DESCRIPTION

[Title of Invention]

CONNECTOR SET FOR MEDICAL CONTAINER

[Technical Field]

[0001]

The present invention relates to a connector set for connecting a medical container to a feeding tube or the like, and in particular to technology for accurately connecting a nutrition container to a feeding tube in a liquid-tight manner while preventing the nutrition from being contaminated with impurities.

[Background Art]

[0002]

There are various known methods for administering nutrition, medicine, etc. to a patient. Examples include nutrition therapy using a percutaneous endoscopic gastrostomy (PEG) tube and enteral nutrition therapy.

[0003]

In nutrition therapy using a PEG tube, nutrition is administered to a patient via the PEG tube instead of oral intake. In this therapy, an opening is created in the patient's skin such that the opening communicates with the stomach via the abdominal wall (i.e., gastrostomy). Thereafter, the tube (PEG tube) is percutaneously inserted into the opening.

[0004]

On the other hand, in enteral nutrition therapy, a flexible tube (referred to as a nasal tube) is inserted through the naval cavity into the intestine of the patient, and a liquid substance such as nutrition, medicine and liquid food (hereinafter simply referred to as "nutrition") is directly provided to the intestine of the patient via the nasal tube.

[0005]

A general medical container is internally sealed by a cap attached to its port. In order to administer the liquid substance in the medical container to a patient, an operator creates an opening in the cap, thereby breaking the internal seal of the medical container (i.e., releasing the liquid substance to the outside). Thereafter, with use of a predetermined nozzle-shaped connector (hereinafter simply referred to as "nozzle"), the operator connects one end of the nasal tube or the PEG tube (or a feeding tube connected to the PEG tube) to the opening created in the cap. At this time, the cap and the nozzle may be locked to each other so they are not easily detached from each other. The operator then causes the nutrition to be carried via the tube. As a result, the nutrition is provided to the patient from the other end of the tube.

[Citation List]

[Patent Literature]

[0006]

[Patent Literature 1]

JP Patent Application Publication No. 2009-125162

[Patent Literature 2]

JP Patent Application Publication No. 2009-153588

[Summary of Invention]

[Technical Problem]

[0007]

Generally, the operator creates the opening in the cap and thus breaks the internal seal of the medical container before connecting the nozzle to the cap. Therefore, there is a moment when the nutrition in the medical container is exposed to the open air via the opening created in the cap. This may give rise to the

possibility that impurities and germs from the open air are mixed into the nutrition, thereby contaminating the nutrition.

[0008]

This also gives rise to the problem that, as a result of opening a fluid passage of the cap in the open air, the nutrition leaks to the outside from the opened fluid passage. In terms of sanitation and safety, such a problem needs to be solved.

[0009]

Meanwhile, for proper nutrition therapy, a predetermined pair of a cap and a feeding tube must be connected to each other accurately. However, there is a possibility that the operator mistakenly connects the cap of the nutrition container to a wrong feeding tube or the like that is provided to the patient for a different purpose. This possibility must be prevented without fail.

[0010]

The present invention has been conceived in view of the above problems. Example embodiments of the present invention may provide a connector set for a medical container that can accurately connect the medical container to a tube while maintaining the liquid tightness of the medical container, and that can prevent contamination and leakage of a liquid substance (e.g., nutrition) held in the medical container, thereby enabling satisfactory administration.

In accordance with an aspect of the present invention, there is provided a connector set for a medical container in which a liquid substance is contained, the connector set comprising:

a first connector that is connected to the medical container and that includes a first latching member; and

a second connector that is connected to a fluid supply tube and that includes a second latching member latchable with the first latching member, wherein

the first connector further includes a closure that seals the medical container with the liquid substance contained therein, and

upon moving the first connector and the second connector relative to each other while the first connector and the second connector are in contact with each other in a liquid-tight manner, the first latching member and the second latching member latch with each other, and the sealing of the medical container by the closure is broken;

the first connector has a shaft-like body,

the first connector and the second connector are brought into contact with each other in the liquid-tight manner by moving the first connector and the second connector relative to each other along an axial direction of the shaft-like body, and

upon rotating the first connector and the second connector relative to each other about the axial direction of the shaft-like body while the first connector and the second connector are in contact with each other in the liquid-tight manner, the first latching member and the second latching member latch with each other, and the sealing of the medical container by the closure is broken;

the shaft-like body has a fluid passage that carries the liquid substance,

the closure is joined to the shaft-like body via one or more links that each have a thickness smaller than a wall thickness of the shaft-like body,

the shaft-like body, the closure and the one or more links are made of the same material and assembled as a single integral component, and

the fluid passage is opened by breakage of the one or more links due to a rotation of the closure in coordination with the rotation of the first connector and the second connector;

the closure includes one or more ribs joined to the shaft-like body via the one or more links,

the one or more ribs are latchable with one or more recesses provided on an inner surface of the second connector, and

once the one or more ribs have latched with the one or more recesses, the rotation of the first connector and the second connector causes the one or more ribs to be rotated, and the rotation of the one or more ribs causes the breakage of the one or more links.

[Solution to Problem]

[0011]

In order to achieve the above object, the present invention provides a connector set for a medical container in which a liquid substance is contained. The connector set comprises: a first connector that is connected to the medical container and that includes a first latching member; and a second connector that is connected to a fluid supply tube and that includes a second latching member latchable with the first latching member. In the connector set, the first connector further includes a

closure that seals the medical container with the liquid substance contained therein, and upon moving the first connector and the second connector relative to each other while the first connector and the second connector are in contact with each other in a liquid-tight manner, the first latching member and the second latching member latch with each other, and the sealing of the medical container by the closure is broken.

[0012]

The connector set may be structured such that: the first connector has a shaft-like body; the first connector and the second connector are brought into contact with each other in the liquid-tight manner by moving the first connector and the second connector relative to each other along an axial direction of the shaft-like body; and upon rotating the first connector and the second connector relative to each other about the axial direction of the shaft-like body while the first connector and the second connector are in contact with each other in the liquid-tight manner, the first latching member and the second latching member latch with each other, and the sealing of the medical container by the closure is broken.

[0013]

The connector set may be structured such that: the shaft-like body has a fluid passage that carries the liquid substance; the closure is joined to the shaft-like body via one or more links that each have a thickness smaller than a wall thickness of the shaft-like body; the shaft-like body, the closure and the one or more links are made of the same material and assembled as a single integral component; and the fluid passage is opened by breakage of the one or more links due to a rotation of the closure in coordination with the rotation of the first connector and the second connector.

[0014]

The connector set may be structured such that: the closure includes one or more ribs joined to the shaft-like body via the one or more links; the one or more ribs are latchable with one or more recesses provided on an inner surface of the

second connector; and once the one or more ribs have latched with the one or more recesses, the rotation of the first connector and the second connector causes the one or more ribs to be rotated, and the rotation of the one or more ribs causes the breakage of the one or more links.

[0015]

The closure may include three ribs that extend in a radial fashion and exhibit symmetry.

[0016]

More specifically, the connector set may be structured such that: the shaft-like body has a protruding portion that is insertable into the second connector in a liquid-tight manner; and the closure is disposed on the protruding portion and is inserted into the second connector upon the protruding portion being inserted into the second connector.

[0017]

The present invention also provides a connector for sealing a medical container in which a liquid substance is contained and for connecting the medical container and a fluid supply tube. The connector includes: a body having a fluid passage that carries the liquid substance; and a closure that seals the medical container with the liquid substance contained therein. In the connector, the closure is joined to the body via one or more links that each have a thickness smaller than a wall thickness of the body, and the fluid passage is opened by breakage of the one or more links caused by applying a force to the closure.

[Advantageous Effects of Invention]

[0018]

The connector set pertaining to Claim 1 comprises a first connector that is connected to a medical container and that includes a closure for closing the fluid passage via which a liquid substance is carried. When using such a connector set, the

first connector and a second connector are brought into contact with each other in a liquid-tight manner. While maintaining the state where the first connector and the second connector are in contact with each other in a liquid-tight manner, the first connector is moved in a certain direction. As a result, the latching members of the first and second connectors (i.e., the first and second latching members) latch with each other. By performing such a latching (locking) operation, the fluid passage that had been closed by the closure is opened, and the liquid substance in the medical container can be carried to the second connector (to the fluid supply tube).

[0019]

Therefore, with the connector set pertaining to the present invention, the closure of the first connector never lets the liquid substance in the medical container exposed to the open air, at least until the first and second connectors latch with each other. When the fluid passage is opened so as to allow the liquid substance to be carried to the fluid supply tube, the first and second connectors always remain latched with each other, the fluid passage is never exposed to the open air, and the liquid tightness is always maintained.

[0020]

Therefore, the connector set pertaining to the present invention can (i) reduce the possibility of the liquid substance being exposed to the open air and thus contaminated with impurities, and (ii) suppress the liquid substance from leaking and thus leaving a smudge upon opening the fluid passage. As such, the nutrition can be administered under advanced sanitary management.

[0021]

The first and second connectors can be locked to each other only with use of a dedicated pair of latching members, namely the first and second latching members. That is to say, each connector strictly requires another dedicated connector to which it can be connected. This can prevent the problem where the operator erroneously connects the first connector to a wrong fluid supply tube. In this regard, the

connector set pertaining to the present invention offers high safety.

[0022]

The connector set pertaining to the present invention offers the above-described advantageous effects with use of the pair of first and second connectors. However, the connector set pertaining to the present invention is useful also when it uses the first connector alone, because the closure of the first connector allows the medical container to hold the liquid substance in a liquid-tight manner while preventing the liquid substance from being exposed to the open air.

[Brief Description of Drawings]

[0023]

FIG. 1 is a schematic diagram showing the structure of a nutrition feeding set 1 pertaining to Embodiment 1.

FIG. 2 illustrates the structure of a cap 15 (male connector) and a nozzle 20 (female connector), as well as a connection mechanism therefor.

FIGs. 3A and 3B are respectively an external view and a cross-sectional view showing the structure of the cap 15.

FIGs. 4A and 4B are respectively an external view and a cross-sectional view showing the structure of the nozzle 20.

FIGs. 5A, 5B and 5C illustrate a process in which the cap 15 and the nozzle 20 engage with each other.

FIG. 6A is a partial cross-sectional view showing a positional relationship between the nozzle 20 and the cap 15 in an unlocked state, and FIG. 6B is a partial cross-sectional view showing a positional relationship between the nozzle 20 and the cap 15 in a locked state.

FIG. 7A is a top view showing a positional relationship between the nozzle 20 and the cap 15 in an unlocked state, and FIG. 7B is a top view showing a positional relationship between the nozzle 20 and the cap 15 in a locked state.

FIG. 8 shows the structure of a cap 20A and a nozzle 15A pertaining to Embodiment 2.

[Description of Embodiments]

[0024]

The following describes embodiments of the present invention.

[0025]

[Embodiment 1]

(Nutrition Feeding Set 1)

FIG. 1 shows the structure of a nutrition feeding set 1 pertaining to Embodiment 1. FIG. 2 shows the structure of a cap 15 and a nozzle 20 included in the nutrition feeding set 1, as well as a connection mechanism therefor.

[0026]

The nutrition feeding set 1 shown in FIG. 1 includes a nutrition container 10 and a feeding tube 30 as its constituent elements. Note, the nutrition container 10 is one example of a medical container, and a feeding tube is also referred to as a fluid supply tube in the present description. The nutrition container 10 is composed of a flexible bag 100 and the cap 15. The flexible bag 100 is formed by attaching two rectangular resin films to each other at peripheral edges thereof. A port (opening) 101 that communicates with the inside of the bag 100 is provided at one of the peripheral edges of the bag 100. The cap 15 is connected to the port 101. Nutrition for enteral feeding is held in the bag 100 as a liquid substance. The bag 100 is internally sealed by the cap 15. With the above structure, the nutrition is maintained in a sterile condition.

[0027]

In the present embodiment, a flexible container is used as the bag 100. This, however, is merely one example of a medical container. Alternatively, other known medical containers such as paper packs, glass bottles, metallic containers and

syringes may be used as the bag 100.

[0028]

It goes without saying that the liquid substance held in the container is not limited to nutrition for enteral feeding. Alternatively, the container may hold various types of liquid substances, such as nutrition that must be administered to the patient by a means other than the intravenous infusion.

[0029]

The cap 15 is formed from resin material as a single integral component, and is attached to the port (fluid path) 101. The bag 100 is internally sealed by the cap 15. The cap 15 also functions as a connector for connecting the bag 100 to the nozzle 20. In the nutrition feeding set 1, a pair of the cap 15 and the nozzle 20, when connected to each other, constitutes a connector set as shown in FIG. 2. Upon the operator performing a predetermined locking operation (described later) during use, the internal seal of the bag 100 is broken. This allows the nutrition in the bag 100 to be conveyed to the feeding tube 30 via the cap 15. As such, with the nutrition feeding set 1, the nutrition in the bag 100 is never exposed to the open air when connecting the nozzle 20 to the cap 15 during use. The nutrition feeding set 1 can therefore maintain the nutrition in an excellent sanitary condition, not only until immediately before the administration, but also during the administration. In this way, the nutrition can be administered to the patient with high safety.

[0030]

The feeding tube 30 is a feeding line formed from resin material having moderate flexibility, such as silicone resin and polyvinyl chloride. A connector (nozzle 20) for connecting to the cap 15 is attached to an upstream end of the feeding tube 30 in the feeding direction. An insertion member 33 having a predetermined port is attached to a downstream end of the feeding tube 30 in the feeding direction, so as to provide the nutrition to the patient. Well-known drip chamber 31 and clamp 32 are attached to midway portions of the feeding tube 30.

[0031]

In order to use the nutrition feeding set 1, the bag 100 is hung on a predetermined stand so that the port 101 faces down. Then, after connecting the nozzle 20 to the cap 15 that is connected to the port 101 as shown in FIG. 2, this state of connection is locked. Consequently, the nutrition in the bag 100 is provided to the patient via the feeding tube 30.

[0032]

Detailed descriptions of the cap 15 and the nozzle 20 are provided below.

(Cap 15)

FIG. 3A shows an external appearance of the cap (male connector) 15. FIG. 3B is a cross-sectional view showing the internal structure of the cap 15. For the sake of explanation, FIGs. 3A and 3B show the cap 15 upside down compared to the cap 15 shown in FIG. 2.

[0033]

The cap 15 is formed as a single integral component from any of various known types of resin material, such as polycarbonate (PC), polyethylene terephthalate (PET), polyethylene (PE) and polypropylene (PP). As shown in FIG. 3B, the inside of the cap 15 is an empty space. During the administration of the nutrition to the patient, the empty space functions as a fluid passage 159 through which the nutrition is conveyed from the bag 100. Before the administration of the nutrition to the patient, the fluid passage 159 is closed by a closure 155.

[0034]

The cap 15 includes a cap body 150 as a main structure. The cap 15 also includes links 1550a, 1550b and 1550c and the closure 155 that are attached to the cap body 150.

[0035]

The cap body 150 has a substantially cylindrical cap base 151. A step portion 162 and a protruding portion 160 are provided above a ceiling surface 152 of

the cap base 151, in such a manner that the step portion 162 protrudes from the ceiling surface 152 and the protruding portion 160 protrudes from the step portion 162.

[0036]

The step portion 162 has a shape of a circular column and has a smaller diameter than the cap base 151. A pair of latching claws 153 and 154 juts out from a lateral surface of an upper portion of the step portion 162.

[0037]

Each of the latching claws 153 and 154 is a plate-like member whose main surface extends parallel to and faces the ceiling surface 152. Projections 1531 and 1541 jut out from the main surfaces of the latching claws 153 and 154, respectively, toward the ceiling surface 152 (note, the projection 1541 is not illustrated).

[0038]

A ceiling surface of the step portion 162 is a contact surface 161 that comes into contact with a contact surface 200 of the nozzle 20.

[0039]

The protruding portion 160 has a shape of a conical frustum and protrudes from the center of the contact surface 161. The shape of the outer circumferential surface of the protruding portion 160 fits the shape of the inner circumferential surface of a nozzle body 21. The circumferential surface of the protruding portion 160 has been adjusted so that the cap 15 and the nozzle 20 come into contact with each other while maintaining the liquid tightness of a contact area between the protruding portion 160 and the nozzle body 21.

[0040]

The closure 155 includes three standing ribs 155a, 155b and 155c that extend in a radial fashion (a triradial fashion in the present embodiment). Each of the ribs 155a through 155c has one end standing on the axis of the protruding portion 160. These ends of the ribs 155a through 155c are joined to one another. An angle of

120° is formed by any two adjacent lateral surfaces of the ribs 155a through 155c. As shown in FIG. 3B, the closure 155 is joined to the cap body 150 (the upper surface of the protruding portion 160) via the links (thin members) 1550a through 1550c at the bases of the ribs 155a through 155c. The links have a smaller thickness than the material of the cap body 150 (note, the links 1550b and 1550c are not illustrated). Slits 156a, 156b and 156c are provided immediately below the ribs 155a, 155b and 155c, respectively. The slits 156a through 156c communicate with the fluid passage 159 and have a rectangular cross-section (see FIG. 6B).

[0041]

An opening 158 that communicates with the fluid passage 159 is provided inside the cap 15. A thread 157 via which the cap 15 is connected to the port 101 is also formed inside the cap 15.

[0042]

It should be noted that a means for fixing the cap 15 to the port 101 is not limited to the thread 157. The cap 15 may be connected to the port 101 using a means other than the thread 157, e.g., by thermally fusing the cap 15 and the port 101. In this case, the thread 157 is naturally unnecessary.

[0043]

Furthermore, the cap 15 and the port 101 need not be separate components. The cap 15 and the port 101 may be formed as a single integral component.

(Nozzle 20)

The nozzle 20 is formed as a single integral component from resin material similar to the resin material of the cap 15. As shown in FIG. 2, the external appearance of the nozzle 20 is such that a pair of plate-like handles 205 and 206 is attached to the outer circumferential surface of a shaft-like nozzle body 21 that has been tapered. This way, the operator can move the nozzle 20 while holding the pair of plate-like handles 205 and 206 between his/her fingers. As stated earlier, the shape of the inner circumferential surface of the nozzle body 21 fits the shape of the

outer circumferential surface of the protruding portion 160. The feeding tube 30 comes out of a tip 2033 (the lower tip in FIG. 2) of the nozzle body 21. On the other hand, a plate-like nozzle base 22 is provided at the upper tip of the nozzle body 21 (i.e., the upstream tip in the feeding direction), in such a manner that main surfaces of the nozzle base 22 are perpendicular to the axis of the nozzle 20. One of the main surfaces of the nozzle base 22 (the upper main surface in FIG. 2) is a contact surface 200 that comes into contact with the contact surface 161 of the cap 15.

[0044]

FIG. 4A is an external view showing the structure of the nozzle 20, as viewed from above the contact surface 200. FIG. 4B is a cross-sectional view showing the internal structure of the nozzle 20 (taken along a cross-section that passes a recess 2030b, with the arc of the nozzle body 21 around the axis of the nozzle body 21 measuring 180°). FIGs. 5A, 5B and 5C illustrate a process in which the latching claw 153 latches with an latching flange 202, as viewed from the axis of the cap 15 (for the sake of explanation, FIGs. 5A, 5B and 5C illustrate a part of the latching claw 153 that is contiguous with the step portion 162 as a cross-section).

[0045]

As shown in FIG. 4A, the main structure of the nozzle base 22 is a disk-shaped member that has, at the center thereof, an opening 2031 communicating with the nozzle body 21. The nozzle base 22 includes two portions that jut out from the circumference of the nozzle base 22. These two portions are symmetrical with respect to the axis of the nozzle body 21. A pair of latching flanges 201 and 202 is attached to these two portions. The pair of latching flanges 201 and 202 can latch with the pair of latching claws 153 and 154 of the cap 15.

[0046]

As shown in FIG. 5A, the latching flange 201 (202) includes a flange body 2012 (2022), an eave 2013 (2023) and a contact portion 2011 (2021). The contact portion 2011 (2021) comes into contact with the latching claw 153 (154).

[0047]

The flange bodies 2012 and 2022 are ribs standing along the periphery of the contact surface 200.

[0048]

The eave 2013 (2023) is a plate-like member provided along the lateral surface of the flange body 2012 (2022) at a predetermined height from the contact surface 200, so as to allow the latching claw 153 (154) to proceed into a space defined by the eave 2012 (2123), the flange body 2012 (2022) and the contact surface 200.

[0049]

The contact portion 2011 (2021) is a rectangular column that is contiguous with the eave 2013 (2023) and projects from the flange body 2012 (2022) toward the axis of the nozzle 20.

[0050]

In a section where the contact portion 2011 (2021) is contiguous with the eave 2013 (2023), a recess 2014 (2024) is formed by removing a part of the section in a thickness direction (note, the recess 2014 is not illustrated due to positional issues). The projection 1531 (1541) of the latching claw 153 (154) is guided toward and latches with the recess 2014 (2024).

[0051]

Owing to a die used in the resin casting process for the nozzle 20, openings 2010 and 2020 are respectively formed in portions of the contact surface 200 immediately below the eaves 2013 and 2023.

[0052]

Furthermore, in order to enable the operator to properly recognize the direction in which the nozzle 20 should be locked to the cap 15, signs are provided on a display surface 204, which is a reverse side of the contact surface 200. In the present description, these signs are specifically the word "LOCK" and an arrow

indicating the direction of rotation. It should be naturally appreciated that signs provided on the display surface 204 are not limited to those mentioned above. Alternatively, no signs may be provided on the display surface 204.

[0053]

Meanwhile, as shown in FIGs. 4A and 4B, three recesses 2030a, 2030b and 2030c are formed on the inner wall of the nozzle body 21 in the vicinity of the opening 2031 by removing portions of the inner wall in the thickness direction. Here, the recesses 2030a through 2030c are formed at an equal interval (that is, any two of the recesses 2030a through 2030c form an angle of 120° with respect to the axis of the nozzle body 21). The ribs 155a through 155c of the cap 15 are fit into the recesses 2030a through 2030c.

[0054]

An engaging step 2032 is formed on a part of the inner circumferential surface of the nozzle body 21 between the opening 2031 and the tip 2033 by reducing the inner diameter of this part toward the tip 2033 in a stepped manner. The engaging step 2032 engages with the end of the feeding tube 30 so as to prevent the feeding tube 30 from being detached from the nozzle 20.

(Advantageous Effects Achieved during Administration)

The following describes a procedure for administrating nutrition to a patient with use of the nutrition feeding set 1 having the above-described structure.

[0055]

First, as shown in FIG. 1, an operator (e.g., a doctor or a nurse) hangs one end of the bag 100 on the stand so that the port 101 and the cap 15 both face down. The operator then inserts one end of the feeding tube 30 into the nozzle 20 so that this end of the feeding tube 30 engages with the engaging step 2032 formed on the inner circumferential surface of the nozzle body 21. In this way, the feeding tube 30 comes out of the tip 2033 of the nozzle body 21. Alternatively, the nozzle 20 and the feeding tube 30 may be connected to each other in advance, e.g., during the

manufacturing process or anytime before the shipment.

[0056]

The operator connects the insertion member 33, which is provided at the other end of the feeding tube 30, to an end of a predetermined tube attached to the patient.

[0057]

Thereafter, as shown in FIG. 2, the operator holds the nozzle 20 with the contact surface 200 facing up and brings the contact surface 200 of the nozzle 20 into contact with the contact surface 161 of the cap 15, while paying attention to the angle of the nozzle 20 around the axis of the nozzle 20 so as not to make the latching flanges 201 and 202 touch the latching claws 153 and 154 (see the first direction indicated by a vertical arrow). By thus moving the nozzle 20 and the cap 15 relative to each other, the operator brings the nozzle 20 and the cap 15 in contact with each other. At this time, the protruding portion 160 and the closure 155 (ribs 155a through 155c) of the cap 15 are inserted into the nozzle body 21.

[0058]

As a result of performing the above operation, the outer circumferential surface of the protruding portion 160 comes in contact with the inner circumferential surface of the nozzle body 21 in a liquid-tight manner. Hence, the inside of the nozzle body 21, as well as the protruding portion 160 and the closure 155 of the cap 15, are not exposed to the open air, thereby creating a state where the nozzle 20 and the cap 15 are connected to each other.

[0059]

Thereafter, in order to fix (lock) the state where the nozzle 20 and the cap 15 are connected to each other, the operator holds the handles 205 and 206 between his/her fingers, and rotates the nozzle 20 relative to the cap 15 by 60° around the axis of the nozzle 20 (see the second direction indicated by curved arrows in FIG. 2). During the rotation, the inner circumferential surface of the nozzle body 21 is

rotated relative to the outer circumferential surface of the protruding portion 160 around the axis of the nozzle 20 while maintaining the liquid tightness. At this time, the inner circumferential surface of the nozzle body 21 and the outer circumferential surface of the protruding portion 160 slide across each other. The above rotating operation causes the latching claw 153 (154), which was positioned more upstream than the eave 2013 (2023) in the direction of rotation prior to the above rotating operation (see FIG. 5A), to slide into a space defined by the contact surface 200 and the eave 2013 (2023) and to proceed forward while pushing the eave 2013 (2023) toward a direction away from the contact surface 200 (see the arrows in FIG. 5B). The latching claw 153 (154) eventually comes into contact with the contact portion 2011 (2021). This stops the latching claw 153 (154) from further proceeding. At the same time, the projection 1531 (1541) of the latching claw 153 (154) latches with the recess 2014 (2024) formed in the eave 2013 (2023) (FIG. 5C). Upon the projection 1531 (1541) latching with the recess 2014 (2024), the engaging (locking) operation for the nozzle 20 and the cap 15 is completed.

[0060]

Once the locking operation is completed, the nozzle 20 and the cap 15 are solidly connected to each other, and are not easily detached from each other.

[0061]

FIGs. 6A and 6B both illustrate a positional relationship between the nozzle 20 and the cap 15, as well as the mechanism of the ribs 155a through 155c (closure 155) for releasing the liquid substance. Note that FIG. 6A shows an unlocked state, whereas FIG. 6B shows a locked state. More specifically, FIGs. 6A and 6B illustrate a cross-section of the nozzle 20 taken along a line passing through recesses 3020b and 3020c, with the arc of the nozzle body 21 around the axis of the nozzle body 21 measuring 120°. FIGs. 7A and 7B are front views illustrating a positional relationship between the nozzle 20 and the cap 15, as viewed from above the tip 2033 of the nozzle body 21 in the direction of the axis of the nozzle 20. Note, FIG.

7A shows an unlocked state, whereas FIG. 7B shows a locked state. In FIGs. 7A and 7B, the outlines of the latching flanges 201 and 202 are illustrated with dotted lines.

[0062]

Immediately after the nozzle 20 is connected to the cap 15 as shown in the above-discussed FIG. 2, the ribs 155a through 155c are in a state where they are merely fit into the recesses 2030a through 2030c inside the nozzle body 21 (see FIGs. 6A and 7A). In this state, the operator performs the above-described locking operation by, while holding the handles 205 and 206 between his/her fingers, rotating the nozzle 20 relative to the cap 15 by 60° around the axis of the nozzle body 21. The rotation of the nozzle 20 causes the ribs 155a through 155c to rotate while being fit into the recesses 2030a through 2030c. That is, the ribs 155a through 155c are rotated by 60° around the axis of the nozzle body 21. Due to the rotation of the ribs 155a through 155c, the links 1550a through 1550c provided at the bases of the ribs 155a through 155c are subjected to a rotational force are therefore break. As a result, the slits 156a through 156c communicating with the inside of the nozzle body 21 become visible (FIGs. 6B and 7B). FIG. 6B illustrates the cap 15 in which the slits 156a through 156c have become visible as a result of breakage of the links 1550a through 1550c caused by rotation of the ribs 155a through 155c by 60° around the axis of the nozzle body 21.

[0063]

As set forth above, the fluid passage 159 communicates with the nozzle 20 via the slits 156a and 156c only after the links 1550a through 1550c break due to the rotation of the ribs 155a through 155c according to the locking operation. During the locking operation, the liquid tightness of a contact area between the outer circumferential surface of the protruding portion 160 and the inner circumferential surface of the nozzle body 21 is maintained. Because the bag 100 is hung with the cap 15 facing down as shown in FIG. 1, the nutrition in the bag 100 is conveyed through the cap 15 and the nozzle body 21 under its own weight, and therefore can

be provided to the patient via the feeding tube 30. With the nutrition feeding set 1, the administration of the nutrition can be started upon completion of the locking operation for the nozzle 20 and the cap 15. As such, the nutrition is never exposed to the open air, even when the internal seal of the bag 100 by the cap 15 is broken. The nutrition feeding set 1 is extremely effective in sanitary management because, during the administration of the nutrition to the patient, the nutrition feeding set 1 certainly prevents the nutrition from being contaminated with impurities originating from the open air via the slits 156a through 156c. Unlike the conventional structure in which an opening must be created in a cap before connecting a nozzle to the cap, the nutrition feeding set 1 is structure such that the internal seal of the bag 100 by the cap 15 is broken as soon as completing the locking operation for the nozzle 20 and the cap 15 while the nozzle 20 and the cap 15 are connected to each other. In this way, the nutrition feeding set 1 offers dramatically high safety.

[0064]

The nozzle 20 and the cap 15 are properly connected/locked to each other only with use of combinations of precisely dedicated latching members (in the present embodiment, latching claws 153 and 154, latching flanges 201 and 202, closure 155, and recesses 2030a through 2030c). As such, the nutrition feeding set 1 requires a strict selection of connection mechanisms. Therefore, even when the operator mistakenly attempts to connect the cap 15 to a different feeding line attached to the patient, such connection is impossible to make. This can prevent the problem of erroneous connection without fail. Also in this regard, the nutrition feeding set 1 offers high safety.

[0065]

There are cases where the links 1550a through 1550c are completely broken by the rotation of the nozzle 20, thereby causing the closure 155 to separate from the cap 15. However, even in such cases, the ribs 155a through 155c remain fit into the recesses 2030a through 2030c, and therefore the closure 155 separated from the cap

15 would never be carried over to the feeding tube 30.

[0066]

The engaging operation for the nozzle 20 and the cap 15, as well as the accompanying operation for opening the fluid passage 159, should be performed by moving the nozzle 20 and the cap 15 relative to each other. Therefore, these operations may be performed either by moving the cap 15 relative to the nozzle 20, or by moving the nozzle 20 relative to the cap 15.

[0067]

The following describes another embodiment of the present invention, with a focus on differences from Embodiment 1.

[0068]

[Embodiment 2]

FIG. 8 illustrates Embodiment 2 in which a nozzle 20A and a cap 15A respectively serve as a male connector and a female connector. For the sake of explanation, the nozzle 20A and the cap 15A are respectively shown in the upper part and the lower part of FIG. 8. However, during use, the positional relationship between the nozzle 20A and the cap 15A is reversed (upside down) as shown in FIGs. 1 and 2.

[0069]

Embodiment 2 is different from Embodiment 1 in that the cap 15A includes a cap base 151A and a tubular portion 163. The cap base 151A has a shape of a circular column, and the upper surface of the cap base 151A is a contact surface 161A. The tubular portion 163 stands along the circumference of the contact surface 161A in a manner as to encircle the contact surface 161A. By aligning the inner diameter of the tubular portion 163 with the outer diameter of a nozzle body 21A of the nozzle 20A, the nozzle body 21A can be inserted (or pressed) into the tubular portion 163. The tubular portion 163 has an opening 164. A pair of latching claws

153A and 154A, which are similar to the above-described latching claws 153 and 154 in structure, is attached to the outer circumference of the tubular portion 163 in the vicinity of the opening 164. A closure 155A is disposed at the center of the contact surface 161A via links. The closure 155A is similar to the above-described closure 155, and the links are similar to the above-described links 1550a through 1550c. Slits are provided immediately below ribs 155a through 155c of the closure 155A. These slits communicate with a fluid passage in the cap 15A. The fluid passage and slits are respectively similar to the above-described fluid passage 159 and slits 156a through 156c in structure.

[0070]

On the other hand, the nozzle 20A is composed of the nozzle body 21A and a pair of latching flanges 201A and 202A.

[0071]

The nozzle body 21A has a shape of a circular column. The lower surface of the nozzle body 21A is a contact surface 200A that comes into contact with the contact surface 161A of the cap 15A. The upper surface of the nozzle body 21A is a display surface 204A.

[0072]

The word and arrow provided on the display surface 204 are similarly provided on the display surface 204A. The feeding tube 30 is connected to the center of the display surface 204A.

[0073]

The mechanisms of the latching flanges 201A and 202A are similar to those of the latching flanges 201 and 202. The latching flanges 201A and 202A are disposed on a lateral surface of the nozzle body 21A at an equal interval, and can latch with the latching claws 153A and 154A. According to the structure shown in FIG. 8, constituent elements of the latching flanges 201A and 202A are covered with box-shaped housings and are thus invisible from outside.

[0074]

In the structure shown in FIG. 8, a circular rib (tubular portion) stands along the circumference of the display surface 204A in a manner as to encircle the display surface 204A. This circular rib, however, is not indispensable.

[0075]

A recess 2030A having a radial shape (a triradial shape in the present embodiment) is provided at the center of the contact surface 200A. The ribs 155a through 155c of the closure 155 can be fit into the recess 2030A.

[0076]

Furthermore, a total of three nozzle holes L1, L2 and L3 are provided in the nozzle body 21A so as to extend in the direction of the axis of the nozzle body 21A and penetrate through the contact surface 200A and the display surface 204A. Once the nozzle 20A has been locked to the cap 15, openings of the nozzle holes L1 through L3 at the contact surface 200A communicate with the slits provided immediately below the ribs 155a through 155c, whereas openings of the nozzle holes L1 through L3 at the display surface 204A communicate with the inside of the feeding tube 30.

[0077]

Although each of the nozzle holes L1 through L3 has a circular cross-section in the present embodiment, various adjustments may be made to the nozzle holes L1 through L3. For example, each of the nozzle holes L1 through L3 may have a rectangular cross-section, or the number of the nozzle holes may be greater than three.

[0078]

With use of the cap 15A and the nozzle 20A having the above-described structure, advantageous effects similar to those achieved by the nutrition feeding set 1 can be achieved.

[0079]

In order to connect the nozzle 20A to the cap 15A, the operator presses the nozzle body 21A into the tubular portion 163 of the cap 15, while paying attention so as not to make the latching claws 153 and 154 touch the latching flanges 201 and 202. The operator then aligns the recess 2030A with the closure 155A so that the closure 155A is fit into the recess 2030A, and presses the nozzle body 21A into the tubular portion 163 until the contact surfaces 200A and 161A thoroughly come into contact with each other.

[0080]

As a result of the above operation, the lateral surface of the nozzle body 21A comes into contact with the inner surface of the tubular portion 163 in a liquid-tight manner, thereby creating a state where the nozzle 20A and the cap 15A are connected to each other.

[0081]

Thereafter, with this state of connection maintained, the operator performs a locking operation by rotating the nozzle 20A by 60° around the axis of the nozzle 20A so as to make the latching claws 153A and 154A latch with the latching flanges 201A and 202A. In accordance with this locking operation, the closure 155A that has been fit into the recess 2030A is rotated. As a result, the links break, and the slits become visible and communicate with the nozzle holes L1 through L3. In this way, the nutrition in the bag 100 can be conveyed to the feeding tube 30 via the nozzle holes L1 through L3.

[0082]

The above operation pertaining to Embodiment 2 breaks the internal seal of the bag 100 by the cap 15A without exposing the nutrition in the bag 100 to the open air during use, as in Embodiment 1. Accordingly, Embodiment 2 prevents the nutrition from being contaminated with foreign substances and allows administration of the nutrition to the patient in a sanitary condition. Furthermore, the internal seal of the bag 100 by the cap 15A is broken only in a state where the cap

15A and the nozzle 20A are connected to each other. This can prevent the problem of leakage of the nutrition from the slits of the cap 15A or the like to the outside. Moreover, in Embodiment 2, the structure of the cap 15A and the nozzle 20A requires a strict selection of connection mechanisms. This can certainly prevent the problem of erroneously connecting the cap 15A to a wrong feeding tube.

[0083]

FIG. 8 exemplarily shows the structure in which the recess 2030A and the nozzle holes L1 through L3 are provided in the nozzle 20A. Alternatively, it is permissible to provide a cylindrical space (fluid passage) communicating with the feeding tube 30 inside the nozzle body 21A, and to provide recesses 2030a through 2030c, into which the ribs 155a through 155c can be fit, on the inner wall of the nozzle body 21A encircling the cylindrical space, as with the nozzle 20 pertaining to Embodiment 1.

(Related Matters)

Embodiment 1 has described the closure 155 including three ribs 155a through 155c that extend in a radial (triradial) fashion. However, the number of ribs extending in a radial fashion is not limited to three, but may be one, two, and four or more.

[0084]

Furthermore, these ribs may be replaced by rods (columnar members) standing in such a manner that the lengthwise direction of each rod is parallel to the axis of the nozzle. In this case, thin links should be provided around the bases of the rods, and holes equivalent to the slits should be provided immediately below the rods. Also, in this case, recesses into which the rods can be inserted should be formed in the nozzle in place of the above-described recesses. This way, in accordance with the locking operation, each rod breaks at its base and the slits (holes) become visible, thereby breaking the internal seal of the bag by the cap. Alternatively, it is permissible to employ a combination of a closure having a simple

solid shape (a shape of a cuboid, a shape of a polygonal column, etc.) and a recess into which such a closure can be fit. Note that no matter what kind of structure the cap and the nozzle have, care should be taken so as to maintain the liquid tightness even after the cap and the nozzle are connected to each other, and so as not to expose the inside of the nozzle body, in which the fluid passage is opened, to the open air.

[0085]

In order to enhance the liquid tightness of the cap and the nozzle, a sealing member (e.g., packing) may be provided on the contact surface of the cap or on the outer circumferential surface of the protruding portion. Furthermore, the contact surfaces of the cap and the nozzle may be flattened.

[0086]

Furthermore, even when the protruding portion is not provided on the contact surface of the cap—i.e., when the closure is provided directly on the contact surface of the cap, the fluid passage can be prevented from being exposed to the open air upon opening the fluid passage. However, in order to guarantee excellent liquid tightness of the cap and the nozzle prior to the locking operation, it is still preferable to provide the protruding portion so as to increase a liquid-tight contact area between the cap and the nozzle. For this reason, it is preferable to make improvements such as bringing the tubular portion and the nozzle body into contact with each other in a liquid-tight manner, as in Embodiment 2.

[0087]

Furthermore, the nozzle and the cap are not limited to engaging with each other with use of the latching claws and the latching flanges. The nozzle and the cap may engage with each other by using other engaging means. As one example of other engaging means, the nozzle and the cap may be screwed together.

[0088]

A connector set for a medical container pertaining to the present invention

is extremely effective as it uses both of a male connector and a female connector that are manufactured as a dedicated pair, such as the above-described pair of the cap 15 (15A) and the nozzle 20 (20A). The connector set is of great advantage in that, even when the cap 15 (15A) is attached to the bag 100 alone, the closure 155 (155A) enables the nozzle 20 (20A) to be connected to the cap 15 (15A) at a high degree of sealing until the nozzle 20 (20A) is locked to the cap 15 (15A).

[Industrial Applicability]

[0089]

The present invention can be widely used in, for example, enteral nutrition therapy where a liquid substance held in a medical container is administered to a patient via a tube. Hence, the present invention has excellent industrial applicability.

[Reference Signs List]

[0090]

L1, L2 and L3	nozzle hole
1	nutrition feeding set
10	nutrition container (medical container)
15	cap (male connector)
15A	cap (female connector)
20	nozzle (female connector)
20A	nozzle (male connector)
21, 21A	nozzle body
22	nozzle base
30	feeding tube
31	drip chamber
32	clamp
33	insertion member

150 cap body

151, 151A cap base

153, 153A, 154, 154A latching claw (first latching member)

155, 155A closure

155a through 155c rib

156a through 156c slit

157 thread

158, 2031 opening

159 fluid passage

160 protruding portion

161, 161A, 200, 200A contact surface

163 tubular portion

164 opening

201, 201A, 202, 202A latching flange (second latching member)

203 nozzle body

204, 204A display surface

205, 206 handle

1550a through 1550c link (thin member)

1531, 1541 projection

2010, 2020 opening

2011, 2021 contact portion

2012, 2022 flange bodies

2013, 2023 eave

2014, 2024 recess

2030a through 2030c, 2030 recess

2032 engaging step

2033 tip

CLAIMS

1. A connector set for a medical container in which a liquid substance is contained, the connector set comprising:

a first connector that is connected to the medical container and that includes a first latching member; and

a second connector that is connected to a fluid supply tube and that includes a second latching member latchable with the first latching member, wherein

the first connector further includes a closure that seals the medical container with the liquid substance contained therein, and

upon moving the first connector and the second connector relative to each other while the first connector and the second connector are in contact with each other in a liquid-tight manner, the first latching member and the second latching member latch with each other, and the sealing of the medical container by the closure is broken;

the first connector has a shaft-like body,

the first connector and the second connector are brought into contact with each other in the liquid-tight manner by moving the first connector and the second connector relative to each other along an axial direction of the shaft-like body, and

upon rotating the first connector and the second connector relative to each other about the axial direction of the shaft-like body while the first connector and the second connector are in contact with each other in the liquid-tight manner, the first latching member and the second latching member latch with each other, and the sealing of the medical container by the closure is broken;

the shaft-like body has a fluid passage that carries the liquid substance,

the closure is joined to the shaft-like body via one or more links that each have a thickness smaller than a wall thickness of the shaft-like body,

the shaft-like body, the closure and the one or more links are made of the same material and assembled as a single integral component, and

the fluid passage is opened by breakage of the one or more links due to a rotation of the closure in coordination with the rotation of the first connector and the second connector;

the closure includes one or more ribs joined to the shaft-like body via the one or more links,

the one or more ribs are latchable with one or more recesses provided on an inner surface of the second connector, and

once the one or more ribs have latched with the one or more recesses, the rotation of the first connector and the second connector causes the one or more ribs to be rotated, and the rotation of the one or more ribs causes the breakage of the one or more links.

2. The connector set of Claim 1, wherein

the closure includes three ribs that extend in a radial fashion and exhibit symmetry.

3. The connector set of Claim 1, wherein

the shaft-like body has a protruding portion that is insertable into the second connector in a liquid-tight manner, and

the closure is disposed on the protruding portion and is inserted into the second connector upon the protruding portion being inserted into the second

connector.