

DESCRIPTION

CAP, NUTRITIONAL SUPPLEMENT CONTAINER USING THE SAME,
AND NUTRITIONAL SUPPLEMENT SUPPLY SET

5

Technical Field

[0001] The present invention relates to a cap that is to be secured to a mouth from which a liquid material filled in a container body of a nutritional supplement container flows out, a nutritional supplement container with a container body to which the cap is secured, and a nutritional supplement supply set.

10

Background Art

[0002] Enteral alimentation and intravenous alimentation have been known as a method for parenteral administration of nutrients or drugs to a patient. In the enteral alimentation, a liquid material such as a nutritional supplement, a fluid diet, or a drug (generally called an "enteral nutritional supplement") is administered through a tube that runs from the nasal cavity to the stomach or duodenum of a patient (generally called a "nasotracheal tube") or a tube that is inserted into a gastric fistula formed in the abdomen of a patient (generally called a "PEG tube") (the operation for forming a gastric fistula is called "percutaneous endoscopic gastrostomy"). In the intravenous alimentation, a liquid material containing nutrient components such as glucose or drug components (generally called an "infusion solution") is administered through an infusion line (liquid feed circuit) inserted into the vein of a patient.

15

[0003] FIG. 22 is a schematic configuration diagram showing an example of an enteral alimentation set used for conventional enteral alimentation. A container body 101 of a nutritional supplement container 100 is filled with a nutritional supplement. A thin film (not shown) is attached to a mouth 102 from which the nutritional supplement flows out of the container body 101, and the inside of the container body 101 is sealed with the thin film. When the nutritional supplement is administered to the body, a plastic connection needle 104 is inserted into a cap 105 that is secured to the mouth so as to pierce the thin film. Thus, the nutritional supplement can be

25

30

delivered to the body through a tube connected to the connection needle 104.

[0004] FIG. 23 is a schematic configuration diagram showing an example of an infusion set used for conventional intravenous alimentation. A bag body 111 of a bag 110 is filled with a liquid material containing nutrient components or drug components.

5 When the liquid material is administered to the body, a connection needle 114 is allowed to pierce a connection needle port 113. Thus, the liquid material can be delivered to the body through a tube connected to the connection needle 114 (see Patent Document 1).

10 Prior Art Documents

Patent Documents

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

Disclosure of Invention

15 Problem to be Solved by the Invention

[0006] As described above, similarly to the intravenous alimentation, the conventional enteral alimentation may use a method for delivering the nutritional supplement to the body by inserting a connection needle with a sharp point into the object to be connected. Therefore, the connection needle 114 can be inserted into the

20 cap 105. In this case, the connection needle 114 pierces the cap 105 and the thin film, and reaches the inside of the mouth 102. However, such an incorrect connection can cause the nutritional supplement or the like that should be supplied to the stomach or bowel to be erroneously supplied to the vein, and thus there is a possibility that a medical accident will occur.

25 [0007] The present invention provides a cap that solves the above problem of an incorrect connection, and also enables a nutritional supplement container to hygienically supply a liquid material such as a nutritional supplement by a simple operation, a nutritional supplement container using the cap, and a nutritional supplement supply set.

30

Means for Solving Problem

[0008] A cap of the present invention is to be secured to a mouth of a container body

of a nutritional supplement container and allows a liquid material filled in the container body to flow out. The mouth is provided with a thin film for sealing the container body. The cap includes the following: a cap body; a bridge that is coupled to the cap body and can be broken or deformed; a communicating member that is coupled to the cap body via the bridge and includes a piercing portion that can pierce the thin film by being pushed toward the container body when the bridge is broken or deformed, and a flow path through which the liquid material filled in the container body can flow out of the nutritional supplement container after the thin film has been broken; and a connection maintaining structure that is included in the cap body and can maintain a connection with a connector.

[0009] A nutritional supplement container of the present invention includes the following: a container body including a mouth; a liquid material filled in the container body; a thin film that is attached to the mouth and seals the container body; and the cap of the present invention secured to the mouth.

[0010] A nutritional supplement supply set of the present invention includes the following: the nutritional supplement container of the present invention; and a liquid feed circuit that includes a connector including an engagement portion that can be engaged with the connection maintaining structure of the cap, and a liquid feed tube connected to the connector.

20

Effects of the Invention

[0011] The present invention can provide a cap that solves the problem of an incorrect connection such that a liquid feed circuit for intravenous alimentation is erroneously connected to the nutritional supplement container, and also enables a nutritional supplement container to hygienically supply a liquid material such as a nutritional supplement by a simple operation, a nutritional supplement container using the cap, and a nutritional supplement supply set.

25

Brief Description of Drawings

[0012] [FIG. 1] FIG. 1 is a partial perspective view showing an example of a nutritional supplement container of Embodiment 1.

30

[FIG. 2] FIG. 2 is an exploded perspective view of the nutritional supplement

container shown in FIG. 1.

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

5 [FIG. 3B] FIG. 3B is a partial enlarged view of the cap shown in FIG. 3A.

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

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

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

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

10 [FIG. 3G] FIG. 3G is a cross-sectional view of the cap shown in FIG. 3A.

[FIG. 3H] FIG. 3H is another cross-sectional view of the cap shown in FIG. 3A.

[FIG. 4A] FIG. 4A is an enlarged perspective view for explaining a bridge and a communicating member of the cap shown in FIG. 3A.

15 [FIG. 4B] FIG. 4B is a cross-sectional view taken along the line A-A' in FIG. 4A.

[FIG. 4C] FIG. 4C is a perspective view for explaining another example of the bridge and the communicating member.

[FIG. 4D] FIG. 4D is a perspective view for explaining another example of the bridge and the communicating member.

20 [FIG. 4E] FIG. 4E is a perspective view for explaining another example of the bridge and the communicating member.

[FIG. 4F] FIG. 4F is a perspective view for explaining another example of the bridge and the communicating member.

25 [FIG. 4G] FIG. 4G is a perspective view for explaining another example of the bridge and the communicating member.

[FIG. 5] FIG. 5 is a partial cross-sectional view showing a state immediately before a liquid feed circuit is connected to the nutritional supplement container shown in FIG. 1.

30 [FIG. 6] FIG. 6 is a partial cross-sectional view showing a state in the course of connecting the liquid feed circuit to the nutritional supplement container shown in FIG. 1.

[FIG. 7A] FIG. 7A is a partial cross-sectional view showing a state in which a

thin film of a container body is broken by the communicating member of the cap shown in FIG. 3A in the course of connecting the liquid feed circuit to the nutritional supplement container shown in FIG. 1.

[FIG. 7B] FIG. 7B is a partial enlarged view of the nutritional supplement container and the liquid feed circuit shown in FIG. 7A.

[FIG. 8A] FIG. 8A is a perspective view showing an example of a connector to be connected to the cap shown in FIG. 3A.

[FIG. 8B] FIG. 8B is a plan view of the connector shown in FIG. 8A.

[FIG. 8C] FIG. 8C is a bottom view of the connector shown in FIG. 8A.

10 [FIG. 8D] FIG. 8D is a side view of the connector shown in FIG. 8A.

[FIG. 8E] FIG. 8E is another side view of the connector shown in FIG. 8A.

[FIG. 9] FIG. 9 is a partial perspective view showing an example of a nutritional supplement container of Embodiment 2.

15 [FIG. 10] FIG. 10 is an exploded perspective view of the nutritional supplement container shown in FIG. 9.

[FIG. 11A] FIG. 11A is a perspective view of a protective cover constituting the nutritional supplement container shown in FIG. 9.

[FIG. 11B] FIG. 11B is another perspective view of the protective cover shown in FIG. 11A.

20 [FIG. 11C] FIG. 11C is a plan view of the protective cover shown in FIG. 11A.

[FIG. 11D] FIG. 11D is a bottom view of the protective cover shown in FIG. 11A.

[FIG. 12] FIG. 12 is a partial perspective view showing an example of a nutritional supplement container of Embodiment 3.

25 [FIG. 13] FIG. 13 is an exploded perspective view of the nutritional supplement container shown in FIG. 12.

[FIG. 14A] FIG. 14A is an enlarged perspective view showing an example of a cap of the present invention that constitutes the nutritional supplement container shown in FIG. 12.

30 [FIG. 14B] FIG. 14B is a partial enlarged view of the cap shown in FIG. 14A.

[FIG. 14C] FIG. 14C is a plan view of the cap shown in FIG. 14A.

[FIG. 14D] FIG. 14D is a bottom view of the cap shown in FIG. 14A.

[FIG. 14E] FIG. 14E is a side view of the cap shown in FIG. 14A.

[FIG. 14F] FIG. 14F is another side view of the cap shown in FIG. 14A.

[FIG. 15] FIG. 15 is a perspective view for explaining a bridge and a communicating member of the cap shown in FIG. 14A.

5 [FIG. 16] FIG. 16 is a partial cross-sectional view showing a state immediately before a liquid feed circuit is connected to the nutritional supplement container shown in FIG. 12.

[FIG. 17A] FIG. 17A is a partial cross-sectional view showing a state in which a thin film of a container body is broken by the communicating member of the cap
10 shown in FIG. 14A.

[FIG. 17B] FIG. 17B is a partial enlarged view of FIG. 17A.

[FIG. 18] FIG. 18 is a partial perspective view showing an example of a nutritional supplement container of Embodiment 4.

[FIG. 19] FIG. 19 is an exploded perspective view of the nutritional
15 supplement container shown in FIG. 18.

[FIG. 20A] FIG. 20A is an enlarged perspective view showing an example of a cap of the present invention that constitutes the nutritional supplement container shown in FIG. 18.

[FIG. 20B] FIG. 20B is a partial enlarged view of the cap shown in FIG. 20A.

20 [FIG. 20C] FIG. 20C is a plan view of the cap shown in FIG. 20A.

[FIG. 20D] FIG. 20D is a bottom view of the cap shown in FIG. 20A.

[FIG. 20E] FIG. 20E is a partial enlarged cross-sectional view taken along the line B-B' of the cap shown in FIG. 20A.

[FIG. 20F] FIG. 20F is a partial enlarged cross-sectional view taken along the
25 line C-C' of the cap shown in FIG. 20A.

[FIG. 21A] FIG. 21A is a partial enlarged cross-sectional view showing a state immediately before a liquid feed circuit is connected to the nutritional supplement container shown in FIG. 18.

[FIG. 21B] FIG. 21B is a partial enlarged cross-sectional view showing a state
30 in the course of pushing a communicating member of the nutritional supplement container shown in FIG. 18 toward a thin film.

[FIG. 21C] FIG. 21C is a partial enlarged cross-sectional view showing a state

in the course of pushing a communicating member of the nutritional supplement container shown in FIG. 18 toward a thin film.

[FIG. 21D] FIG. 21D is a partial enlarged cross-sectional view showing a state in the course of pushing a communicating member of the nutritional supplement container shown in FIG. 18 toward a thin film.

[FIG. 22] FIG. 22 is a schematic configuration diagram showing an example of an enteral alimentation set used for conventional enteral alimentation.

[FIG. 23] FIG. 23 is a schematic configuration diagram showing an example of an infusion set used for conventional intravenous alimentation.

Description of the Invention

[0013] In a preferred example of the cap of the present invention, the communicating member includes a plurality of flow paths, and a plurality of holes are formed in the end face of the communicating member facing away from the thin film. For example, it is preferable that the communicating member includes a plate portion that is provided on the end of the communicating member facing away from the thin film, and the end face has holes that constitute a part of the respective flow paths. Since a plurality of holes are formed in the end face, it can be said that a through hole is divided into two or more small holes. This structure makes it difficult to insert a connection needle with a sharp point into the through holes. Thus, when the communicating member has a structure that makes it difficult to insert a connection needle with a sharp point, it can more reliably solve the problem of an incorrect connection such that a liquid feed circuit for intravenous alimentation, in which a liquid material is fed into the body by simply inserting a connection needle with a sharp point into the object to be connected, is erroneously connected to the nutritional supplement container used for enteral alimentation.

[0014] In a preferred example of the cap of the present invention, the communicating member includes a partition that is provided closer to the thin film than the plate portion, and arranged so as to separate one space from another in the direction in which each of the holes extends. In this case, the communicating member is lightweight and can be easily molded compared to, e.g., a communicating member having a substantially cylindrical outer shape.

[0015] In a preferred example of the cap of the present invention, a portion of the communicating member that is farther from the point on the thin film side than the piercing portion projects outward. In this case, after the piercing portion pierces the thin film, the portion projecting outward comes into contact with the portion of the thin film that has not been broken, thereby preventing the communicating member from falling into the container body.

[0016] In a preferred example of the cap of the present invention, the bridge joins the communicating member and the cap body by stretching across the flow path through which the liquid material filled in the container body can flow out of the nutritional supplement container. In this case, since the bridge is placed across the internal cavity (flow path) of the communicating member, a connection needle with a sharp point is not easily inserted into the communicating member, so that the incorrect connection can be prevented more reliably.

[0017] In a preferred example of the cap of the present invention, a portion that includes the bridge and extends from a coupling portion between the cap body and the bridge to a coupling portion between the bridge and the communicating member is bent and deformed so that the communicating member can be pushed toward the container body. In this case, since the thin film can be broken while the cap body and the communicating member remain joined, it is possible to reliably prevent the communicating member from falling in the container body and being suspended in the liquid material.

[0018] For example, when the portion that includes the bridge and extends from the coupling portion between the cap body and the bridge to the coupling portion between the bridge and the communicating member includes three thin portions, and each of the three thin portions is bent and deformed, the communicating member can be pushed easily toward the container body. If the number of thin portions is 3, it is possible to suppress a break of the bridge that occurs due to a small number of thin portions or a complicated bending of the bridge that occurs due to an excessively large number of thin portions.

[0019] In a preferred example of the cap of the present invention, the cap includes a protective cover that covers the communicating member and includes an engagement portion that can be engaged with the connection maintaining structure of the cap.

This configuration can prevent an unwanted application of an external force to the communicating member. Therefore, it is possible to prevent the thin film from being broken by the communicating member that is pushed toward the container body due to the unwanted application of an external force to the communicating member.

5 [0020] (Embodiment 1)

In Embodiment 1, an example of a cap of the present invention and an example of a nutritional supplement container of the present invention that uses the cap will be described with reference to FIGS. 1 to 8E.

[0021] FIG. 1 is a partial perspective view showing an example of a nutritional
 10 supplement container of this embodiment. FIG. 2 is an exploded perspective view of the nutritional supplement container shown in FIG. 1. FIG. 3A is an enlarged perspective view showing an example of a cap of this embodiment that constitutes the nutritional supplement container shown in FIG. 1. FIG. 3B is a partial enlarged view of the cap shown in FIG. 3A. FIG. 3C is a plan view of the cap shown in FIG. 3A.
 15 FIG. 3D is a bottom view of the cap shown in FIG. 3A. FIG. 3E is a side view of the cap shown in FIG. 3A. FIG. 3F is another side view of the cap shown in FIG. 3A. FIG. 3G is a cross-sectional view of the cap shown in FIG. 3A. FIG. 3H is another cross-sectional view of the cap shown in FIG. 3A. For convenience of explanation, FIG. 3A shows a larger view than FIGS. 3C to 3H.

20 [0022] As shown in FIGS. 1 and 2, a nutritional supplement container 10 is a medial nutritional supplement container used for enteral alimentation. The nutritional supplement container 10 includes a bottle body (container body) 11, a liquid material (not shown) that contains a nutritional supplement and is filled in the bottle body 11, and a cap 13 that is secured to a mouth 12 (see FIG. 2) of the bottle body 11. A
 25 hanging portion (not shown) is provided at the bottom of the bottle body 11 and used to suspend the bottle body 11 from a stand or the like.

[0023] The bottle body 11 is made of, e.g., a hard material. Therefore, the outer shape is maintained unless an external force is applied. The bottle body 11 is produced, e.g., by blow molding of a resin material. Examples of the resin material
 30 include polyethylene terephthalate (PET), polypropylene (PP), polyvinyl chloride (PVC), and nylon.

[0024] As shown in FIG. 2, an external thread 12a is cut on the outer circumferential

surface of the mouth 12 and is to be screwed into an internal thread 23 (see FIG. 3H etc.) of the cap 13. A thin film 16 is attached to the mouth 12 so as to block the opening of the mouth 12, and the inside of the bottle body 11 is sealed with the thin film 16. Therefore, even if the bottle body 11 having the thin film 16 is placed with the mouth 12 facing down, the liquid material in the bottle body 11 will not leak from the bottle body 11.

[0025] The material of the thin film 16 may be, e.g., aluminum foil, a laminated film of paper and aluminum foil, or a resin film containing the same resin as that of the bottle body 11. The resin film may be either a single-layer film or a multi-layer film.

10 In particular, it is preferable that the thin film 16 is a resin film, and the surface of the resin film that comes into contact with the bottle body 11 is formed of the same resin as that of the bottle body 11 in terms of ensuring high adhesiveness of the thin film 16 to the bottle body 11 by thermal welding.

[0026] The thin film 16 is bonded to an opening end face 12b of the mouth 12, and a peripheral portion 16a of the thin film 16 is bonded to the outer circumferential surface of the mouth 12 in the vicinity of the opening end face 12b. However, the thin film 16 may be bonded only to the opening end face 12b of the mouth 12. A method for bonding the thin film 16 to the mouth 12 is selected appropriately in accordance with the material of the thin film 16, the material of the mouth 12, or the like.

20 [0027] As shown in FIG. 2, the cap 13 includes a cap body 22 and a communicating member 19 that is coupled to the cap body 22 via a bridge 19a (see FIG. 3B etc.). The cap body 22, the bridge 19a, and the communicating member 19 can be molded integrally by injection molding or the like. When pressure is applied to the communicating member 19 so that it is pushed toward the thin film 16, any part of the bridge 19a is broken. The thickness, width, etc. of the bridge 19a are determined appropriately in accordance with the material of the bridge 19a.

[0028] As shown in FIGS. 3A to 3G, the cap body 22 includes a base portion 20 and a connecting portion 21. The base portion 20 includes a top portion 17 and a side wall portion 18. The top portion 17 faces the opening of the mouth 12 and the side wall portion 18 surrounds the outer circumferential surface of the mouth 12 when the cap 13 is secured to the mouth 12. The internal thread 23 (see FIG. 3H etc.) is cut on the inner circumferential surface of the side wall portion 18, into which the external

30

thread 12a (see FIG. 2) cut on the outer circumferential surface of the mouth 12 is to be screwed.

[0029] As shown in FIG. 3A, the connecting portion 21 includes a tubular portion 21a that projects from the outer principal surface of the top portion 17, a seat 21b that is
 5 formed around the tubular portion 21a, and a pair of pawls 21c that is provided on the periphery of the tubular portion 21a and projects outward from the outer surface of the seat 21b. The outer circumferential surface of the tubular portion 21a includes a tapered surface 211 near the end of the tubular portion 21a. The tapered surface 211 increases in diameter from the end of the tubular portion 21a to the base portion.
 10 The pair of pawls 21c functions as a connection maintaining structure that can maintain the connection with a connector 25 of a liquid feed circuit 27 (see FIG. 5 etc.), as will be described later. As shown in FIG. 3B, the communicating member 19 is coupled to the tubular portion 21a of the cap body via the bridge 19a, and one part of the communicating member 19 is inserted into the internal cavity of the tubular
 15 portion 21a. Therefore, the other part of the communicating member 19 projects over the tubular portion 21a. Thus, the cap 13 includes the cap body including the top portion 17, the side wall portion 18, and the tubular portion 21a and the communicating member 19, a part of which is inserted into the tubular portion 21a.
 [0030] As shown in FIGS. 3E and 3F, each of the pawls 21c includes a lock projection
 20 211c that is formed on the surface facing the top portion 17 and can be fitted into a lock recess 321g (see FIG. 8A) of the connector 25 of the liquid feed circuit 27 (see FIG. 5 etc.), as will be described later.

[0031] FIG. 4A is a perspective view for explaining the bridge 19a and the communicating member 19 that constitute the cap. FIG. 4B is a cross-sectional view
 25 of the communicating member 19 taken along the line A-A' in FIG. 4A. The communicating member 19 includes a plate portion 19e that has a circular planar shape and is provided on the end of the communicating member 19 facing away from the thin film 16 (i.e., the opening of the base portion 20 of the cap). The plate portion 19e has a plurality of through holes 19d.

30 [0032] The communicating member 19 has a plurality of partitions 19c that are provided closer to the thin film than the plate portion 19e and divide a space on the thin film side into two or more parts. The partitions 19c are arranged so as to

separate one space from another in the direction in which each of the through holes 19d extends. Therefore, in order to connect the connector 25 of the liquid feed circuit 27 (see FIG. 5 etc.) to the cap 13, when the connector 25 is used to push the communicating member 19 toward the bottle body 11 so that a piercing portion 19b pierces the thin film 16, a plurality of spaces 19g that are open to the internal cavity of the cap body 22 (the base portion 20) are formed by the partitions 19c, and these spaces 19g and the through holes 19d function as a plurality of flow paths through which the liquid material filled in the bottle body 11 can flow out of the nutritional supplement container (i.e., in the direction of the arrow X). The communicating

member 19 shown in FIGS. 4A and 4B has four partitions, and thus provides four flow paths. The four partitions are spaced circumferentially at equal angles and also are integrated with each other. Therefore, as shown in FIG. 4B, the cross-sectional shape of a division member composed of the partitions 19c is substantially a cross.

[0033] The communicating member 19 has the piercing portion 19b on the end facing the thin film 16 in the axial direction. The point of the piercing portion 19b is sharp enough to be able to pierce the thin film 16. In the example shown in FIG. 4A, each of the partitions 19c has an inclined surface 19m that is inclined toward the point of the communicating member 19 on the thin film side. The inclined surfaces 19m meet at the point 19f of the communicating member 19 on the thin film side, thus forming the piercing portion 19b that can pierce the thin film 16.

[0034] As shown in FIG. 4A, the communicating member 19 preferably has portions 19h that project outward (in the radial direction) from the piercing portion 19b at any positions that are farther from the point 19f than the piercing portion 19b. In other words, the portions 19h project from the piercing portion 19b in the direction perpendicular to the longitudinal direction of the communicating member 19. For example, it is preferable that each of the partitions 19c has the wide portion 19h that projects outward from the piercing portion 19b at any position that is farther from the point 19f than the other portions of the partition 19c constituting the piercing portion 19b. After the piercing portion 19b pierces the thin film 16, the portions 19h come into contact with the portions of the thin film 16 that have not been broken, thereby preventing the communicating member 19 from falling into the bottle body 11. In the example shown in FIG. 4A, surfaces 19j of the portions 19h facing the thin film 16

come into contact with the portions of the thin film 16 that have not been broken, and thus can prevent the communicating member 19 from falling into the bottle body 11.

[0035] The bridge 19a is provided so as to project outward (e.g., in the direction perpendicular to the longitudinal direction of the communicating member 19) from the partition 19c. The number, shape, etc. of the bridge 19a are not particularly limited as long as the communicating member 19 is supported stably by the cap body 22, and the bridge 19a can be broken easily when the communicating member 19 is pushed toward the thin film 16. For example, when a plurality of partitions 19c are arranged radially from the central axis of the communicating member 19, and the surfaces of the partitions 19c facing the inner circumferential surface of the tubular portion 21a are located in the circumferential direction, the bridge 19a may be provided so as to extend outward (in the radial direction) from every other partition 19c. In the case of the communicating member 19 shown in FIGS. 4A and 4B, e.g., since there are four partitions 19c, the bridge 19a may be provided only on two partitions 19c that are 180 degrees apart.

[0036] As shown in FIGS. 3A, 3C, and 3D, two vent holes 29 are formed in the top portion 17 of the cap 13 and penetrate the top portion 17 in its thickness direction. Moreover, a vent filter 28 (see FIG. 3D etc.) is attached to the inner principal surface 17a of the top portion 17 to cover the vent holes 29. The vent filter 28 is surrounded by an annular wall 28a that is provided on the inner principal surface 17a of the top portion 17. The vent filter 28 is a hydrophobic vent filter and transmits a gas, but not a liquid. The pressure in the bottle body 11 decreases as the liquid material filled in the bottle body 11 flows out of the mouth 12. If the bottle body 11 is made of a flexible material, the bottle body 11 is deformed with the flow of the liquid material, so that the liquid material continues to come out. However, the bottle body 11 made of a hard material is not likely to be deformed. In this embodiment, air is drawn into the bottle body 11 through the vent filter 28 while the liquid material flows out. Thus, the liquid material can flow continuously from the bottle body 11, e.g., without making a hole for ventilation by inserting a needle or the like into the bottle body 11 during the supply of a nutritional supplement to the body.

[0037] The material etc. of the vent filter 28 are not particularly limited as long as the vent filter 28 is a known hydrophobic filter used, e.g., for a connection needle such

as a bottle needle.

[0038] As shown in FIGS. 3D, 3G, 3H, 5 to 7, etc., it is preferable that the cap 13 further includes an annular sealing material 171 that is placed on the inner principal surface 17a of the top portion 17. The sealing material 171 is interposed between the inner principal surface 17a of the top portion 17 and the opening end face 12b (see FIG. 2) of the mouth 12 of the bottle body 11, so that the airtightness between the cap 13 and the mouth 12 can be improved. This can effectively prevent leakage of the liquid material from a gap between the cap 13 and the mouth 12 when the liquid material is supplied to a patient. For convenience of illustration, the sealing material 171 is hatched in FIG. 3D.

[0039] The sealing material 171 may be, e.g., isoprene rubber, butylene rubber, or thermoplastic elastomer.

[0040] FIG. 5 shows a state immediately before the liquid feed circuit 27 that includes the connector 25 and a flexible tube 26 connected to the connector 25 is connected to the connecting portion 21 and the communicating member 19 of the cap 13. FIG. 6 shows a state in the course of connecting the liquid feed circuit 27 to the connecting portion 21 and the communicating member 19. FIGS. 7A and 7B show a state in which the thin film 16 is broken in the course of connecting the liquid feed circuit 27 to the connecting portion 21 and the communicating member 19.

[0041] As shown in FIGS. 5 to 7B, the connecting portion 21 and the communicating member 19 have structures that are to be connected to the liquid feed circuit 27 including the connector 25, as will be described with reference to FIGS. 8A to 8E. Therefore, it is possible to solve the problem of an incorrect connection such that a liquid feed circuit for intravenous alimentation, in which a liquid material is fed into the body by simply inserting a connection needle with a sharp point into the object to be connected, is erroneously connected to the nutritional supplement container 10 (see FIG. 1) used for enteral alimentation. Moreover, as shown in FIGS. 4A to 4G, since a plurality of through holes 19d are formed in the end face of the communicating member 19 opposite to the piercing portion 19b, a connection needle with a sharp point is not easily inserted into the through holes, so that the incorrect connection can be prevented more reliably.

[0042] As shown in FIGS. 5 to 7B, when the tubular portion 21a is press fitted into

the connector 25, and then the connector 25 is rotated around the axis, the pawls 21c of the cap 13 are engaged with engagement portions of the connector 25, as will be described later. Accordingly, the connector 25 is fitted on the connecting portion 21, and thus can be prevented reliably from detaching from the connecting portion 21.

5 Moreover, when the pawls 21c are engaged with the engagement portions of the connector 25, as shown in FIG. 7B, an outer surface 212 of the tubular portion 21a comes into close contact with the inner surface (i.e., a large-diameter portion 33a) of the connector 25. Thus, the connector 25 and the cap 13 are connected without causing a liquid leakage.

10 [0043] The connection between the cap 13 and the connector 25 may be maintained by using either various known structures or a method other than the engagement between the pawls 21c (see FIG. 3E etc.) including the lock projections 211c (i.e., the connection maintaining structure) of the cap 13 and engagement walls 321d (see FIG. 8A) including the lock recesses 321g of the connector 25.

15 [0044] The material of the cap 13 may be, e.g., polyethylene (PE), polypropylene (PP), polyacetal (POM), polyethylene terephthalate (PET), or polycarbonate (PC).

[0045] Next, an example of the connector to be connected to the cap will be described with reference to FIGS. 8A to 8E.

[0046] FIG. 8A is a perspective view showing a schematic configuration of an
20 example of the connector 25 to be connected to the cap of the present invention. FIG. 8B is a plan view of the connector 25 shown in FIG. 8A. FIG. 8C is a bottom view of the connector 25 shown in FIG. 8A. FIG. 8D is a side view of the connector 25 shown in FIG. 8A. FIG. 8E is another side view of the connector 25 shown in FIG. 8A.

[0047] As shown in FIGS. 8A to 8E, the female connector 25 includes an insertion
25 portion 33, a liquid feed tube connecting portion 30, flanges 32, and holders 31. By connecting the connector 25 to the cap 13 that is secured to the mouth 12 of the bottle body (container body) 11, the inside of the bottle body 11 can be communicated with the lumen of the flexible tube 26 (see FIGS. 5 to 7B etc.) connected to the connector 25. An alternate long and short dash line 151 represents the central axis of the insertion
30 portion 33 and the liquid feed tube connecting portion 30. In this specification, the direction of the central axis 151 is defined as a vertical direction, and the upper side of the sheet of FIG. 8A (i.e., the side to be connected to the cap) is referred to as an “upper

side” and the lower side of the sheet of FIG. 8A is referred to as a “lower side”.

[0048] The connector 25 is substantially tubelike as a whole. The insertion portion 33 in the vicinity of the upper end of the connector 25 has the large-diameter portion 33a and a small-diameter portion 33b. The large-diameter portion 33a has an inner diameter that is the same as or slightly smaller than the maximum outer diameter of the tubular portion 21a of the cap 13. The small-diameter portion 33b is located on the lower side of the large-diameter portion 33a and has an inner diameter that is smaller than the outer diameter of the plate portion 19e of the communicating member 19 and the inner diameter of the large-diameter portion 33a. The inner diameter of the large-diameter portion 33a is the same as or slightly smaller than the maximum outer diameter of the tubular portion 21a. Therefore, when the tubular portion 21a of the cap 13 is pressed into the insertion portion 33 of the connector 25 to establish a connection between the connector 25 and the cap 13, the outer surface 212 of the tubular portion 21a comes into close contact with the inner surface of the large-diameter portion 33a (see FIGS. 5 and 7B). Thus, the cap 13 and the connector 25 can be connected reliably without causing a liquid leakage.

[0049] Since the insertion portion 33 of the connector 25 has both the large-diameter portion 33a and the small-diameter portion 33b, there is a stepped surface 33c between the large-diameter portion 33a and the small-diameter portion 33b. When the connector 25 is connected to the cap 13, the stepped surface 33c comes into contact with an end face 211a of the tubular portion 21a and an end face 19k of the communicating member 19 (see FIG. 7B).

[0050] The liquid feed tube connecting portion 30 that is substantially in the form of a cylinder is located on the lower side of the small-diameter portion 33b.

[0051] A pair of flanges 32 is formed around the large-diameter portion 33a and located on the upper side of the large-diameter portion 33a. The pair of flanges 32 is symmetrical with respect to the central axis 151. Each of the flanges 32 has an arc-shaped wall 321 and a joining portion 322. The arc-shaped wall 321 is provided substantially along the cylindrical surface that is arranged around the central axis 151. The joining portion 322 extends in the direction perpendicular to the central axis 151 and joins the lower end of the arc-shaped wall 321 and the upper end of the large-diameter portion 33a.

[0052] As shown in FIGS. 8A and 8B, the arc-shaped wall 321 includes a passing area 321a, an engagement area 321b, and a non-passing area 321c in accordance with the difference in shape of the inner surface facing the central axis 151. As shown in FIG. 8B, the inner surface of the passing area 321a is a part of the cylindrical surface with a diameter DF21, and the inner surface of the non-passing area 321c is a part of the cylindrical surface with a diameter DF 23 ($DF23 < DF21$). As shown in FIG. 8A, the engagement wall 321d is provided on the upper end of the engagement area 321b between the passing area 321a and the non-passing area 321c, and extends circumferentially so as to join the upper ends of the passing area 321a and the non-passing area 321c. The inner surface of the engagement wall 321d facing the central axis 151 is a part of the cylindrical surface with a diameter DF22 ($DF22 < DF21$). Since the engagement area 321b includes the engagement wall 321d, a region between the engagement wall 321d and the joining portion 322 is depressed in a concave shape. That is, the region between the engagement wall 321d and the joining portion 322 is recessed relative to the engagement wall 321d with respect to the central axis 151, so that a recess 321e is formed. The non-passing area 321c that is adjacent circumferentially to the engagement area 321b projects relative to the recess 321e toward the central axis 151, so that a projection 321f is formed. The lock recess 321g that is depressed in a concave shape is formed at the end of the lower surface of the engagement wall 321d (i.e., the surface of the engagement wall 321d on the recess 321e side or the surface of the engagement wall 321d facing the joining portion 322) near the non-passing area 321c. A through hole 220 (see FIG. 8C) passing through the joining portion 322 in its thickness direction is formed in a part of the joining portion 322 facing the engagement wall 321d. However, the through hole 220 may not be necessary.

[0053] As shown in FIG. 8A, a pair of holders 31 is provided on the periphery of the insertion portion 33 and projects outward (in the direction perpendicular to the central axis 151) from the outer surface of the insertion portion 33. When a rotation operation is performed to engage the pawls 21c of the cap 13 with the flanges 32, the connector 25 is rotated by holding the pair of holders 31.

[0054] Next, a method for connecting the connector 25 to the cap 13 will be described.

[0055] As shown in FIGS. 5 to 7B, when the connector 25 is being attached to the cap

13 so that the communicating member 19 is inserted into the insertion portion 33 of the connector 25, the bridges 19a (see FIG. 3B) are broken, and the communicating member 19 is pushed into the mouth 12 of the bottle body while the piercing portion 19b of the communicating member 19 pierces the thin film 16. In other words, the communicating member 19 is pushed toward the bottle body 11 by the operation of connecting the connector 25 to the cap 13.

[0056] Subsequently, the holders 31 are held to rotate the connector 25 around the central axis with respect to the cap 13. With the rotation of the connector 25, each of the lock projections 211c (see FIG. 3E etc.) slides over a surface 321h of the engagement wall 321d on the joining portion 322 side while being pressed against the surface 321h, and then is fitted into the lock recess 321g (see FIG. 8A). Due to the fit between the lock projections 211c and the lock recesses 321g, the state in which the connector 25 is connected to the cap 13 can be maintained stably.

[0057] As described above, in the nutritional supplement container 10 (see FIG. 1), the inside of the nutritional supplement container 10 and the inside of the liquid feed circuit 27 can be communicated with each other, e.g., only by pushing the communicating member 19 of the cap toward the container body as the connector 25 is connected to the cap 13. Therefore, the liquid material can be supplied hygienically by a simple operation.

[0058] Moreover, the connector 25 includes the projections 321f (see FIG. 8A) adjacent to the lock recesses 321g that receive the pawls 21c. Therefore, when the pawls 21c of the cap 13 are allowed to enter the lock recesses 321g and further moved until they come into contact with the projections 321f, the pawls 21c can be engaged reliably with the engagement walls 321d.

[0059] It is preferable that the rotation of the connector 25 with respect to the cap 13 can be limited by bringing the pawls 21c of the cap 13 into contact with the projections 321f of the connector 25. Thus, the pawls 21c can be engaged reliably with the engagement walls 321d by a simple operation of rotating the connector 25 with respect to the cap 13 until the rotation is limited.

[0060] The hardness of the connector 25 measured based on JIS-K7202 is preferably R40 to R140, and more preferably R50 to R100 in terms of improving the workability in the connection of the flexible liquid feed tube 26 to the liquid feed tube connecting

portion 30.

[0061] The form of the communicating member 19 is not limited to that shown in FIGS. 4A and 4B. For example, as shown in FIG. 4C, the communicating member 19 may have three through holes 19d in the plate portion 19e, three partitions 19c provided closer to the thin film side than the plate portion 19e, and three flow paths. In the communicating member 19 shown in FIG. 4C, all the partitions 19c have the bridges 19a, and these bridges 19a are arranged circumferentially at regular intervals. However, at least one bridge 19a may be provided as long as the communicating member 19 is supported stably by the cap body.

10 [0062] As shown in FIG. 4D, the communicating member 19 may have two through holes 19d in the plate portion 19e, one partition 19c provided closer to the thin film than the plate portion 19e, and two flow paths. In the communicating member 19 shown in FIG. 4D, the bridge 19a is formed on each of the surfaces of the partition 19c facing the inner circumferential surface of the tubular portion 21a. That is, in the communicating member 19 shown in FIG. 4D, the partition 19c has a pair of bridges 19a that are symmetrical with respect to the central axis of the communicating member 19. However, at least one bridge 19a may be provided as long as the communicating member 19 is supported stably by the cap body.

[0063] As shown in FIGS. 4E to 4G, the communicating members 19 may be substantially in the form of a cylinder, and also may have two to four flow paths by dividing the internal cavity into two to four through holes 19d. As shown in FIGS. 4E to 4G, it is preferable that each of the communicating members 19 is substantially in the form of a cylinder, and the outer shape of the end face of the communicating member 19 as seen in a plan view, i.e., from the piercing portion 19b side in the longitudinal direction is, e.g., a circle. This is because a large hole can be made in the thin film 16 by piercing it with the communicating member 19. In the communicating members 19 shown in FIGS. 4E to 4G, at least one bridge 19a may be provided on the outer circumferential surface as long as the communicating members 19 are supported stably by the cap body.

30 [0064] (Embodiment 2)

Next, another example of a cap of the present invention and another example of a nutritional supplement container of the present invention that uses the cap will be

described with reference to FIGS. 9 to 11D.

[0065] FIG. 9 is a partial perspective view showing an example of a nutritional supplement container of this embodiment. FIG. 10 is an exploded perspective view of the nutritional supplement container shown in FIG. 9. As shown in FIGS. 9 and 10, the cap and the nutritional supplement container of this embodiment have the same configurations as those of the cap and the nutritional supplement container of Embodiment 1 except that the cap 13 further includes a protective cover 40 for protecting the communicating member 19. Accordingly, the same components as those of Embodiment 1 are denoted by the same reference numerals, and the explanation will not be repeated.

[0066] In this embodiment, the protective cover 40 protects the communicating member 19, and thus can prevent an unwanted application of an external force to the communicating member 19. Therefore, it is possible to prevent the thin film 16 from being broken by the communicating member 19 that is pushed toward the bottle body (container body) 11 (i.e., the opening of the cap body 22) due to the unwanted application of an external force to the communicating member 19.

[0067] As shown in FIGS. 11A to 11D, the protective cover 40 includes a cover body 41 and a pair of flanges 42. The cover body 41 covers the communicating member 19 from outside the top portion 17 (see FIG. 10). The pair of flanges 42 includes engagement walls 421d that can be engaged with the pawls 21c (see FIG. 10) of the cap 13 as engagement portions. Each of the flanges 42 of the protective cover 40 has the same configuration as that of the connector 25

[0068] The protective cover 40 is put so that the communicating member 19 and the seat 21b are contained in the cover body 41. By rotating the protective cover 40, each of the lock projections 211c (see FIG. 3E etc.) of the pawls 21c of the cap 13 is fitted into a lock recess 421g that is formed at the end of the lower surface of the engagement wall 421d (i.e., the surface of the engagement wall 421d on the recess 418 side) near a non-passing area 421c. Thus, the state in which the protective cover 40 is put on the cap 13 can be maintained stably.

[0069] Similarly to Embodiment 1, this embodiment also can solve the problem of an incorrect connection such that a liquid feed circuit for intravenous alimentation is erroneously connected to the nutritional supplement container used for enteral

alimentation. In addition, this embodiment can hygienically supply the liquid material such as a nutritional supplement by a simple operation. That is, the protective cover 40 is removed from the cap, and then the thin film 16 is broken, e.g., by applying pressure to the communicating member 19 so that it is pushed toward the thin film 16 via the connector 25. Thus, the liquid material can be supplied to a patient only by connecting the liquid feed circuit 27 to the cap 13 (see FIGS. 5 to 7B etc.).

[0070] (Embodiment 3)

In Embodiment 3, another example of a cap of the present invention and another example of a nutritional supplement container of the present invention that uses the cap will be described with reference to FIGS. 12 to 17B.

[0071] FIG. 12 is a partial perspective view showing an example of a nutritional supplement container of this embodiment. FIG. 13 is an exploded perspective view of the nutritional supplement container shown in FIG. 12. FIG. 14A is an enlarged perspective view showing an example of a cap of this embodiment that constitutes the nutritional supplement container shown in FIG. 12. FIG. 14B is a partial enlarged view of the cap 43 shown in FIG. 14A. FIG. 14C is a plan view of the cap 43 shown in FIG. 14A. FIG. 14D is a bottom view of the cap 43 shown in FIG. 14A. FIG. 14E is a side view of the cap 43 shown in FIG. 14A. FIG. 14F is another side view of the cap 43 shown in FIG. 14A. FIG. 15 is a perspective view for explaining a bridge and a communicating member of the cap 43 shown in FIG. 14A. For convenience of explanation, FIG. 14A shows a larger view than FIGS. 14C to 14F. As shown in FIGS. 12 to 15, the cap and the nutritional supplement container of this embodiment have the same configurations as those of the cap and the nutritional supplement container of Embodiment 1 except that the shapes of a communicating member 39 and a bridge 39a are different. Accordingly, the same components as those of Embodiment 1 are denoted by the same reference numerals, and the explanation will not be repeated.

[0072] As shown in FIGS. 14B and 15, the communicating member 39 has a cylindrical portion 39e on the opposite side to the thin film (see FIG. 13). The cylindrical portion 39e is formed so that a part of the circumference of the cylindrical portion 39e is cut when the communicating member 39 is seen in a plan view, i.e., from the end face opposite to the thin film. Thus, the cylindrical portion 39e has a cut 39h

extending along the axial direction. The outer surface of the cylindrical portion 39e is a part of the cylindrical surface with a diameter that is slightly smaller than the inner diameter of the tubular portion 21a. Moreover, the communicating member 39 has a piercing portion 39b on the end facing the thin film 16 in the axial direction. The point of the piercing portion 39b is sharp enough to be able to pierce the thin film 16. The communicating member 39 has a pair of inclined surfaces 39m that is inclined toward the point of the communicating member 39 on the thin film side. The inclined surfaces 39m meet at the point 39f of the communicating member 39 on the thin film side, thus forming the piercing portion 39b that can pierce the thin film 16. When the piercing portion 39b pierces the thin film 16, an internal cavity 39j of the communicating member 39 functions as a flow path through which the liquid material filled in the container body 11 (see FIG. 13) can flow out of the nutritional supplement container (i.e., in the direction of the arrow X).

[0073] The cap body 22, the bridge 39a, and the communicating member 39 can be molded integrally by injection molding or the like. As shown in FIG. 14B, the bridge 39a passes through the cut 39h and stretches between the inside and the outside of the cylindrical portion 39e, thereby joining an inner circumferential surface 39k of the communicating member 39 and the tubular portion 21a of the connecting portion 21. When pressure is applied to the communicating member 39 so that it is pushed toward the thin film 16, the bridge 39a is plastically deformed and will not be restored to its original shape even after removal of the pressure. The thickness, width, etc. of the bridge 39a are determined appropriately in accordance with the material of the bridge 39a so that a plastic deformation can occur when the communicating member 39 is pushed toward the thin film 16 (see FIG. 13).

[0074] The bridge 39a is required to have a length long enough for the communicating member 39 to move toward the thin film 16 so that the piercing portion 39b can pierce the thin film 16 (see FIG. 13). In terms of ensuring such a length of the bridge 39a, it is preferable that the bridge 39a is, e.g., in the form of an S shape when the communicating member 39 is seen in a plan view, i.e., from the end face opposite to the thin film.

[0075] As shown in FIG. 15, when the communicating member 39 has a tubelike, e.g., cylindrical shape with one end in the longitudinal direction including the piercing

portion 39b and being pointed so as to pierce the thin film, and the cut 39h is formed along the entire length of the communicating member 39 in the longitudinal direction, it is preferable that the width of the cut 39 (i.e., the length in the direction perpendicular to the longitudinal direction of the cut 39) may be slightly larger than the width of a portion of the bridge 39a that is inside the cut 39. This is because a larger hole can be made in the thin film 16 by piercing it with the communicating member 39.

[0076] FIG. 16 shows a state before the liquid feed circuit 27 (see FIGS. 5 to 7A) that includes the connector 25 (see FIGS. 5 to 7) and the flexible tube 26 (see FIG. 5) connected to the connector 25 is connected to the connecting portion 21 and the communicating member 39 of the cap 43. FIG. 17A shows a state in which the thin film 16 is broken by the communicating member 39. FIG. 17B is a partial enlarged view of FIG. 17A. In FIGS. 16 to 17B, the liquid feed circuit 27, which is shown in FIGS. 5 to 7A, is omitted.

[0077] In this embodiment, the connecting portion 21 and the communicating member 39 have structures that are to be connected to the liquid feed circuit 27 including the connector 25, which has been described with reference to FIGS. 8A to 8E. Therefore, it is possible to solve the problem of an incorrect connection such that a liquid feed circuit for intravenous alimentation, in which a liquid material is fed into the body by simply inserting a connection needle with a sharp point into the object to be connected, is erroneously connected to the nutritional supplement container 10 (see FIG. 12 etc.) used for enteral alimentation. Moreover, as shown in FIG. 14B etc., the bridge 39a is placed across the internal cavity (flow path) 39j of the communicating member 39, that is, the bridge 39a stretches from one side to the other of the flow path, thereby joining the communicating member 39 and the tubular portion 21a of the cap body. Therefore, a connection needle with a sharp point is not easily inserted into the communicating member 39, so that the incorrect connection can be prevented more reliably.

[0078] In this embodiment, the thin film 16 is broken, e.g., by applying pressure to the communicating member 39 so that it is pushed toward the thin film 16 (see FIG. 13) via the connector 25 and plastically deforming the bridge 39a. Thus, the liquid material can be supplied to a patient only by connecting the liquid feed circuit 27 (see

FIG. 5) to the cap 43. Therefore, similarly to Embodiment 1, this embodiment also can solve the problem of an incorrect connection such that a liquid feed circuit for intravenous alimentation is erroneously connected to the nutritional supplement container used for enteral alimentation. In addition, this embodiment can
 5 hygienically supply the liquid material such as a nutritional supplement by a simple operation.

[0079] In FIGS. 17A, 17B, etc., when pressure is applied to the communicating member 39 so that it is pushed toward the thin film 16, the bridge 39a is plastically deformed and will not be restored to its original shape even after removal of the
 10 pressure. In this embodiment, however, the bridge 39a may be either broken or plastically deformed but will be restored to its original shape after removal of the pressure.

[0080] The cap and the nutritional supplement container of this embodiment may include the protective cover described in Embodiment 2.

15 [0081] (Embodiment 4)

In Embodiment 4, another example of a cap of the present invention and another example of a nutritional supplement container of the present invention that uses the cap will be described with reference to FIGS. 18 to 21D.

[0082] FIG. 18 is a partial perspective view showing an example of a nutritional
 20 supplement container of this embodiment. FIG. 19 is an exploded perspective view of the nutritional supplement container shown in FIG. 18. FIG. 20A is an enlarged perspective view showing an example of a cap of this embodiment that constitutes the nutritional supplement container shown in FIG. 18. FIG. 20B is a partial enlarged view of the cap 53 shown in FIG. 20A. FIG. 20C is a plan view of the cap 53 shown in
 25 FIG. 20A. FIG. 20D is a bottom view of the cap 53 shown in FIG. 20A. FIG. 20E is a partial enlarged cross-sectional view taken along the line B-B' of the cap 53 shown in FIG. 20A. FIG. 20F is a partial enlarged cross-sectional view taken along the line C-C' of the cap 53 shown in FIG. 20A. For convenience of explanation, FIG. 20A is shows a larger view than FIGS. 20C to 20D. As shown in FIGS. 18 to 21D, the cap
 30 and the nutritional supplement container of this embodiment have the same configurations as those of the cap and the nutritional supplement container of Embodiment 1 except that the shapes of a communicating member 49 and a bridge

49a are different. Accordingly, the same components as those of Embodiment 1 are denoted by the same reference numerals, and the explanation will not be repeated.

[0083] As shown in FIGS. 20A and 20B, the communicating member 49 has a cylindrical portion 49e on the opposite side to the thin film 16 (see FIG. 19 etc.). The cylindrical portion 49e includes a pair of flat plate portions 491e and a pair of curved plate portions 492e. The pair of flat plate portions 491e is arranged opposite to each other and symmetrical with respect to the central axis of the cylindrical portion 49e. The pair of curved plate portions 492e joins the pair of flat plate portions 491e together. The outer surface of each of the curved plate portions 492e is a part of the cylindrical surface with a diameter that is slightly smaller than the inner diameter of the tubular portion 21a. The outer surface of each of the flat plate portions 491e is recessed relative to this cylindrical surface in the direction away from the tubular portion 21a, so that a recess 493e is formed.

[0084] As shown in FIGS. 20E and 20F, the communicating member 49 includes a piercing portion 49b that is provided closer to the thin film than the cylindrical portion 49e, and a partition 49c that divides a space in the tubular portion 21a into two or more parts. The width of the partition 49c becomes gradually narrower at the end on the thin film side, thus forming the piercing portion 49b that is sharp enough to be able to pierce the thin film 16. The partition 49c is coupled to the lower ends of the curved plate portions 492e and integrated with the cylindrical portion 49e. Therefore, when the cylindrical portion 49e is pushed toward the thin film 16, the partition 49c also is pushed toward the thin film 16. The principal surface of the partition 49c is parallel to the principal surfaces of the pair of flat plate portions 491e. Most of the partition 49c is located under (i.e., on the side closer to the thin film) a pair of bridges 49a that joins each of the lower ends of the flat plate portions 491e and the tubular portion 21a, and the partition 49c is arranged between the pair of bridges 49a when the communicating member 49 is seen in a plan view, i.e., from the end face opposite to the thin film (see FIG. 20C).

[0085] FIG. 21A shows a state before the liquid feed circuit 27 (see FIGS. 5 to 7A) that includes the connector 25 and the flexible tube 26 connected to the connector 25 is connected to the connecting portion and the communicating member 49 of the cap 53. FIGS. 21B to 21D show a state in the course of pushing the communicating member

49 toward the thin film 16. In FIGS. 21A to 21D, the liquid feed circuit 27, which is shown in FIGS. 5 to 7A, is omitted.

[0086] The thickness T_1 of a coupling portion 51 between the tubular portion 21a (the cap body) and the bridge 49a is smaller than the thickness of the bridge 49a in the vicinity of the coupling portion 51. The thickness T_2 of a coupling portion 52 between the bridge 49a and the cylindrical portion 49e (the communicating member) is smaller than the thickness of the bridge 49a in the vicinity of the coupling portion 52. Moreover, the bridge 49a has a thin portion 54 with a thickness of T_3 , e.g., in the middle. Therefore, when pressure is applied to the communicating member 49 so that it is pushed toward the thin film 16 via the connector 25, as shown in FIGS. 21B to 21D, in portions Z (i.e., the dotted portions in FIGS. 21A to 21D), each of which includes the bridge 49 and extends from the coupling portion 51 to the coupling portion 52, three thin portions including the coupling portion 51, the coupling portion 52, and the thin portion 54 are bent and deformed, and the communicating member 49 is pushed toward the bottle body (container body) 11 (see FIG. 18) while the piercing portion 49b of the communicating member 49 pierces the thin film 16. The thickness T_1 of the coupling portion 51, the thickness T_2 of the coupling portion 52, the thickness T_3 of the thin portion 54, the thickness of each portion of the bridge 49a, etc. are appropriately determined in accordance with the material of these portions.

[0087] When the communicating member 49 shown in FIG. 21D is pushed toward the thin film 16 further, and the pawls 21c (see FIG. 20E etc.) are engaged with the engagement walls 321d (the engagement portions, see FIG. 8A etc.) of the connector 25, an end face 49f of the communicating member 49 facing away from the thin film 16 is substantially flush with the end face 211a of the tubular portion 21a. When the cylindrical portion 49e is pushed toward the thin film 16 and inserted into the tubular portion 21a, gaps are formed between each of the outer surfaces of the flat plate portions 491e and the inner circumferential surface of the tubular portion 21a. These gaps, i.e., the spaces surrounded by the recesses 493e (see FIG. 20B) and the inner circumferential surface of the tubular portion 21a are used to house the bent bridges 49a.

[0088] In this embodiment, the connecting portion 21 and the communicating member 49 have structures that are to be connected to the liquid feed circuit 27

including the connector 25, which has been described with reference to FIGS. 8A to 8E. Therefore, it is possible to solve the problem of an incorrect connection such that a liquid feed circuit for intravenous alimentation, in which a liquid material is fed into the body by simply inserting a connection needle with a sharp point into the object to be connected, is erroneously connected to the nutritional supplement container 10 (see FIG. 18) used for enteral alimentation.

[0089] In this embodiment, the thin film 16 is broken, e.g., by applying pressure to the communicating member 49 so that it is pushed toward the thin film 16 via the connector 25 and bending and deforming the portions Z, each of which includes the bridge 49a and extends from the coupling portion 51 to the coupling portion 52, and optionally plastically deforming the portions Z. Thus, the liquid material can be supplied to a patient only by connecting the liquid feed circuit 27 (see FIG. 5) to the cap 53. Therefore, similarly to Embodiment 1, this embodiment also can solve the problem of an incorrect connection such that a liquid feed circuit for intravenous alimentation is erroneously connected to the nutritional supplement container used for enteral alimentation. In addition, this embodiment can hygienically supply the liquid material such as a nutritional supplement by a simple operation.

[0090] In an example of this embodiment described with reference to FIG. 21A etc., each of the bridges 49a has one thin portion 54, and the communicating member 49 is allowed to be pushed toward the thin film 16 by bending the coupling portions 51, 52 and the thin portion 54. However, the bridge 49a may include one or more than one thin portion. The shapes of the coupling portions 51, 52, the number of thin portions, etc. are not particularly limited as long as these portions are bent and deformed to allow the communicating member 49 to move toward the thin film and pierce it when pressure is applied to the communicating member 49 so that it is pushed toward the thin film. However, the number of thin portions in each of the portions Z is preferably 3 so as to suppress a break of the bridge that occurs due to a small number of thin portions or a complicated bending of the bridge that occurs due to an excessively large number of thin portions.

[0091] In this embodiment, when pressure is applied to the communicating member 49 so that it is pushed toward the thin film 16, the bridges 49a are bent and deformed, so that the thin film can be broken while the cap body and the communicating member

remain joined. Such a configuration is preferred because it can reliably prevent the communicating member from falling in the container body and being suspended in the liquid material. In this embodiment, however, the bridges 49a may be broken.

[0092] The cap and the nutritional supplement container of this embodiment may
5 include the protective cover described in Embodiment 2.

[0093] For convenience of illustration, the connector 25 and the flexible tube 26 are shown partially in the liquid feed circuit 27 of FIG. 5. However, the liquid feed circuit that is connected to the cap and the nutritional supplement container in any of Embodiments 1 to 4 or constitutes a nutritional supplement supply set with the
10 nutritional supplement container may further include the components of a liquid feed circuit used for conventionally known enteral alimentation, such as a flow controller for controlling the flow rate of the liquid material that flows through the flexible tube 26 by pressing the flexible tube 26, a drip chamber, a connector to be connected to a nasotracheal tube or the like that is fixed to a patient, and a cover of this connector.

15

Industrial Applicability

[0094] The present invention can provide a cap of a nutritional supplement container, a nutritional supplement container using the cap, and a nutritional supplement supply set including the nutritional supplement container that are suitable for enteral
20 alimentation.

Description of Reference Numerals

25	[0095] 10	Nutritional supplement container
	11	Container body
	12	Mouth
	12a	External thread
	13, 43, 53	Cap
30	16	Thin film
	17	Top portion
	18	Side wall portion
	19, 39, 49	Communicating member
	19a, 39a, 49a	Bridge

	19b, 39b, 49b	Piercing portion
	19c, 49c	Partition
	19e	Plate portion
	20	Base portion
5	21	Connecting portion
	22	Cap body
	23	Internal thread
	21a	Tubular portion
	21b	Seat
10	21c	Pawl
	25	Connector
	26	Flexible tube
	27	Liquid feed circuit
	28	Vent filter
15	29	Vent hole
	171	Seal material
	40	Protective cover
	51	Coupling portion between cap body and bridge
	52	Coupling portion between bridge and communicating
20	member	
	54	Thin portion of bridge
	Z	Portion including bridge and extending from coupling portion
		between cap body and bridge to coupling portion between bridge and communicating
		member
25		

CLAIMS

- [1] A cap that is to be secured to a mouth of a container body of a nutritional supplement container and allows a liquid material filled in the container body to flow out, the mouth being provided with a thin film for sealing the container body,
- 5 the cap comprising:
- a cap body;
- a bridge that is coupled to the cap body and can be broken or deformed;
- a communicating member that is coupled to the cap body via the bridge and comprises a piercing portion that can pierce the thin film by being pushed toward the container body when the bridge is broken or deformed, and a flow path through which
- 10 the liquid material filled in the container body can flow out of the nutritional supplement container after the thin film has been broken; and
- a connection maintaining structure that is included in the cap body and can maintain a connection with a connector.
- 15
- [2] The cap according to claim 1, wherein the communicating member comprises a plurality of the flow paths, and holes that constitute a part of the respective flow paths are formed in an end face of the communicating member facing away from the thin film.
- 20
- [3] The cap according to claim 1, wherein the communicating member comprises a plurality of the flow paths and a plate portion that is provided on an end of the communicating member facing away from the thin film, and holes that constitute a part of the respective flow paths are formed in the plate portion.
- 25
- [4] The cap according to claim 3, wherein the communicating member comprises a partition that is provided closer to the thin film than the plate portion, and arranged so as to separate one space from another in a direction in which each of the holes extends.
- 30
- [5] The cap according to any one of claims 1 to 4, a portion of the communicating member that is farther from a point on the thin film side than the piercing portion

projects outward.

[6] The cap according to claim 1, wherein the bridge joins the communicating member and the cap body by stretching across the flow path.

5

[7] The cap according to claim 1, wherein a portion that includes the bridge and extends from a coupling portion between the cap body and the bridge to a coupling portion between the bridge and the communicating member is bent and deformed so that the communicating member can be pushed toward the container body.

10

[8] The cap according to claim 7, wherein the portion that includes the bridge and extends from the coupling portion between the cap body and the bridge to the coupling portion between the bridge and the communicating member includes three thin portions, and the three thin portions are bent and deformed so that the

15 communicating member can be pushed toward the container body.

[9] The cap according to any one of claims 1 to 8, further comprising a protective cover that covers the communicating member and includes an engagement portion that can be engaged with the connection maintaining structure.

20

[10] A nutritional supplement container comprising:
a container body including a mouth;
a liquid material filled in the container body;
a thin film that is attached to the mouth and seals the container body; and
25 the cap according to any one of claims 1 to 9 secured to the mouth.

[11] A nutritional supplement supply set comprising:
the nutritional supplement container according to claim 10; and
a liquid feed circuit that comprises a connector including an engagement
30 portion that can be engaged with the connection maintaining structure of the cap, and
a liquid feed tube connected to the connector.