DESCRIPTION

MEDICAL PORT, NUTRIENT CONTAINER EMPLOYING SAME, AND NUTRIENT SUPPLY SET

Technical Field

[0001] The present invention relates to a medical port that is to be secured to a container main body portion of a nutrient container so as to allow communications between the inside and the outside of the container main body portion, a nutrient container including the medical port secured to the container main body portion, and a nutrient supply set.

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-delivery circuit) inserted in the vein of a patient.

[0003] FIG. 15 is a schematic view showing an exemplary configuration of a transintestine nutrient set used for a conventional transintestine nutrition therapy. A container main body portion 101 of a nutrient container 100 is filled with a nutrient. A thin film (not shown) is mounted to a mouth portion 102 through which the nutrient in the container main body portion 101 flows out, thereby sealing the container main body portion 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.

[0004] FIG. 16 is a schematic view showing an exemplary configuration of an infusion set used for a conventional intravenous nutrition therapy. A bag main 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 needle 114 is inserted into a connecting-needle port 113. 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 Documents

Patent documents

[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 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 so as 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 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 medical port 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.

Means for Solving Problem

[0008] A medical port of the present invention is a medical port to be secured to a container main body portion of a nutrient container so as to allow communications between the inside and the outside of the container main body portion,

the medical port including:

a port main body portion including a top plate portion that faces the inside of the container main body portion in a state where the medical port is secured to the container main body portion; a side wall portion that is arranged on one main surface of the top plate portion and is to be secured to the container main body portion; and an attachment portion that includes a tubular portion protruding on the top plate portion on a side opposite to the side wall portion and having a through hole being in communication with a space surrounded by the side wall portion;

a thin film that is mounted to the port main body portion and arranged on an extension of the through hole inside the container main body portion in a state where the medical port is secured to the container main body portion so as to block a flow of a liquid material within the container main body portion out of the nutrient container;

a flow path opening member that is attached to the attachment portion; and

a connection maintaining portion that is provided to either the port main body portion or the flow path opening member and that can maintain a connected state with respect to a connector,

wherein the flow path opening member includes: a communication portion 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 attachment portion as follows:

in the first attachment state, the flow path opening member is attached to the attachment 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 attachment 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.

[0009] A nutrient container of the present invention includes a container main body

portion including a flexible bag-like member; and the medical port of the present invention which is secured to the container main body portion.

[0010] A nutrient supply set of the present invention includes the nutrient container of the present invention, and a liquid-delivery circuit that includes: a connector including an engagement portion capable of being engaged with the connection maintaining portion of the medical port; and a liquid-delivery 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-delivery circuit for use in an intravenous nutrition therapy is connected by mistake to a nutrient container and to provide a medical port 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 front view showing an example of a nutrient container according to Embodiment 1.

[FIG. 2A] FIG. 2A is an enlarged perspective view showing an example of a medical port of the present invention that constitutes the nutrient container shown in FIG. 1.

[FIG. 2B] FIG. 2B is a plan view of the medical port shown in FIG. 2A.

[FIG. 2C] FIG. 2C is a bottom view of the medical port shown in FIG. 2A.

[FIG. 2D] FIG. 2D is a side view of the medical port shown in FIG. 2A.

[FIG. 2E] FIG. 2E is another side view of the medical port shown in FIG. 2A.

[FIG. 2F] FIG. 2F is a cross-sectional view of the medical port shown in FIG. 2A.

[FIG. 2G] FIG. 2G is a partially enlarged view of the medical port shown in FIG. 2F.

[FIG. 2H] FIG. 2H is a partially enlarged view for explaining another example of a medical port of the present invention.

[FIG. 3A] FIG. 3A is a perspective cross-sectional view for explaining a flow

path opening member of the medical port shown in FIG. 2A.

[FIG. 3B] FIG. 3B is a bottom view of the flow path opening member shown in FIG. 3A.

[FIG. 3C] FIG. 3C is a perspective cross-sectional view for explaining another example of the flow path opening member.

[FIG. 3D] FIG. 3D is a perspective cross-sectional view for explaining another example of the flow path opening member.

[FIG. 3E] FIG. 3E is a perspective cross-sectional view for explaining another example of the flow path opening member.

[FIG. 3F] FIG. 3F is a perspective cross-sectional view for explaining another example of the flow path opening member.

[FIG. 3G] FIG. 3G is a perspective cross-sectional view for explaining another example of the flow path opening member.

[FIG. 4A] FIG. 4A is a cross-sectional view for explaining a state immediately before a liquid-delivery circuit is connected to the medical port shown in FIG. 2A.

[FIG. 4B] FIG. 4B is a cross-sectional view for explaining a state where the liquid-delivery circuit is being attached to the medical port shown in FIG. 2A and a state where a thin film is broken by the flow path opening member.

[FIG. 4C] FIG. 4C is a cross-sectional view for explaining a state where the liquid-delivery circuit is being attached to the medical port shown in FIG. 2A and a state where a protruding portion of the medical port is inserted completely into an insertion portion of a connector of the liquid-delivery circuit.

[FIG. 4D] FIG. 4D is a partially enlarged view of FIG. 4C.

[FIG. 5A] FIG. 5A is a perspective view of an example of a connector to be connected to the medical port shown in FIG. 2A.

[FIG. 5B] FIG. 5B is a plan view of the connector shown in FIG. 5A.

[FIG. 5C] FIG. 5C is a bottom view of the connector shown in FIG. 5A.

[FIG. 5D] FIG. 5D is a side view of the connector shown in FIG. 5A.

[FIG. 5E] FIG. 5E is another side view of the connector shown in FIG. 5A.

[FIG. 6] FIG. 6 is a partial perspective view showing an example of a nutrient container according to Embodiment 2.

[FIG. 7A] FIG. 7A is an enlarged perspective view showing an example of a

medical port of the present invention that constitutes the nutrient container shown in FIG. 6.

[FIG. 7B] FIG. 7B is a plan view of the medical port shown in FIG. 7A.

[FIG. 7C] FIG. 7C is a bottom view of the medical port shown in FIG. 7A.

[FIG. 7D] FIG. 7D is a side view of the medical port shown in FIG. 7A.

[FIG. 7E] FIG. 7E is another side view of the medical port shown in FIG. 7A.

[FIG. 7F] FIG. 7F is a cross-sectional view of the medical port shown in FIG. 7A.

[FIG. 8A] FIG. 8A is a partially enlarged cross-sectional schematic view of the medical port shown in FIG. 7A.

[FIG. 8B] FIG. 8B is a partially enlarged cross-sectional view of the medical port shown in FIG. 7A.

[FIG. 9A] FIG. 9A is a perspective cross-sectional view for explaining a flow path opening member of the medical port shown in FIG. 7A.

[FIG. 9B] FIG. 9B is a bottom view of the flow path opening member shown in FIG. 9A.

[FIG. 10A] FIG. 10A is a cross-sectional view showing a state where a thin film is broken by the flow path opening member in the medical port shown in FIG. 7A.

[FIG. 10B] FIG. 10B is a cross-sectional view showing a state where a liquid-delivery circuit is being attached to the medical port shown in FIG. 10A.

[FIG. 11A] FIG. 11A is a cross-sectional view showing an example of a medical port according to Embodiment 3.

[FIG. 11B] FIG. 11B is a partially enlarged cross-sectional schematic view of the medical port shown in FIG. 11A.

[FIG. 12] FIG. 12 is a front view showing an example of a nutrient container according to Embodiment 4.

[FIG. 13A] FIG. 13A is a perspective view of a protection cover constituting the nutrient container shown in FIG. 12.

[FIG. 13B] FIG. 13B is a top view of the protection cover shown in FIG. 13A.

[FIG. 13C] FIG. 13C is a bottom view of the protection cover shown in FIG. 13A.

[FIG. 13D] FIG. 13D is a side view of the protection cover shown in FIG. 13A.

[FIG. 13E] FIG. 13E is another perspective view of the protection cover shown in FIG. 13A.

[FIG. 14] FIG. 14 is a front view showing another example of a nutrient container of the present invention.

[FIG. 15] FIG. 15 is a schematic view of an exemplary configuration of a transintestine nutrient set used for a conventional transintestine nutrition therapy.

[FIG. 16] FIG. 16 is a schematic view of an exemplary configuration of an infusion set used for a conventional intravenous nutrition therapy.

Description of the Invention

[0013] In a preferred example of a medical port according to the present invention, the communication portion further includes a rib, and 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. The first attachment state is maintained by the rib and the annular groove fitted together.

[0014] In a preferred example of the medical port 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 medical port 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 second attachment state has been obtained because vibrations are created when the second rib is fitted into the annular groove. Furthermore, it is preferable that the flow path opening member can be shifted from the first attachment state to the second attachment state simply by pressing the communication portion in its axis direction.

[0015] In a preferred example of the medical port according to the present invention, assuming that the tubular portion is a first tubular portion, the port main body portion further includes a second tubular portion that is arranged to surround the first tubular portion, protrudes on the top plate portion on a side opposite to the side wall 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 to surround the first cylindrical portion, is arranged outside the second tubular portion, protrudes toward the port main body portion from an upper 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 medical port 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 medical port.

[0016] In a preferred example of the medical port according to the present invention, assuming that the tubular portion is a first tubular portion, the port main body portion further includes a second tubular portion that is arranged to surround the first tubular portion, protrudes on the top plate portion on a side opposite to the side wall 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 port main body portion from an upper 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 example of the medical port 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 medical port.

[0017] In a preferred example of the medical port according to the present invention, assuming that the tubular portion is a first tubular portion, the port main body portion further includes a second tubular portion that is arranged to surround the

first tubular portion, protrudes on the top plate portion on a side opposite to the side wall 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 further includes a second cylindrical portion that is arranged to surround the first cylindrical portion, is arranged outside the second tubular portion, protrudes toward the port main body portion from an upper 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 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 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 medical port 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.

[0018] In a preferred example of the medical port 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 medical port 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-delivery 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 medical port 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 medical port 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 portion. 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 of the flow path opening member 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 medical port according to the present invention and an exemplary nutrient container using the medical port according to the present invention will be described with reference to FIGs. 1 to 5E.

[0023] FIG. 1 is a front view showing an example of a nutrient container of the present embodiment. FIG. 2 A is an enlarged perspective view showing an example of a medical port 13 of the present embodiment that constitutes the nutrient container shown in FIG. 1. FIG. 2B is a plan view of the medical port 13. FIG. 2C is a bottom view of the medical port 13. FIG. 2D is a side view of the medical port 13. FIG. 2E is another side view of the medical port 13. FIG. 2F is a cross-sectional view of the medical port 13. And FIG. 2G is a partially enlarged view of the medical port 13 shown in FIG. 2F.

[0024] For the convenience of description, for the flow path opening member 19 depicted in FIGs. 2A-2H, the direction parallel to the central axis 19n of the flow path opening member 19 is indicated as Z-axis, the longitudinal direction of the top plate portion 17 orthogonal to the Z-axis is indicated as X-axis, and a direction orthogonal to both the Z-axis and the X-axis is indicated as Y-axis, as shown in FIG. 2A and the like. The Z-axis direction is regarded as "up-and-down direction". The side pointed by an arrow on the Z-axis (namely, the upper side of the drawing surface of FIG. 2A) is

regarded as "upper side" or "end side", and the opposite side (namely, the lower side of the drawing surface of FIG. 2A) is regarded as "lower side" or "base end side".

[0025] As shown in FIG. 1, a nutrient container 10 includes a container main body portion 11 that includes a flat and flexible bag-like member 29, a liquid material (not shown) that contains a nutrient and is filled in the container main body portion 11, and a medical port 13 secured at a bottom end of the container main body portion 11. At the upper part of the flexible bag-like member 29, a hanger portion 28 for hanging the nutrient container 10 on a stand or the like is provided.

[0026] The container main body portion 11 is formed by, for example, laminating two soft resin sheets 16a, 16b and heat-sealing (bonding by heat) their rims to each other. The reference sign 2 in FIG. 1 denotes the heat-sealed region of the two soft resin sheets 16a, 16b (the dotted part in FIG. 1). The medical port 13 is sandwiched between the soft resin sheets 16a, 16b and thus secured to the container main body portion 11. The medical port 13 can be integrated with the soft resin sheets 16a, 16b by for example heat-sealing the heat-sealed region 2 of the soft resin sheets 16a, 16b in a state arranged between the soft resin sheets 16a, 16b.

[0027] Although there is no particular limitation on the soft resin sheets 16a and 16b, for example, a conventionally-known soft resin sheet to be applied for a medical soft container can be used. The specific examples include: a single-layer sheet formed of a vinyl chloride resin, polyethylene, an ethylene-vinyl acetate copolymer, polyester, polybutadiene, polypropylene, polyamide, an ethylene-methacrylate copolymer, and the like; and a laminated sheet composed of at least two of the single-layer sheets. Specific examples of the structure of the laminated sheet are nylon/polyethylene, nylon/polypropylene, polyethylene terephthalate / polyethylene, polyethylene terephthalate / polypropylene, polypropylene/polyethylene, nylon/polypropylene/polyethylene, and the like. Alternatively, it may be a laminated sheet formed by laminating the same kind of resins different in the grades (for example, different from each other in the film-formation method, mechanical characteristics, compositions or the like): for example, 'biaxially-stretched polypropylene (OPP)' / 'unstretched polypropylene (CPP)' and the like. It is preferable that the surface of the side to be heat-sealed is composed of a material to be easily heat-sealed (e.g., polypropylene). Although the thickness of the soft resin

sheets 16a, 16b is not limited in particular, it is about 0.1 to 0.6 mm for example. Preferably, the soft resin sheets 16a, 16b have translucency (or semi-transparency) so that the liquid material in the flexible bag-like member 29 can be recognized visually from the outside. It is more preferable that the soft resin sheets 16a, 16b are transparent.

[0028] For example, in a case where the container main body portion 11 is formed of a hard material, when the liquid material filled in the container main body portion 11 flows out through the medical port 13, the pressure inside the container main body portion 11 is lowered. However, if the bag-like member of the container main body portion 11 is the flexible bag-like member 29 formed of a soft material such as a soft resin sheet or the like, the flexible bag-like member 29 transforms due to the outflow of the liquid material, whereby the outflow of the liquid material continues.

[0029] As shown in FIGs. 2A-2G, the medical port 13 includes a port main body portion 22 and a flow path opening member 19 attached to the port main body portion 22. The flow path opening member 19 is formed independently from the port main body portion 22 and then attached to the port main body portion 22.

[0030] As shown in FIGs. 2A to 2G, the port main body portion 22 of the medical port 13 includes a base 20 and an attachment portion 21 to which the flow path opening member 19 is to be attached. The base 20 includes a top plate portion 17 including a plane parallel to the XY plane, and a side wall portion 18 arranged to stand in parallel to the Z-axis from one of the main surfaces of the top plate portion 17 downward and that can be secured to the inner surface of the container main body portion 11 (see FIG. 1). Therefor, at a part situated lower than the top plate portion 17 of the port main body portion 22 (i.e., on the side opposite to the attachment portion 21), a cylindrical space 20a (see FIG. 2F) is present for example, which is surrounded by the side wall portion 18. The space 20a is in communication with the inside of the container main body portion 11 in a state where the medical port 13 is secured to the container main body portion 11. As shown in FIG. 1, in a state where the medical port 13 is secured to the container main body portion 11 (see FIG. 1), both the attachment portion 21 and the flow path opening member 19 are arranged entirely outside of the container main body portion 11, while at least one part of the port main body portion 22 is arranged inside of the container main body portion 11.

[0031] As shown in FIG. 2F, the attachment portion 21 includes a tubular portion 21a and a second tubular portion 21b that protrude upward from the top plate portion 17 (on the side of the top plate portion 17 opposite to the side wall portion 18). The second tubular portion 21b is arranged around the first tubular portion 21a at a distance from the first tubular portion 21a. The first tubular portion 21a has a through hole 21e penetrating the top plate portion 17 in the up-and-down direction (thickness direction), and the through hole 21e is in communication with a lower space 20a under the through hole 21e. Alternate long and short dashed lines 151 indicate a central axis of the first tubular portion 21a and the second tubular portion 21b, and coincides with the central axis 19n of the flow path opening member 19 (see FIG. 2A). In the example shown in FIGs. 2A to 2F, 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 of the flow path opening member 19 described later is formed.

[0033] As shown in FIGs. 2A and 2D to 2G, 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 151 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. 2F and 2G, on an inner peripheral surface of a second cylindrical portion 19c of the flow path opening member 19 described below, a pair of linear grooves 190a are formed to receive the pair of linear ribs 21c slidably. Each of the linear 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 19n (see FIG. 2A). Consequently, it is easy to perform rotation for fitting a lock protrusion 197 (see FIGs. 2D, 2E) into a lock concave portion 321g (see FIG. 5A) of a connector 25 of a liquid-delivery circuit 27 (see FIG. 5A etc.) described later and for engaging the claw portion 19e and an engagement wall 321d of the connector 25.

[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 medical port shown in FIGs. 2A to 2G, 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 medical port of the present invention, as shown in FIG. 2H, the second tubular portion 21b may include a pair of linear grooves 21d on the outer peripheral surface, and the second cylindrical portion 19c may include a pair of linear ribs 190b on the inner peripheral surface, so that each of the linear ribs 190b is inserted slidably into each of the linear grooves 21d.

[0036] As shown in FIG. 2C, the outer peripheral surface 18a of a side wall portion 18 surrounding the space 20a is shaped as a substantial rhombus when observed along the Z-axis direction, and the width at the respective ends of the substantial rhombus in the X-axis direction are decreased gradually toward the corners. Therefore, at a time of sandwiching the side wall portion 18 between the two soft resin sheets 16a, 16b constituting the container main body portion 11 (see FIG. 1) so as to secure the medical port 13 to the soft resin sheets 16a, 16b by heat sealing, at the border between the area where the soft resin sheets 16a, 16b come into intimate contact with each other and the area where the soft resin sheets 16a, 16b come into intimate contact with the side wall portion 18, failure in sealing can be suppressed, and thus it is preferred.

[0037] As shown in FIGs. 2F, 2G and 2H, on the lower surface 17a of the top plate portion 17 (the surface of the top plate portion 17 facing the space 20a), a thin film 16 to block the communications of the liquid material between the through hole 21e and the space 20a is mounted. Therefore, as shown in FIG. 1, even when the nutrient container 10 is set so that the medical port 13 faces downward, the liquid material in the nutrient container 10 will not leak out from the nutrient container 10. Since the thin film 16 is bonded to the lower surface 17a of the top plate portion 17 so as to seal the through hole 21e, it can be regarded as being arranged on the extension of the through hole 21e.

[0038] Examples of the material for the thin film 16 include an aluminum foil, a laminated film made of paper and an aluminum foil, a resin film including the same resin as the resin included in the base 20, and the like. The resin film may be any of a single-layer film or a laminated film composed of a plurality of layers. In particular,

from the viewpoint of securing high adhesiveness due to heat-melting of the thin film 16 with respect to the base 20 of the port main body portion 22, a preferred resin film contains, on the surface to be in contact with the port main body portion 22, the same resin as what is contained in the port main body portion 22. The thin film 16 may be transparent, semi-transparent or opaque. In FIG. 2C, the thin film 16 (and also in FIG. 7C etc.) is expressed as a dotted area for the sake of clarity.

[0039] The method for adhering the thin film 16 to the port main body portion 22 is selected suitably depending on the material of the thin film 16, the material of the port main body portion 22 and the like.

[0040] As shown in FIGs. 2F to 2H, 3A and 3B, the flow path opening member 19 of the medical port 13 includes the connection portion 19a (a part thereof has been inserted into the through hole 21e), a first cylindrical portion 19b, the second cylindrical portion 19c, an upper surface portion 19d, and a pair of claw portions 19e. As shown in FIGs. 2D and 2E, the pair of claw portions 19e protrude outward from the outer peripheral surface of the upper surface portion 19d (in a direction parallel to the XY plane) around the second cylindrical portion 19c. A surface of each of the pair of claw portions 19e on a side opposite to the top plate portion 17 is in the same plane as an outer surface (upper surface) of the upper surface portion 19d. Each of the pair of claw portions 19e includes, on the surface facing the top plate portion 17, a lock protrusion 197 (see FIGs. 2D and 2E) that can be fitted into the lock concave portion 321g (see FIG. 5A) of the connector 25 of the liquid-delivery circuit 27 (see FIG. 4A etc.) described later. In other words, the pair of claw portions 19e function as a connection maintaining portion that can maintain a connected state with respect to the connector 25 of the liquid-delivery 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 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. 2F), 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 upper surface

portion 19d. In addition to that, in the second attachment state, the inner peripheral surface of the first cylindrical portion 19b comes into intimate contact with the outer peripheral surface of the first tubular portion 21a. Consequently, the flow path opening member 19 is constituted so that the liquid material does not leak from any part other than a flow path 211e (see FIG. 3e) 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 container main body portion 11 (see FIG. 1) to flow toward the flow path opening member 19.

[0043] As shown in FIG. 3A, 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 upper surface portion 19d (i.e., the upper surface portion 19d on a side opposite to the first cylindrical portion 19b) so as to be inserted into the connector 25 described later (see FIG. 4A etc.). 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. 3A, the communication portion 19a includes, below the protruding portion 191 (at the side closer to the thin film 16) (see FIG. 2F etc.), a plurality of partition walls 193 that partition a space (through hole 21e) on the thin film 16 side into a plurality of regions. The partition walls 193 are arranged so as to divide the space (through hole 21e) in the direction of an extension of the respective through holes 192. Consequently, when the flow path opening member 19 is pressed toward the thin film 16 side by the connector 25 for the purpose of connecting the connector 25 of the liquid-delivery circuit 27 (see FIG. 4A etc.) to the medical port 13 thereby allowing the piercing portion 194 to pierce the thin film 16, a plurality of spaces 196 that are formed due to the presence of the plurality of partition walls 193 and are open with respect to a space 20a of the port main body portion 22 (base 20) and the plurality of through holes 192 (see FIG. 3B) function as a plurality of flow paths 211e (see FIG. 3B) through which the liquid material filled in the container main body portion 11 can flow out of the nutrient container in the direction of an arrow X (see FIG. 3A). The flow path opening member 19 shown in FIGs. 3A and 3B 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. 3B, 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.

[0045] The communication portion 19a of the flow path opening member 19 includes the piercing portion 194 at an end closer to the thin film 16 in its axis direction (Z-axis direction). The piercing portion 194 has a pointed end so as to pierce the thin film 16. In the example shown in FIGs. 3A and 3B, each of the plurality of partition walls 193 includes an inclined surface 195 that is inclined toward 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. 3A, each of the partition walls 193 includes a first rib 198 and a second rib 199 formed on its side. In other words, the first rib 198 and the second rib 199 are formed on a surface of the communication portion 19a facing the inner peripheral surface of the first tubular portion. The plurality of first ribs 198 are arranged at a predetermined distance from the end of the communication portion 19a on the thin film 16 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 from the end of the communication portion 19a on the thin film side 16 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. 4A shows a state where the first ribs 198 are fitted into the annular groove 211, and FIG. 4B shows a state where the second ribs 199 are fitted into the annular groove 211.

[0048] There is no particular limitation on the material of the medical port 13 other than the thin film 16, as long as the material is harder than the material of the soft resin sheets 16a, 16b. The examples 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 medical port will be described with reference to FIGs. 5A to 5E.

[0050] FIG. 5A is a perspective view showing an exemplary schematic configuration

of the connector 25 to be connected to the medical port of the present invention. FIG. 5B is a plan view of the connector 25 shown in FIG. 5A. FIG. 5C is a bottom view of the connector 25 shown in FIG. 5A. FIG. 5D is a side view of the connector 25 shown in FIG. 5A. And FIG. 5E is another side view of the connector 25 shown in FIG. 6A.

[0051] As shown in FIGs. 5A to 5E, the female connector 25 includes an insertion portion 33, a liquid-delivery tube connecting portion 30, brim portions 32, and holding portions 31. When being connected to the medical port 13 secured to a mouth portion 12 of the container main body portion 11, the connector 25 allows the inside of the container main body portion 11 to communicate with a lumen of a flexible liquid-delivery tube 26 (see FIGs. 4A to 4C etc.) connected to the connector 25. The alternate long and short dashed lines 150 indicate central axes of the insertion portion 33 and the liquid-delivery tube connecting portion 30, which coincide with a central axis 151 of the first tubular portion 21a and the central axis 19n of the flow path opening member 19 in a state where the connector 25 is connected to the medical port 13. The direction of the central axis 150 in FIG. 5A is defined as an up-and-down direction, and an upper side on the drawing surface (side to be connected to the medical port) of FIG. 5A is referred to as an "upper side" and a lower side on the drawing surface is referred to as a "lower side".

[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. 3A etc.) of the medical port 13, and a small-diameter portion 33b with an inner diameter smaller than an outer 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 portion 191 comes into intimate contact with an inner peripheral surface of the large-diameter portion 33a when the protruding portion 191 of the medical port 13 is forced into the insertion portion 33 of the connector 25 so that the connector 25 and the medical port 13 are connected to each other. Thus, the medical port 13 and the

connector 25 can be connected reliably to each other without causing leakage of the liquid material (see FIG. 4D).

[0053] As shown in FIG. 5A, 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 medical port 13, the stepped surface 33c comes into contact with an end surface 191a of the protruding portion 191 (see FIG. 4D).

[0054] On a lower side relative to the small-diameter portion 33b, the liquid-delivery 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 150. Each of the brim portions 32 includes an arc-shaped wall 321 substantially along a cylindrical surface with the central axis 150 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. 5A and 5B, 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. 5B, 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 as an engagement portion capable of being engaged with the claw portion 19e of the medical port 13. An inner peripheral surface of the engagement wall 321d opposed to the central axis 150 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 150 so as 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 so as 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. 5C) 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. 5A, a pair of the holding portions 31 protruding outward (in a direction orthogonal to the central axis 150) 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 medical port 13 with the brim portions 32 (see FIG. 5A etc.) is performed with the pair of holding portions 31 held.

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

[0059] FIG. 4A shows a state immediately before the liquid-delivery circuit 27 including the connector 25 and the flexible liquid-delivery tube 26 connected to the connector 25 is connected to the medical port 13. FIG. 4B shows a state where the liquid-delivery circuit 27 is being connected to the medical port 13 and the thin film 16 is broken. FIG. 4C shows a state where the protruding portion 191 of the medical port 13 is inserted completely into the insertion portion 33 (see FIG. 5A) of the connector 25.

[0060] As shown in FIG. 4A, 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 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. 4B and 4C, 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 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 medical port 13, the flow path opening member 19 moves toward the container main body portion 11. In this state, the thin film 16 is broken by the piercing portion 194, and an inner peripheral surface of the first cylindrical member 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 port main body portion 22 so that no leakage occurs (second attachment state). Further, as shown in FIG. 4D, an outer peripheral surface 191b of the protruding portion 191 comes into intimate contact with the large-diameter portion 33a of the connector 25.

[0062] As shown in FIG. 4C, 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. 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.

[0063] Then, the connector 25 is rotated further around its central axis with respect to the medical port 13 with the holding portions 31 held. Due to the rotation of the connector 25, the lock protrusion 197 (see FIG. 2E 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. 5A). 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 medical port 13 can be maintained stably.

[0064] Since the connector 25 includes the convex portion 321f (see FIG. 5A)

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 medical port 13 to enter the lock concave portion 321g and move further until the claw portion 19e (see FIG. 2E 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.

[0065] Preferably, the claw portion 19e of the medical port 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 medical port 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 medical port 13 until the rotation is regulated.

[0066] Various known structures may be used to maintain the connection between the medical port 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 medical port 13 as a connection maintaining portion and the engagement wall 321d (see FIG. 8A) including the lock concave portion 321g of the connector 25. Although the connection maintaining portion is provided in the flow path opening member 19 in the present embodiment, it may be provided in the medical port main body portion 22.

[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-delivery tube 26 with respect to the connector 25.

[0068] The flow path opening member 19 is not limited to that shown in FIGs. 3A and 3B. For example, as shown in FIG. 3C, 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. 3D, the flow path opening member 19 may have two through holes 192 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. 3E to 3G, 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 medical port 13 need not include the second tubular portion 21b and the second cylindrical portion 19c.

[0072] (Embodiment 2)

Another exemplary medical port according to the present invention and another exemplary nutrient container using the medical port according to the present invention will be described with reference to FIGs. 6 to 11B.

[0073] FIG. 6 is a front view of an example of a nutrient container 10 according to the present embodiment. FIG. 7A is an enlarged perspective view showing an example of a medical port 43 of the present embodiment constituting the nutrient container shown in FIG. 6. FIG. 7B is a plan view of the medical port 43. FIG. 7C is a bottom view of the medical port 43. FIG. 7D is a side view of the medical port 43. FIG. 7E is another side view of the medical port 43. And FIG. 7F is a cross-sectional view of the medical port shown in FIG. 2A. FIG. 8A is a partially enlarged cross-sectional schematic view of the medical port 43, and FIG. 8B is a partially enlarged cross-sectional view of the medical port 43. FIG. 9A is a perspective cross-sectional view for explaining a flow path opening member 19 of the medical port 43, and FIG. 9B is a bottom view of the flow path opening member 19 shown in FIG. 9A.

[0074] As shown in FIGs. 6 to 8B, the medical port 43 and a nutrient container 10 of the present embodiment have the same configurations as the medical port and the nutrient container 10 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 thereof will be omitted. Similarly, the liquid-delivery circuit 27 shown in FIG. 10B has the same structure as the liquid-delivery circuit 27 to be connected to the medical port of Embodiment 1. Although FIG. 8B is a cross-sectional view, hatching is not

given for the sake of clarity.

[0075] As shown in FIGs. 9A and 9B, 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 first tubular portion 21a). As shown in FIGs. 9A and 9B, each part of the male thread 200 is formed on a side surface of each of the partition walls 193 (a surface facing the inner peripheral surface of the first tubular portion 21a), and thus the male thread 200 is not continuous. As shown in FIG. 7F and the like, 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 at its end, and the second cylindrical portion 19c includes a second hook portion 191c formed at its end.

[0076] As shown in FIG. 7F, 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 is broken by the piercing portion 194. However, as shown in FIG. 8A, a surface 200a of the male thread 200 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 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 around its central axis, the thin film 16 is not broken by the communication portion 19a.

[0077] Further, as shown in FIGs. 8A and 8B, 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 as shown in FIG. 10A, allowing the liquid material filled in the container main body portion 11 (see FIG. 6) to flow out of the nutrient container through a plurality of flow paths. 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 21a, whereby the flow path opening member 19 is attached to the port main body portion 22 so that no leakage occurs (second attachment state).

[0079] As shown in FIG. 10B, 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-delivery circuit 27, the connector 25 is rotated around its central axis with respect to the medical port 43 with the holding portions 31 held. Due to the rotation of the connector 25, the lock protrusion 197 (see FIGs. 7D, 7E 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. 5A). 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 medical port 43 can be maintained stably.

[0080] (Embodiment 3)

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

[0081] FIG. 11A is a cross-sectional view showing an example of a medical port of the present embodiment. FIG. 11B is a partially enlarged cross-sectional schematic view of the medical port shown in FIG. 11A. As shown in FIGs. 11A and 11B, the medical port has the same configurations as the medical port of Embodiment 2 except that the flow path opening member 19 does not include the second cylindrical portion and the attachment portion does not include the second tubular portion. The same components are denoted with the same reference numerals, and the description thereof will be omitted.

[0082] FIGs. 11A and 11B show a medical port 53 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 piercing portion 194 of 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 is broken by the piercing portion 194 of the communication portion 19a, allowing the liquid material filled in the container main body portion 11 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) 21a, whereby the flow path opening member 19 is attached to the port main body portion 22 so that no leakage occurs (second attachment state).

[0085] (Embodiment 4)

Another exemplary medical port according to the present invention and another exemplary nutrient container using the medical port according to the present invention will be described with reference to FIGs. 12 to 13E.

[0086] FIG. 12 is a front view of an example of a nutrient container of the present embodiment. As shown in FIG. 12, the medical port and the nutrient container have the same configurations as the medical port and the nutrient container of Embodiment 2 except that a protection cover 60 for protecting the flow path opening member 19 is attached to the medical port 43. 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 (see FIG. 7F etc.) from being broken by the communication portion 19a forced toward the container main body portion 11 due to the flow path opening member 19 being forced toward the container main body portion 11 by an external force applied to the flow path opening member 19 when not required.

[0088] As shown in FIGs. 13A to 13E, the protection cover 60 includes a cover main body portion 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 FIGs. 7D, 7E etc.) of the medical port 43. 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 connecter 25 as shown in FIGs. 5A to 5E.

[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 portion 61, and is rotated around its central axis until the lock protrusion 197 (see FIG. 3E etc.) of the claw portion 19e of the medical port 43 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 medical port 43 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 medical port 13 when the protection cover 60 is attached to the medical port 13 with the flow path opening member 19 assuming the first attachment state. Thus, the attachment state of the protection cover 60 with respect to the medical port 13 is maintained stably.

[0091] The protection cover 60 also can be attached to the medical port according to any of Embodiments 1 to 3.

[0092] Also in the present embodiment, as in Embodiments 1 to 3, it is possible not only to solve a problem of an improper connection of a liquid-delivery circuit for use in

an intravenous nutrition therapy but also to supply the liquid material such as a nutrient sanitarily in a simple manner. Simply by removing the protection cover 60 from the medical port 43, applying a force to move the communication portion 19a toward the thin film 16 to break the thin film 16, and connecting the liquid-delivery circuit 27 (see FIG. 10B) to the medical port 43 (see FIG. 10B), the liquid material can be supplied to a patient.

[0093] In FIG. 4A and the like showing the liquid-delivery circuit 27, only the connector 25 and a part of the flexible liquid-delivery tube 26 are shown for the sake of illustration. However, the liquid-delivery circuit to be connected to the medical port in any of Embodiments 1 to 4 further may include components provided in a liquid-delivery 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 liquid-delivery tube 26 by pressing the liquid-delivery 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.

[0094] The container main body portion 11 of the nutrient container 10 shown in any of FIGs. 1, 6 and 12 is filled with a liquid material such as a nutrient (not shown). However, as shown in FIG. 14, a nutrient container 40 may be an empty container having the container main body portion 11 not filled with a liquid material. As shown in FIG. 14, the container main body portion 11 of the nutrient container 10 has an opening portion 23, and it is provided with a zipper 23a (which is an engagement portion that allows opening-closing of plural times, and is called also as "zip fastener") that is provided across the opening portion 23 in the transverse direction so that the opening portion 23 can be opened and closed reversibly. A hanger portion also (not shown) may be provided above the opening portion 23.

Industrial Applicability

[0095] The present invention can provide a medical port of a nutrient container, a nutrient container using the same, and a nutrient supply set including a nutrient container and a liquid-delivery circuit that are suitable for use in a transintestine nutrition therapy.

Explanation of Letters and Numerals

[0096]

10,40	Nutrient container
11	Container main body portion
13,43,53	Medical port
16	Thin film
17	Top plate portion
18	Side wall portion
19	Flow path opening member
19a	Communication portion
19b	First cylindrical portion (cylindrical portion)
19c	Second cylindrical portion
19e	Claw portion (connection maintaining portion)
19d	Upper surface portion
191	Protruding portion
191c	Second hook portion
192	Hole
193	Partition wall
194	Piercing portion
197	Lock protrusion
198	First rib (rib)
199	Second rib
20	Base
21	Attachment portion
21a	First tubular portion (tubular portion)
21b	Second tubular portion
21e	Through hole
21c,190b	Linear rib
21d,190a	Linear groove
211	Annular groove
211b	First hook portion
211e	Flow path
22	Port main body portion

25	Connector
26	Liquid-delivery tube
27	Liquid-delivery circuit
29	Flexible bag-like member
321g	Lock concave portion
200	Male thread
212	Female thread

CLAIMS

[1] A medical port that is to be secured to a container main body portion of a nutrient container so as to allow communications between the inside and the outside of the container main body portion,

the medical port comprising:

a port main body portion comprising a top plate portion that faces the inside of the container main body portion in a state where the medical port is secured to the container main body portion; a side wall portion that is arranged on one main surface of the top plate portion and is to be secured to the container main body portion; and an attachment portion that comprises a tubular portion protruding on the top plate portion on a side opposite to the side wall portion and having a through hole being in communication with a space surrounded by the side wall portion;

a thin film that is mounted to the port main body portion and arranged on an extension of the through hole inside the container main body portion in a state where the medical port is secured to the container main body portion so as to block a flow of a liquid material within the container main body portion out of the nutrient container;

a flow path opening member that is attached to the attachment portion; and

a connection maintaining portion that is provided to either the port main body portion or the flow path opening member and that allows to maintain the connection to a connector,

wherein the flow path opening member comprises: a communication portion comprising 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 attachment portion as follows:

in the first attachment state, the flow path opening member is attached to the attachment 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 attachment 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 medical port according to claim 1,

wherein the communication portion further comprises a rib,

the tubular portion further comprises 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 medical port according to claim 2,

wherein assuming that the rib is a first rib, the communication portion further comprises 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 medical port according to any one of claims 1 to 3,

wherein assuming that the tubular portion is a first tubular portion, the attachment portion further comprises a second tubular portion that is arranged to surround the first tubular portion, protrudes on the top plate portion on a side opposite to the side wall 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 path opening member further comprises a second cylindrical portion that is arranged to surround the first cylindrical portion, is arranged outside the second tubular portion, protrudes toward the port main body portion from an upper 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.

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

wherein assuming that the tubular portion is a first tubular portion, the attachment portion further comprises a second tubular portion that is arranged to surround the first tubular portion, protrudes on the top plate portion on a side opposite to the side wall 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 path opening member further comprises a second cylindrical portion that is arranged to surround the first cylindrical portion, is arranged outside the second tubular portion, protrudes toward the port main body portion from an upper 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.

[6] The medical port according to claim 1,

wherein assuming that the tubular portion is a first tubular portion, the attachment portion further comprises a second tubular portion that is arranged to surround the first tubular portion, protrudes on the top plate portion on a side opposite to the side wall portion, and 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 comprises a second cylindrical portion that is arranged to surround the first cylindrical portion, is arranged outside the second tubular portion, protrudes toward the port main body portion from an upper 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,

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

the first tubular portion further comprises 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.

[7] The medical port according to claim 1,

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

the tubular portion further comprises 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 screwed together.

[8] The medical port according to any one of claims 1 to 7, wherein the communication portion comprises 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 medical port according to any one of claims 1 to 8, wherein the communication portion comprises a plurality of flow paths, comprises 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.

[10] The medical port 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 comprises an engagement portion capable of being engaged with the connection maintaining portion.

[11] A nutrient container comprising:

a container main body portion including a flexible bag-like member; and

the medical port according to any one of claims 1 to 10, which is secured to the

container main body portion.

[12] A nutrient supply set comprising:

the nutrient container according to claim 11; and

a liquid-delivery circuit that comprises: a connector comprising an engagement portion capable of being engaged with the connection maintaining portion of the medical port; and a liquid-delivery tube connected to the connector.