). Due to the fitting of the lock protrusion 197 into the lock concave portion 321g, the connected state of the connector 25 with respect to the cap 43 can be maintained stably.

[0080] (Embodiment 3)

Another exemplary cap according to the present invention and another exemplary nutrient container using the cap according to the present invention will be described with reference to FIGs. 12A and 12B.

[0081] FIG. 12A is a partial cross-sectional perspective view showing an example of

a nutrient container. FIG. 12B is a partially enlarged cross-sectional schematic view of FIG. 12A. As shown in FIGs. 12A and 12B, a cap and a nutrient container have the same configurations as the cap and the nutrient container of Embodiment 2 except that the flow path opening member 19 does not include the second cylindrical portion and the second tubular portion. The same components are denoted with the same reference numerals, and the description thereof will be omitted.

[0082] FIGs. 12A and 12B show the nutrient container in the first attachment state. The flow path opening member 19 is rotated around its central axis once or more, for example, so that the screw-starting side of the male thread 200 is screwed with the screw-starting side of the female thread 212 such that a part of the male thread on the screw-starting side is inserted in a thread groove of the female thread 212. Thus, unless the flow path opening member 19 is rotated around its central axis in a direction opposite to the rotation direction in which the male thread 200 is screwed with the female thread 212, the flow path opening member 19 cannot be removed from the first tubular portion (tubular portion) 21a (first attachment state).

[0083] Further, unless the flow path opening member 19 is rotated around its central axis, the thin film 16 is not broken by the communication portion 19a.

[0084] When the flow path opening member 19 in the first attachment state is rotated around its central axis until the male thread 200 and the female thread 212 are screwed together further, the thin film 16 (see FIG. 12A) is broken by the piercing portion 194 of the communication portion 19a, allowing the liquid material filled in the bottle main body as a container main body portion to flow out of the nutrient container through a plurality of flow paths. Simultaneously, the inner peripheral surface of the first cylindrical portion (cylindrical portion) 19b comes into intimate contact with the outer peripheral surface of the first tubular portion (tubular portion) 21b, whereby the flow path opening member 19 is attached to the cap main body portion 22 so that no leakage occurs (second attachment state).

[0085] (Embodiment 4)

Another exemplary cap according to the present invention and another exemplary nutrient container using the cap according to the present invention will be described with reference to FIGs. 13 to 15D.

[0086] FIG. 13 is a partial perspective view of an example of a nutrient container of

the present embodiment. FIG. 14 is an exploded perspective view. As shown in FIGs. 13 and 14, a cap and a nutrient container have the same configurations as the cap and the nutrient container of Embodiment 1 except that a protection cover 60 for protecting the flow path opening member 19 is attached to the cap 13. The same components are denoted with the same reference numerals, and the description thereof will be omitted.

[0087] In the present embodiment, the protection cover 60 protects the flow path opening member 19, thereby preventing an external force from being applied to the flow path opening member 19 when not required. Consequently, it is possible to prevent the thin film 16 from being broken by the communication portion 19a forced toward the container main body portion due to the flow path opening member 19 being forced toward the bottle main body 11 as a container main body portion by an external force applied to the flow path opening member 19 when not required.

[0088] As shown in FIGs. 15A to 15D, the protection cover 60 includes a cover main body 61 for covering the flow path opening member 19 and a pair of brim portions 62 each including an engagement wall 621d as an engagement portion that can be engaged with the claw portion 19e (see FIG. 3E etc.) of the cap 13. The engagement wall 621d of the brim portion 62 of the protection cover 60 has the same structure as the engagement wall 321d of the brim portion 32 of the connector 25 as shown in FIGs. 6A to 6E.

[0089] The protection cover 60 is attached from an outer surface side of the top plate portion 17 so that the flow path opening member 19 and the attachment portion 21 are accommodated in the cover main body 61, and is rotated around its central axis until the lock protrusion 197 (see FIG. 3E etc.) of the claw portion 19e of the cap 13 is fitted into a lock concave portion 621g formed on a lower surface (a surface on a concave portion 618 side) of the engagement wall 621d at an end on a non-passage region 621c side, whereby a state where the protection cover 60 is attached to the cap 13 can be maintained stably.

[0090] Each of the brim portions 62 of the protection cover 60 includes an arc-shaped wall 621 whose end surface comes into contact with the top plate portion 17 of the cap 13 when the protection cover 60 is attached to the cap 13 with the flow path opening member 19 assuming the first attachment state 13. Thus, the attachment

state of the protection cover 6 with respect to the cap 13 is maintained stably.

[0091] The protection cover 60 also can be attached to the cap and the nutrient container according to any of Embodiments 2 and 3.

[0092] Also in the present embodiment, as in Embodiments 1 to 3, it is possible not
 5 only to solve a problem of an improper connection of a liquid-sending circuit for use in an intravenous nutrition therapy but also to supply the liquid material such as a nutrient sanitarly in a simple manner. Simply by removing the protection cover 60 from the cap, applying a force to move the communication portion 19a toward the thin film 16 to break the thin film 16, and connecting the liquid-sending circuit 27 to the
 10 cap (see FIGs. 5A to 5C etc.), the liquid material can be supplied to a patient.

[0093] In FIG. 5A and the like showing the liquid-sending circuit 27, only the connector 25 and a part of the flexible tube 26 are shown for the sake of illustration. However, the liquid-sending circuit to be connected to the cap and the nutrient container in any of Embodiments 1 to 4 further may include components provided in a
 15 liquid-sending circuit used in a conventionally known transintestine nutrition therapy, such as a flow rate adjuster for adjusting the flow rate of the liquid material flowing through the flexible tube 26 by pressing the flexible tube 26, a drip tube, a connector to be connected to a nasotracheal tube or the like fixed to a patient, a cover of the connector, and the like.

20 Industrial Applicability

[0094] The present invention can provide a cap of a nutrient container, a nutrient container using the same, and a nutrient supply set including a nutrient container and a liquid-sending circuit that are suitable for use in a transintestine nutrition therapy.

Explanation of Letters or Numerals

- 25 [0095] 10, 40 Nutrient container
- 11 Bottle main body (container main body portion)
 - 12 Mouth portion
 - 13, 43 Cap
 - 16 Thin film
 - 30 17 Top plate portion
 - 18 Side wall portion
 - 19a Communication portion

	19b	First cylindrical portion (cylindrical portion)
	19c	Second cylindrical portion
	19e	Claw portion
	194	Piercing portion
5	191	Protruding portion
	191c	Second hook portion
	192	Through hole
	193	Partition wall
	197	Lock protrusion
10	198	First rib (rib)
	199	Second rib
	20	Base
	21	Attachment portion
	21a	First tubular portion (tubular portion)
15	21b	Second tubular portion
	21c, 190b	Linear rib
	21d, 190a	Linear groove
	211	Annular groove
	211b	First hook portion
20	22	Cap main body portion
	25	Connector
	26	Flexible tube
	27	Liquid-sending circuit
	321g	Lock concave portion
25	200	Male thread

CLAIMS

[1] A cap that is to be secured to a mouth portion of a container main body portion of a nutrient container through which a liquid material filled in the container main body portion flows out, and to which a connector can be connected,

5 wherein a thin film that seals the container main body portion is attached to the mouth portion, the cap comprising:

a cap main body portion including: a top plate portion that faces an opening of the mouth portion; a side wall portion that surrounds an outer peripheral surface of the mouth portion when the cap is secured to the mouth portion; and a tubular portion
10 that protrudes outward from the top plate portion;

a flow path opening member attached to the tubular portion; and

a connection maintaining structure that can maintain a connected state with respect to the connector,

wherein the flow path opening member includes: a communication portion
15 including a piercing portion that can pierce the thin film and a flow path through which the liquid material filled in the container main body portion can flow out of the nutrient container; and a cylindrical portion that is arranged integrally with and around the communication portion, and

the flow path opening member can assume a first attachment state and a
20 second attachment state with respect to the tubular portion as follows:

in the first attachment state, the flow path opening member is attached to the tubular portion such that an end of the piercing portion is held at a position not in contact with the thin film or in contact with the thin film without pressing the thin film, while

25 in the second attachment state, the flow path opening member is attached to the tubular portion such that the thin film is broken by the piercing portion and an inner peripheral surface of the cylindrical portion is held in contact with an outer peripheral surface of the tubular portion.

[2] The cap according to claim 1,

30 wherein the communication portion further includes a rib,

the tubular portion further includes an annular groove that is formed on an inner peripheral surface of the tubular portion and into which the rib can be fitted, and

the first attachment state is maintained by the rib and the annular groove fitted together.

[3] The cap according to claim 2,

wherein assuming that the rib is a first rib, the communication portion further
5 includes a second rib arranged farther from the piercing portion than the first rib, and
the second attachment state is maintained by the second rib and the annular groove fitted together.

[4] The cap according to any one of claims 1 to 3,

wherein assuming that the tubular portion is a first tubular portion, the cap
10 main body portion further includes a second tubular portion that is arranged so as to
surround the first tubular portion, protrudes outward from the top plate portion, and
is provided with a linear rib formed on an outer peripheral surface of the second
tubular portion,

assuming that the cylindrical portion is a first cylindrical portion, the flow
15 path opening member further includes a second cylindrical portion that is arranged so
as to surround the first cylindrical portion, is arranged outside the second tubular
portion, protrudes toward the cap main body portion from a top surface portion of the
flow path opening member, and is provided with a linear groove formed on an inner
peripheral surface of the second cylindrical portion,

20 a longitudinal direction of the linear rib coincides with an axis direction of the
second tubular portion, and

the linear rib is inserted slidably in the linear groove.

[5] The cap according to any one of claims 1 to 3,

wherein assuming that the tubular portion is a first tubular portion, the cap
25 main body portion further includes a second tubular portion that is arranged so as to
surround the first tubular portion, protrudes outward from the top plate portion, and
is provided with a linear groove formed on an outer peripheral surface of the second
tubular portion,

assuming that the cylindrical portion is a first cylindrical portion, the flow
30 path opening member further includes a second cylindrical portion that is arranged so
as to surround the first cylindrical portion, is arranged outside the second tubular
portion, protrudes toward the cap main body portion from a top surface portion of the

flow path opening member, and is provided with a linear rib formed on an inner peripheral surface of the second cylindrical portion,

a longitudinal direction of the linear groove coincides with an axis direction of the second tubular portion, and

5 the linear rib is inserted slidably in the linear groove.

[6] The cap according to claim 1,

wherein assuming that the tubular portion is a first tubular portion, the cap main body portion further includes a second tubular portion that is arranged so as to surround the first tubular portion, protrudes outward from the top plate portion, and

10 is provided with a first hook portion formed at an end of the second tubular portion,

assuming that the cylindrical portion is a first cylindrical portion, the flow path opening member further includes a second cylindrical portion that is arranged so as to surround the first cylindrical portion, is arranged outside the second tubular portion, protrudes toward the cap main body portion from a top surface portion of the

15 flow path opening member, and is provided with a second hook portion formed at an end of the second cylindrical portion,

the communication portion further includes a male thread formed on an outer peripheral surface of the communication portion,

20 the first tubular portion further includes a female thread that is formed on an inner peripheral surface of the first tubular portion and can be screwed with the male thread, and

in the first attachment state, a surface of the male thread facing the female thread at an end on a screw-starting side is in contact with a surface of the female thread facing the male thread, and the second hook portion is arranged closer to the top plate portion than the first hook portion.

25 [7] The cap according to claim 1,

wherein the communication portion further includes a male thread formed on an outer peripheral surface of the communication portion,

30 the tubular portion further includes a female thread that is formed on an inner peripheral surface of the tubular portion and can be screwed with the male thread, and

in the first attachment state, a screw-starting side of the male thread and a

screw-starting side of the female thread are screwed together so that the flow path opening member cannot be removed from the tubular portion unless the flow path opening member is rotated around a central axis of the flow path opening member in a direction opposite to a direction in which the male thread and the female thread are
 5 screwed together.

[8] The cap according to any one of claims 1 to 7, wherein the communication portion includes a plurality of flow paths and is provided with holes, each constituting a part of each of the flow paths, on an end surface on a side opposite to the thin film.

[9] The cap according to any one of claims 1 to 8, wherein the communication
 10 portion includes a plurality of flow paths, includes a protruding portion arranged at an end on the side opposite to the thin film, is provided with holes, each constituting a part of each of the flow paths, in the protruding portion, and includes a partition wall that is arranged on a side of the thin film relative to the protruding portion so as to divide a space in a direction of extension of the holes.

15 [10] The cap according to any one of claims 1 to 9, further comprising a protection cover that covers the flow path opening member in the first attachment state and includes an engagement portion capable of being engaged with the connection maintaining structure.

[11] A nutrient container comprising:
 20 a container main body portion including a mouth portion;
 a liquid material filled in the container main body portion;
 a thin film that is attached to the mouth portion to seal the container main body portion; and
 the cap according to any one of claims 1 to 10 that is secured to the mouth
 25 portion.

[12] A nutrient supply set comprising:
 the nutrient container according to claim 11; and
 a liquid-sending circuit that includes: a connector including an engagement portion capable of being engaged with the connection maintaining structure of the cap;
 30 and a liquid-sending tube connected to the connector.