

CONTAINER AND CONTAINERIZED ENTERAL NUTRIENT OR CONTAINERIZED FOOD/DRINK PRODUCT, METHOD OF INSPECTING CONTAINERIZED ENTERAL NUTRIENT OR CONTAINERIZED FOOD/DRINK PRODUCT, AND METHOD OF MANUFACTURING THE SAME

TECHNICAL FIELD

[0001] The present invention relates to a container for containing an enteral nutrient, a food/drink product or the like. More particularly, the present invention relates to a technique for controlling the quality of an enteral nutrient, a food/drink product or the like.

BACKGROUND ART

[0002] Lightproof containers are used to store food/drink products, enteral nutrients, drugs, cosmetics, etc. to maintain the quality of the contents.

[0003] For example, JP 2002-065154 A (Patent Document 1) discloses storing a fermented dairy product in a lightproof container provided with a means for shutting out visible light with wavelengths of 400 to 550 nm to prevent the quality of the fermented dairy product from deteriorating.

[0004] JP 2006-271761 A (Patent Document 2) discloses wrapping a container in a cover that shuts out ultraviolet light or some visible light to prevent vitamins, amino acids and other components contained in a liquid to be transfused from being spoiled.

PRIOR ART DOCUMENTS

PATENT DOCUMENTS

[0005] Patent Document 1: JP 2002-065154 A

Patent Document 2: JP 2006-271761 A

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0006] Before an enteral nutrient, a food/drink product or the like is shipped, inspections are conducted on the quality of the contents before being loaded into containers and also to check whether the appearance after loading and the amount of the loaded contents are appropriate, for example. To prevent bad contents and/or associated problems in advance and to reduce losses due

to the inspection steps, it is desirable to inspect individual products after loading and sealing in a non-invasive manner. Methods for inspecting contents in a non-invasive manner includes inspections using an inspection light such as a near-infrared ray, for example.

[0007] However, to prevent nutritional components contained in the contents from deteriorating or decreasing, the contents must be loaded into a lightproof container. This makes it difficult to prevent nutritional components from deteriorating or decreasing while allowing non-invasive and speedy inspection.

[0008] An object of the present invention is to prevent nutritional components in the contents of a containerized enteral nutrient, a containerized food/drink product or the like from deteriorating or decreasing while allowing non-invasive and speedy inspection on the quality thereof.

MEANS FOR SOLVING THE PROBLEMS

[0009] In one aspect, there is provided a container comprising: a filling opening through which a content is to be loaded; and a containing assembly for containing the content, wherein the containing assembly is entirely constructed to have a transmittance of 75 % or lower with respect to light with a wavelength of 520 nm or less, and the containing assembly includes a long-wavelength-light transmitting region having a transmittance of 75 % or lower with respect to light with a wavelength of 520 nm or less and a transmittance of 30 % or higher with respect to light with a wavelength of 1100 to 1150 nm and light with a wavelength of 1400 and 1600 nm, and the long-wavelength-light transmitting region is orange-colored and translucent, brown-colored and translucent, or red-colored and translucent.

[0009a] In another aspect, there is provided a container comprising: a filling opening through which a content is to be loaded; and a containing assembly for containing the content, wherein a portion of the containing assembly other than its bottom is constructed to have a transmittance of 75 % or lower with respect to light with a wavelength of 520 nm or less, and the containing assembly includes a long-wavelength-light transmitting region having a transmittance of 75 % or lower with respect to light with a wavelength of 520 nm or less and a transmittance of 30 % or higher with respect to light with a

wavelength of 1100 to 1150 nm and light with a wavelength of 1400 to 1600 nm, and the long-wavelength-light transmitting region is orange-colored and translucent, brown-colored and translucent, or red-colored and translucent. [0009c] In another aspect, there is provided a containerized enteral nutrient or a containerized food/drink product comprising: the container described herein; and an enteral nutrient or a food/drink product loaded into the container in a sealed manner.

[0009d] In another aspect, there is provided a method of inspecting quality of a content of a containerized enteral nutrient or a containerized food/drink product including the container described herein and an enteral nutrient or a food/drink product loaded into the container in a sealed manner, comprising the step of: conducting an inspection by illuminating the long-wavelength-light transmitting region with an inspection light with a wavelength of 1100 to 1150 nm and light with a wavelength of 1400 to 1600 nm.

[0009e] In another aspect, there is provided a method of manufacturing a containerized enteral nutrient or a containerized food/drink product including the container described herein and an enteral nutrient or a food/drink product loaded into the container in a sealed manner, comprising the steps of: preparing the container; loading the content into the containing assembly of the container that has been prepared and sealing the filling opening; and illuminating the long-wavelength-light transmitting region with an inspection light with a wavelength of 1100 to 1150 nm and light with a wavelength of 1400 to 1600 nm to inspect the quality of the content.

[0009f] To solve the above problems, a container according to an embodiment of the present invention includes a filling opening through which a content is to be loaded and a containing assembly for containing the content. The containing assembly is entirely constructed to have a transmittance of 75 % or lower with respect to light with a wavelength of 520 nm or less. The containing assembly includes a long-wavelength-light transmitting region having a transmittance of 75 % or lower with respect to light with a wavelength of 520 nm or less and a transmittance of 30 % or higher with respect to light with a wavelength of 1100 to 1150 nm and light with a wavelength of 1400 and 1600 nm.

[0010] In the context of the container of the present invention, it is preferable that the containing assembly is entirely constructed to have a transmittance of 35 % or lower with respect to light with a wavelength of 520 nm or less. In such implementations, even the long-wavelength-light transmitting region has a transmittance of 35 % or lower with respect to light with a wavelength of 520 nm or less.

[0011] Further, in the context of the container of the present invention, it is preferable that the long-wavelength-light transmitting region has a transmittance of 70 % or higher with respect to light with a wavelength of 1100 to 1150 nm and light with a wavelength of 1400 to 1600 nm.

[0012] In the context of the container of the present invention, it is

preferable that a portion of the containing assembly other than a bottom is covered with a packaging member having a transmittance of 35 % or lower with respect to light with a wavelength of 520 nm or less.

[0013] A containerized enteral nutrient or a containerized food/drink product according to the present invention includes the container and an enteral nutrient or a food/drink product loaded into the container in a sealed manner.

[0014] A method of inspecting quality of a content of a containerized enteral nutrient or a containerized food/drink product according to the present invention conducts an inspection by illuminating the long-wavelength-light transmitting region with an inspection light with a wavelength of 1100 to 1150 nm and light with a wavelength of 1400 to 1600 nm.

[0015] A method of manufacturing a containerized enteral nutrient or a containerized food/drink product according to the present invention includes the steps of: preparing the container; loading the content into the containing assembly of the container that has been prepared and sealing the filling opening; and illuminating the long-wavelength-light transmitting region with an inspection light with a wavelength of 1100 to 1150 nm and light with a wavelength of 1400 to 1600 nm to inspect the quality of the content.

[0016] A container according to another embodiment of the present invention includes a filling opening through which a content is to be loaded and a containing assembly for containing the content. The containing assembly is entirely constructed to have a transmittance of 75 % or lower with respect to light with a wavelength of 520 nm or less. The containing assembly includes a long-wavelength-light transmitting region having a transmittance of 75 % or lower with respect to light with a wavelength of 520 nm or less and a transmittance of 30 % or higher with respect to light with a wavelength of λ nm, where $700 \leq \lambda \leq 2500$.

[0017] A container according to yet another embodiment of the present invention includes a filling opening through which a content is to be loaded and a containing assembly for containing the content. The containing assembly is constructed such that a portion other than a bottom has a transmittance of 75 % or lower with respect to light with a wavelength of 520 nm or less. The containing assembly includes a long-wavelength-light transmitting region having a transmittance of 75 % or lower with respect to light with a wavelength of 520 nm or less and a transmittance of 30 % or

higher with respect to light with a wavelength of 1100 to 1150 nm and light with a wavelength of 1400 to 1600 nm.

EFFECTS OF THE INVENTION

[0018] The container of the present invention has a containing assembly entirely constructed to have a transmittance of 75 % or lower with respect to light with a wavelength of 520 nm or less, thereby preventing light with a wavelength of 520 nm or less from entering the interior of the container. This will mostly or completely prevent nutritional components, flavor and other properties contained in the contents of the container from deteriorating or decreasing.

[0019] Further, the containing assembly of the container of the present invention includes a long-wavelength-light transmitting region having a transmittance of 75 % or lower with respect to light with a wavelength of 520 nm or less and a transmittance of 30 % or higher with respect to light with a wavelength of 1100 to 1150 nm and 1400 to 1600 nm, thereby allowing inspection lights with wavelengths of 1100 to 1150 nm and 1400 to 1600 nm to enter the interior of the container from the outside through the long-wavelength-light transmitting region. That is, it is possible to prevent light that may cause nutritional components of the contents to deteriorate or decrease from entering, while allowing an inspection light for inspecting the quality of the contents of the container to enter the interior of the container through the long-wavelength-light transmitting region. This will allow inspecting the contents in a non-invasive manner and speedily without destroying or opening the container.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] [FIG. 1] FIG. 1 is a side view of the outside of a containerized enteral nutrient according to the present embodiment.

[FIG. 2] FIG. 2 is a plan view of the outside of the containerized enteral nutrient according to the present embodiment.

[FIG. 3] FIG. 3 is a side cross-sectional view of the container body and packaging member of the present embodiment.

[FIG. 4] FIG. 4 is a bottom view of the container body and packaging member of the present embodiment.

[FIG. 5] FIG. 5 is an enlarged view of a portion of a cross section of

the container body of the present embodiment.

[FIG. 6] FIG. 6 is a flow chart showing a process of producing the containerized enteral nutrient.

[FIG. 7] FIG. 7 illustrates the process of manufacturing the container body of the present embodiment.

[FIG. 8] FIG. 8 illustrates the process of manufacturing the container body of the present embodiment.

[FIG. 9] FIG. 9 is a perspective view of the containerized enteral nutrient placed in a cardboard box.

[FIG. 10] FIG. 10 is a bottom view of the containerized enteral nutrient placed in a cardboard box.

[FIG. 11] FIG. 11 is a graph showing the relationship between wavelength and transmittance in Experiment 1.

[FIG. 12] FIG. 12 is a graph showing the relationship between storage time and the retention rate of vitamin B₂ in Experiment 2.

[FIG. 13] FIG. 13 is a table showing the results of Experiment 3.

[FIG. 14] FIG. 14 is a graph showing the relationship between wavelength and transmittance in Experiment 4.

EMBODIMENTS FOR CARRYING OUT THE INVENTION

[0021] Now, preferred embodiments of the present invention will be described in detail with reference to the drawings. For ease of explanation, the drawings to which reference will be made in the following description only show those of the components of embodiments of the present invention that are main components necessary in describing the present invention in a simplified manner. Accordingly, the present invention may include optional components that are not shown in the drawings. Further, the sizes of the components in the drawings do not exactly represent the actual sizes or size ratios of the components.

[0022] <Embodiments>

FIGS. 1 and 2 are a side view and a plan view, respectively, of the outside of a containerized enteral nutrient 20 according to the present embodiment. The containerized enteral nutrient includes an enteral nutrient 1 loaded into a container 10 in a sealed manner.

[0023] (Container)

The container 10 includes a containing assembly for containing the

enteral nutrient 1 (i.e. content). The container 10 generally has the shape of a truncated cone with an opened top face. The container 10 may have, for example, a diameter of 40 to 60 mm near the bottom, a diameter of 60 to 100 mm near the top, a height of 50 to 200 mm, and a thickness of 0.8 to 2 mm. The opening 10a forming the top face of the container 10 provides a filling opening through which the enteral nutrient 1 is loaded into the container 10. [0024] The containing assembly of the container 10 includes a container body 11 and a packaging member 12 covering surfaces thereof. The construction of the container body 11 will be described in detail further below. The packaging member 12 may be formed of, for example, an opaque plastic film of polyethylene-terephthalate, polystyrene, etc., an aluminum-metallized film, or aluminum film. An indication 12a of the content is printed on the packaging member 12. FIGS. 3 and 4 are side cross-sectional view and a bottom view, respectively, of the packaging member 12 wrapped around the container body 11. The packaging member 12 covers a major part of the periphery 11a of the container body 11. Further, the packaging member 12 covers the peripheral portions of the bottom face 11b of the container body 11, but does not cover the central portions of the bottom face, exposing portions of the container body 11. The entire container 10 has a transmittance of 35 % or lower with respect to light with wavelengths of 520 nm and less. Further, the portions of the bottom of the container 10 that are not covered with the packaging member 12 and thus expose portions of the container body 11 have a transmittance of 35 % or lower with respect to light with wavelengths of 520 nm and less and a transmittance of 55 % or higher with respect to light with wavelengths of 800 to 2200 nm. These portions will also be hereinafter referred to as "long-wavelength-light transmitting region 10b". The long-wavelength-light transmitting region 10b may have a diameter of 20 to 55 mm, for example.

[0025] An aluminum film 13 is stuck on the opening 10a at the top of the container 10 and serves as a lid to seal the container 10. The aluminum film 13 may be bonded to the edge around the opening 10a by means of an adhesive member, for example. The aluminum film 13 prevents light of all wavelengths from penetrating. However, it is not essential that the lid shuts out light of all wavelengths, and the lid is required to be formed of a material with a transmittance of 75 % or lower with respect to light with

wavelengths of 520 nm and less. Further, to achieve long-term preservation of the enteral nutrient 1 loaded into the container 10, the lid is preferably formed of a material having a transmittance 35 % or lower with respect to light with wavelengths of 520 nm and less. Further, a cover 14 is fitted onto the opening 10a above the aluminum film 13. The cover 14 may be formed of a transparent plastic, for example. The cover 14, which is not an essential element, has a straw-insert hole 14a formed by a cross-shaped cut.

[0026] Next, the container body 11 will be described.

[0027] The container body 11 is formed by a plurality of plastic layers of different types. FIG. 5 shows an enlarged view of a cross section of the container body 11. The container body 11 includes a main layer 111, where an inner layer 112 is laminated on the inner side thereof with respect to the container and an outer layer 113 is laminated on the outer side thereof with respect to the container. The main layer 111 includes an oxygen barrier layer 111b sandwiched by two colored layers 111a. The colored layers 111a are bonded to the oxygen barrier layer 111b by means of an adhesive 111c.

[0028] The resin forming the colored layers 111a may contain, for example, two types of polypropylene (PP), an orange-colored masterbatch (MB) and a compatibilizer mixed together. The orange-colored masterbatch may be, for example, type number "SCPPM 66520" from Sankyo Chemical Industry Co., Ltd. The two types of polypropylene may be, for example, two of homopolymer polypropylene, random copolymer polypropylene and block copolymer polypropylene. This resin may also contain residues from the step of molding the container, discussed below. The oxygen barrier layer 111b may be formed of, for example, an ethylene-vinyl alcohol copolymer resin (EVOH) that prevents permeation of oxygen. The adhesive 111c may be any adhesive. The resin forming the inner layer 112 may be a mixture of two types of polypropylene (PP), for example. The resin forming the outer layer 113 may be made of two types of polypropylene (PP) to which an antistatic agent (e.g. surfactant) is added, for example. The polypropylene, ethylene-vinyl alcohol copolymer resin, masterbatch, compatibilizer, antistatic agent, adhesive and other components may be conventionally known ones.

[0029] As discussed above, the container body 11 is formed of a laminate of resin including the orange-colored layer 111a and thus is orange-colored as a whole. This orange color is deep enough to prevent the eye from discerning

the color of the interior of the container body 11 or the concentration of the contents, for example. Thus, the container body 11 achieves a transmittance of 35 % or lower with respect to light with wavelengths of 520 nm and less. Further, since the container body 11 is orange-colored, it allows light with a wavelength of 800 to 2200 nm to penetrate at a transmittance of 55 % or higher.

[0030] The portions 11b of the container body 11 that are not covered with the packaging member 12 constitute a region that provides the long-wavelength-light transmitting region 10b of the container 10. The long-wavelength-light transmitting region 10b is to be illuminated with an inspection light when the quality of the enteral nutrient 1 loaded into the container 10 in a sealed manner is inspected. This inspecting will be described further below.

[0031] (Enteral Nutrient)

The enteral nutrient 1 loaded into the container 10 may be a normal liquid diet such as milk or fruit juice, or a natural or artificial high-density liquid diet. If the enteral nutrient 1 is an artificial high-density liquid diet, it may be an elemental diet, digestible nutrient, or semi-digestible nutrient. The enteral nutrient 1 may be a medicine or a food. The enteral nutrient 1 may contain one or more main ingredients including water, amino acid, peptide, protein, lipid, phospholipid, fatty acid, carbohydrate (saccharinity), oligosaccharide and dietary fiber, and one or more vitamins including vitamin A, carotene, vitamin D, vitamin E, vitamin K, vitamin B₁, vitamin B₂, vitamin B₆, niacin, pantothenic acid, nicotinic acid amide, folic acid, vitamin B₁₂, vitamin P, vitamin Q, carnitine, choline, and CoQ10, one or more minerals including calcium, magnesium, phosphorus, sodium, potassium, iron, copper, zinc, manganese, selenium, and chromium, and one or more organic acids including malic acid, citric acid, lactic acid, tartaric acid, and erythorbic acid. Further, in the enteral nutrient 1, the types and amounts of these ingredients, the composition of lipids and other characteristics are adjusted depending on the purpose. Further, various food additives and/or foods may be added to the enteral nutrient 1 for the purposes of coloring, flavoring, seasoning, physicality (viscosity) improvement, emulsion stabilization, pH adjustment, and preservation.

[0032] (Method of Producing Containerized Enteral Nutrient)

Next, the method of producing the containerized enteral nutrient 20

will be described with reference to the flow chart of FIG. 6. The method of producing the containerized enteral nutrient 20 includes the steps for preparing the enteral nutrient 1 (steps S11 to S13), the step of preparing the container 10 (step S20), the steps for loading the enteral nutrient 1 into the container 10 (steps S31 to S33), and the steps for inspecting the quality of the enteral nutrient 1 loaded into the container 10 (steps S41 to S42).

[0033] —Preparation of Enteral Nutrient—

First, at step S11, the ingredients of the enteral nutrient 1 are mixed using a known method. Next, at step S12, the mixed enteral nutrient 1 is sterilized and, at step S13, the enteral nutrient 1 is kept under predetermined storage conditions and stored.

[0034] —Preparation of Container—

At step S20, the container 10 is fabricated.

[0035] FIGS. 7 and 8 show manufacturing equipment 100 for manufacturing the container body 11. The manufacturing equipment 100 for fabricating the container body 11 includes: a resin kneading units 121a, 121b, 121c, 122 and 123 for kneading the ingredients of the colored layer 111a, oxygen barrier layer 111b, adhesive 111c, inner layer 112 and outer layer 113, respectively; a lamination unit 124 for laminating the kneaded resins to produce a resin sheet 114; a heating unit 125 for heating the resin sheet 114; and a molding unit 126 for molding the heated resin sheet 114.

[0036] A plurality of ingredients are supplied to the equipment and kneaded at the resin kneading units 121a, 121b, 121c, 122 and 123. The resins that have been kneaded to be uniform are discharged from their outlets, as shown in FIG. 7, and are supplied to the lamination unit 124. Then, the resins are laminated by the lamination unit 124 to be an integrated sheet, i.e. resin sheet 114, which is then discharged.

[0037] As shown in FIG. 8, the resin sheet 114 is fed into the heating unit 125, and heated. Subsequently, at the molding unit 126, the resin sheet 114 is pressed by molds 126a and 126b to acquire the desired container shape, which provides a resin molding 115. The resulting resin molding 115 is cooled and cut along the edge around the opening 10a, resulting in a container body 11. Resin residues from the cutting to make the container body 11 may be reused and included in the ingredients of the colored layer 121a, as discussed above.

[0038] This container body 11 is covered with a packaging member 12 to

produce a container 10.

[0039] —Loading of Enteral Nutrient—

Next, at step S31, the enteral nutrient 1 is loaded into the container 10 that has been prepared. Subsequently, at step S32, an aluminum film 13 is stuck to the opening 10a of the container 10, which is then sealed and covered with a cover 14.

[0040] Next, at step S33, the enteral nutrient 1 loaded into the container 10 in a sealed manner (i.e. containerized enteral nutrient 20) is stored in a storage box 30. FIG. 9 is a perspective view of the containerized enteral nutrient 20 stored in the storage box 30. FIG. 10 is a bottom view of the storage box 30 storing the containerized enteral nutrient 20. The storage box 30 may be formed of cardboard, for example. The storage box 30 has inspection holes 31 formed in its bottom. Thus, when the containerized enteral nutrient 20 is stored, the long-wavelength-light transmitting region 10b in the bottom of the container 10 is exposed through an inspection hole 31, as shown in FIG. 10.

[0041] —Inspecting Step—

Next, at step S41, the enteral nutrient 1 loaded into the containerized enteral nutrient 20 that is stored is subjected to quality inspection. In this inspection, a near-infrared ray is used as an inspection light. The absorption spectra of water, lipids, proteins and other organic substances are located in the near-infrared range, and thus a near-infrared ray may be used as an inspection light. This inspection allows, for example, detection of components spoiled or clumped due to microbial contamination, measurement of denaturation of proteins, detection of fatty acid, measurement of amount of water, measurement of the concentration of sucrose, detection of hair, and determination of contained components. Measurement of denaturation of proteins reveals the state of microbial contamination or the state of heat denaturation.

[0042] Inspection systems using a near-infrared ray as an inspection light include, for example, "Compovision" from Sumitomo Electric Industries, Ltd., or "Infrizer" from Techniquon. Such an inspection system illuminates the long-wavelength-light transmitting region 10b of the containerized enteral nutrient 20 with an inspection light. The inspection light enters the interior of the container 10 of the containerized enteral nutrient 20 through the long-wavelength-light transmitting region 10b and reaches the enteral

nutrient 1. Part of the inspection light that has reached the enteral nutrient 1 is absorbed by the enteral nutrient 1 and the rest is reflected. The portion of light reflected by the enteral nutrient 1 passes through the long-wavelength-light transmitting region 10b again and then reaches the inspection system. Then, the inspection system measures the wavelength and amount of the light that has reached it. The measured wavelength and amount of light are analyzed to determine the quality of the enteral nutrient 1.

[0043] This inspection system uses lights with wavelengths of 800 to 2200 nm as inspection lights; however, it is not necessary to use the entire range of 800 to 2200 nm for the inspection lights. It is required to illuminate the nutrient with light with wavelengths necessary to detect the quality of the components in interest. For example, to determine the state of contamination due to microorganisms in the enteral nutrient, at least lights with wavelengths of 1100 to 1150 nm and 1400 to 1600 nm are suitably used.

[0044] The resolution of these inspection systems may be, for example, 1 mm for a frame rate of 300 fps (frames per second), a visual field width of 300 mm and a line speed of 20 m/min (as in "Compovision" from Sumitomo Electric Industries, Ltd.). In this case, image processing for 300 frames is performed while an inspected object passes through the visual field width of 300 mm.

[0045] The quality inspection can be performed without removing the containerized enteral nutrient 20 from the storage box 30 since the long-wavelength-light transmitting region 10b is exposed through the bottom of the storage box 30 at the inspection hole 31, as discussed above. Further, the inspection system is capable of performing image processing at high speed and with high resolution, as discussed above, thereby allowing quick and speedy quality inspection.

[0046] As discussed above, the quality of the containerized enteral nutrient 20 can be inspected while the nutrient is stored in the storage box 30, thereby allowing 100 % quality inspection of containerized enteral nutrient 20 units produced.

[0047] Those containerized enteral nutrient 20 units determined to be bad in this quality inspection are removed from the storage box 30 and discarded.

[0048] The containerized enteral nutrient 20 provided by the above process is treated as a quality-inspected containerized enteral nutrient 20 and is

stored at step S42. At this time, the storage box 30 may be placed in another box or another piece of cardboard may be attached to the bottom of the storage box 30 to cover the inspection holes 31 at the bottom. The containerized enteral nutrient 20 stored in the storage box 30 is shipped at an appropriate time. The quality-inspected containerized enteral nutrient 20 does not have to be stored and may be shipped immediately.

[0049] (Effects of Present Embodiment)

The present embodiment prevents deterioration or the like of nutritional components of the enteral nutrient 1 due to light and allows the quality of the enteral nutrient 1 to be inspected in a non-invasive manner and speedily after the nutrient is loaded into a container. More specifically, the long-wavelength-light transmitting region has a light transmittance of 70 % or higher with respect to the wavelength ranges of 1100 to 1150 nm and 1400 to 1600 nm, which are needed to determine the state of contamination by microorganisms, thereby speedily detecting degeneration such as spoiling or congelation of the enteral nutrient 1 due to contamination by microorganisms.

[0050] Further, the present embodiment allows non-invasive and speedy quality inspection after the nutrient is loaded into a container, thereby allowing 100 % quality inspection of containers 20 containing enteral nutrient including inspection on microbial contamination. This ensures that those of containerized enteral nutrient 20 units that have experienced degeneration such as spoiling or congelation are detected before shipment, and only those with guaranteed quality are shipped. This will be discussed in more detail below.

[0051] —Prevention of Deterioration and Decrease of Nutritional Components—

The light absorption wavelength of the nutritional components contained in the enteral nutrient 1 has peaks in the visible light range and ultraviolet range. It is known that nutritional components deteriorate and their content decreases due to radicals produced as they are illuminated with light. For example, vitamin A absorbs light with a wavelength of 325 nm. Vitamin E absorbs light with a wavelength of 260 to 265 nm. Vitamin B₆ absorbs light with a wavelength of 285 to 295 nm. Vitamin B₂ (riboflavin) absorbs light with a wavelength of 520 nm. Vitamin B₁₂ absorbs light with a wavelength of 350 to 360 nm. Folic acid absorbs light with a wavelength

in the ultraviolet range (255 to 357 nm, 281 to 285 nm and 361 to 369 nm).

[0052] Further, when the enteral nutrient 1 is illuminated with light in the visible light range or ultraviolet range, its aromatic components, flavor, color etc. may deteriorate or decrease, or an off-flavor may be produced or oxidation may occur.

[0053] According to the present embodiment, the container body 11 of the container 10 into which the enteral nutrient 1 is loaded in a sealed manner is formed of an orange-colored plastic such that the light transmittance with respect to light with a wavelength of 520 nm or less is 35 % or lower (see FIG. 14 discussed in Experiment 4 below). Thus, the container 10 can shut out light with a wavelength of 520 nm or less and, as a result, it is possible to prevent deterioration or decrease of nutritional components or aromatic components, flavor or color of the enteral nutrient 1 or production of an off-flavor or oxidation even when the containerized enteral nutrient 20 is displayed in a shop for sale and exposed to the illumination in the shop.

[0054] —Quality Inspection—

The quality inspection of the enteral nutrient 1 uses light in the near-infrared range, as discussed above. More specifically, lights in wavelengths of 800 to 2200 nm may be used for inspection.

[0055] The orange-colored plastic forming the container body 11 has a transmittance of 55 % or higher with respect to light with a wavelength of 800 to 2200 nm. In particular, the transmittance with respect to the wavelengths needed to inspect microbial contamination (1100 to 1150 nm and 1400 and 1600 nm) is 70 % or higher (see FIG. 14 discussed in Experiment 4 below). Thus, an inspection light in the near-infrared range used for quality inspection can enter the interior of the container 10 through the long-wavelength-light transmitting region 10b at the bottom, allowing the quality of the enteral nutrient to be inspected in a non-invasive manner and speedily while the container 10 is sealed. Further, since the quality of the enteral nutrient can be inspected in a non-invasive manner and speedily, 100 % quality inspection of containerized enteral nutrient 20 units can be performed easily.

[0056] According to the present embodiment, a long-wavelength-light transmitting region 10b is provided in the bottom of the container 10. Further, an inspection hole 31 is provided in the bottom of the storage box 30 to be aligned with the stored container 10. Thus, when the container 10 is

placed in the storage box 30, the long-wavelength-light transmitting region 10b of the container 10 is exposed through a face of the storage box 30 even when the storage box 30 is closed. This allows the quality of the enteral nutrient 1 to be inspected speedily without destroying or opening the storage box 30. Further, since the quality of the enteral nutrient 1 can be inspected without destroying or opening the containerized enteral nutrient 20 or storage box 30 (i.e. in a non-invasive manner) and speedily, 100 % inspection of containerized enteral nutrient 20 units to be shipped (before shipping) can be performed easily. 100 % quality inspection of containerized enteral nutrient 20 units ensures that the products that do not meet a standard are removed before shipment of the containerized enteral nutrient 20. This will increase the reliability of the quality of the containerized enteral nutrient 20.

[0057] <Other Embodiments>

According to the present embodiment, the plastic that achieves a transmittance of 35 % or lower with respect to light with a wavelength of 520 nm or less is an orange-colored translucent plastic; however, the present invention is not limited to such implementations. It is required that the container body 11 be formed of a material having a transmittance of 75 % or lower with respect to light with a wavelength of 520 nm or less. It has been established that the quality of the nutritional components and other components of the contents can be maintained if a container with a color other than orange/translucent is made of a plastic that achieves a transmittance of 75 % or lower with respect to light of a wavelength of 520 nm or less. Nevertheless, to achieve long-term quality maintenance, the transmittance with respect to light with a wavelength of 520 nm or less is preferably not higher than 60 %, and more preferably not higher than 50 %, and yet more preferably not higher than 35 %.

[0058] According to the present embodiment, the plastic that achieves a transmittance of 55 % or higher with respect to light with a wavelength of 800 to 2200 nm is an orange-colored translucent plastic; however, the present invention is not limited to such implementations. It is required that the container body 11 be formed of a material having a transmittance of 30 % or higher with respect to light with a wavelength of 1100 to 1150 nm and light with a wavelength of 1400 to 1600 nm. It has been found that the quality of the contents can be inspected in a non-invasive manner if a container with a color other than orange/translucent is made of a plastic that

achieves a transmittance of 30 % or higher with respect to light with a wavelength of 1100 to 1150 nm and light with a wavelength of 1400 to 1600 nm. Nevertheless, to improve the precision in quality inspection and improve inspection speed, the transmittance with respect to light with a wavelength of 1100 to 1150 nm and light with a wavelength of 1400 to 1600 nm is preferably not lower than 50 %, and more preferably not lower than 70 %.

[0059] Such materials include, for example, red translucent plastics and brown translucent plastics. Further, plastics with a color that achieves a transmittance of 35 % or lower with respect to light with a wavelength of 520 nm or lower (for example, red) combined with a color that achieves a transmittance of 70 % or higher with respect to light with a wavelength of 1100 to 1150 nm and light with a wavelength of 1400 and 1600 nm (for example, blue) can achieve a transmittance of 35 % or lower with respect to light with a wavelength of 520 nm or lower and a transmittance of 70 % or higher with respect to light with a wavelength of 1100 to 1150 nm and light with a wavelength of 1400 to 1600 nm. Further, lighter orange-colored translucent plastics than those of the present embodiment (for example, plastics colored using type number "SCPPM 66521" from Sankyo Chemical Industry Co., Ltd. as the orange-color masterbatch) can achieve a transmittance of 75 % or lower with respect to light with a wavelength of 520 nm or less and a transmittance of 30 % or higher with respect to light with a wavelength of 1100 to 1150 nm and light with a wavelength of 1400 to 1600 nm.

[0060] It is of small relevance what color the container body has since the color of the container body is not visible from outside the containerized enteral nutrient 20 except at the long-wavelength-light transmitting region 10b in the bottom of the container 10, because the periphery of the container body is covered with an opaque packaging member 12 and an aluminum film 13 is stuck on the opening 10a of the container 10. This allows choosing a color for the container body regardless of the preference of people who will take in the enteral nutrient 1 from the containerized enteral nutrient 20.

[0061] According to the present embodiment, the container body 11 is colored orange by forming the container body 11 using a resin obtained by kneading orange-colored masterbatch; however, the present invention is not limited to such implementations. For example, an orange-colored

translucent film may be attached to the surface of a colorless translucent plastic to form the container body 11.

[0062] According to the present embodiment, the entire container body 11 is formed of an orange-colored translucent plastic; however, the present invention is not limited to such implementations as long as at least part of the container 10 constitutes a long-wavelength-light transmitting region 10b. For example, only the bottom of the container body 11 may be formed of an orange-colored translucent plastic having a transmittance of 75 % or lower with respect to light with a wavelength of 520 nm or less and a transmittance of 30 % or higher with respect to light with a wavelength of 1100 to 1150 nm and light with a wavelength of 1400 to 1600 nm, and the periphery may be formed of a white opaque plastic. Alternatively, only the bottom of the container body 11 may be formed of an orange-colored translucent plastic having a transmittance of 75 % or lower with respect to light with a wavelength of 520 nm or less and a transmittance of 30 % or higher with respect to light with a wavelength of 1100 to 1150 nm and light with a wavelength of 1400 to 1600 nm, and the periphery may be formed of a colorless transparent plastic. In this case, the container body 11 alone cannot prevent light of a wavelength of 520 nm from entering the container through the periphery; in view of this, the periphery of the container body 11 is suitably covered with a lightproof packaging member. Still, to simplify the process of manufacturing the container body 11, the entire container body 11 is preferably formed of plastics of the same color.

[0063] According to the present embodiment, the bottom of the container 10 provides the long-wavelength-light transmitting region 10b; however, the present invention is not limited to such implementations. For example, part of the periphery of the container 10 may provide the long-wavelength-light transmitting region. Still, the long-wavelength-light transmitting region 10b is preferably provided in the bottom of the container 10 to improve the freedom in designing the packaging of the containerized enteral nutrient 20 and to allow the quality of the enteral nutrient 1 to be inspected without destroying or opening the storage box 30 while a plurality of containerized enteral nutrient 20 units are stored in the storage box 30.

[0064] According to the present embodiment, the periphery of the container body 11 is covered with the packaging member 12; however, the container body 11 may be not be covered with the packaging member 12 and be bare.

In such implementations, too, it is possible to prevent light with a wavelength of 520 nm or less from entering the container 10 if the entire container body 11 has a transmittance of 75 % or lower with respect to light with a wavelength of 520 nm or lower. In such implementations, the entire containing assembly of the container 10 provides the long-wavelength-light transmitting region.

[0065] According to the present embodiment, the container body 11 is exposed through the long-wavelength-light transmitting region 10b; however, the present invention is not limited to such implementations as long as the transmittance with respect to light with a wavelength of 1100 to 1150 nm and light with a wavelength of 1400 to 1600 nm is kept at or higher than 30 %. For example, the long-wavelength-light transmitting region 10b may be covered with a colorless transparent film or the like.

[0066] According to the present embodiment, the aluminum film 13 is stuck on the opening 10a of the container 10 to serve as a lid to seal the container 10; however, the present invention is not limited to such implementations. For example, instead of an aluminum film, a plastic lid may seal the opening. Alternatively, instead of providing a separate lid, the opening of the container 10 may be closed using methods such as hot pressing. Further, the entire top face of the container 10 need not be open; for example, only part of the top face may provide an opening, which is sealed by a plastic film.

[0067] According to the present embodiment, during the process of producing the containerized enteral nutrient 20, the container body 11 is covered with the packaging member 12 at the step of preparing a container, i.e. step S20; however, the present invention is not limited to such implementations. For example, at step S20, the container body 11 may be fabricated and the enteral nutrient 1 may be loaded before the container body 11 is covered with the packaging member 12. However, if the container body does not have a transmittance of 75 % or lower with respect to light with a wavelength of 520 nm, it is necessary, for example, to load the enteral nutrient 1 after covering the container body with a packaging member having a transmittance of 75 % or lower with respect to light with a wavelength of 520 nm or less to prevent light with a wavelength of 520 nm or less from entering the interior of the container body. Further, if the container body does not have a transmittance of 35 % or lower with respect to light of a wavelength of 520 nm, it is preferable to load the enteral

nutrient 1 after covering the container body with a packaging member having a transmittance of 35 % or lower with respect to light with a wavelength of 520 nm or less. This will improve the long-term preservation of the enteral nutrient 1.

[0068] In the above description, the container body 11 is formed of a material mainly composed of polypropylene; alternatively, the container body 11 may be formed of a material mainly composed of polystyrene (PS), polyvinyl chloride (PVC), polyethylene-telephthalate (PET) or the like.

[0069] According to the present embodiment, the container 10 generally has the shape of a truncated cone; however, the present invention is not limited to such implementations. For example, the container may have the shape of a prism, pyramid, cylinder, or sphere. Alternatively, the container may be a bag that has no particular shape.

[0070] The present embodiment describes a containerized enteral nutrient 20 where the enteral nutrient 1 is loaded into the container 10 in a sealed manner; however, the present invention is not limited to such implementations. For example, the container of the present invention may be suitably used for, for example, containerized food/drink products where one or more of the following food/drink products are loaded into the container 10: yogurt, fruit juice, lactic drinks, soft drinks, luxury drinks, jelly-like foods, liquid seasonings, liquid sauces, soups, and paste-like foods, or powdered drinks, cream, synthetic cream, ice cream, cheese, butter, margarine, honey, snacks, beauty foods such as collagen, solid foods such as supplements, modified milk powder, proteins for sports competitors, powdered skim milk, ingredients for steamed bread or other powdered foods.

[0071] According to the present embodiment and the other embodiments described above, it is presupposed that the state of microbial contamination of the enteral nutrient 1 (i.e. state of spoiling of the enteral nutrient 1) is inspected and the container 10 must have a transmittance of 30 % or higher with respect to light of a wavelength of 1100 to 1150 nm and light with a wavelength of 1400 to 1600 nm; however, if the objective is to inspect qualities other than the state of microbial contamination, the transmittance with respect to the wavelengths required for such inspections is suitably 30 % or higher. For example, if fat is to be inspected by detecting the methylene group (CH_2), the transmittance with respect to the wavelength ranges of 1150 to 1225 nm, 1365 to 1445 nm, 1670 to 1750 nm and 2250 to

2415 nm is suitably 30 % or higher. If fatty acid is to be inspected by detecting the carbonyl group (R-COO-R), the transmittance with respect to the wavelength range of 1875 to 1930 nm is suitably 30 % or higher. If fatty acid is to be inspected by detecting the carboxy group (R-COOH), the transmittance with respect to the wavelength range of 1880 to 1905 nm is suitably 30 % or higher. If water is to be inspected, the transmittance with respect to the wavelength ranges of 740 to 770 nm, 900 to 950 nm, 1400 to 1445 nm, 1850 to 1910 nm, and 2175 to 2200 nm is suitably 30 % or higher. If fat in wheat is to be inspected, the transmittance with respect to the wavelengths of 1759 nm, 2310 nm and 2230 nm is suitably 30 % or higher. If protein in wheat is to be inspected, the transmittance with respect to the wavelength of 2180 nm is suitably 30 % or higher. If dietary fiber in wheat is to be inspected, the transmittance with respect to the wavelength of 2310 nm is suitably 30 % or higher. If starch in wheat is to be inspected, the transmittance with respect to the wavelengths of 2100 nm and 2180 nm is suitably 30 % or higher. If protein in barley is to be inspected, the transmittance with respect to the wavelengths of 1198 nm, 1706 nm and 2282 nm is suitably 30 % or higher. If the state of oxidation of edible vegetable oil is to be inspected, the transmittance with respect to the wavelengths of 1324 nm, 1656 nm, 1756 nm, and 1820 nm is suitably 30 % or higher. If dextrin is to be inspected, the transmittance with respect to wavelengths near 1900 nm is suitably 30 % or higher. If alcohol in soy sauce is to be inspected by detecting the methylene group (CH_2), the transmittance with respect to the wavelengths of 1680 nm, 1690 nm, 1730 nm, and 2208 nm is suitably 30 % or higher. If alcohol in soy sauce is to be inspected by detecting the methyl group (CH_3), the transmittance with respect to the wavelength of 2266 nm is suitably 30 % or higher. If total nitrogen in soy sauce is to be inspected, the transmittance with respect to the wavelengths of 1420 nm, 1784 nm and 2226 nm is suitably 30 % or higher. If salt in soy sauce is to be inspected, the transmittance with respect to the wavelengths of 1254 nm, 1660 nm, 2178 nm and 2306 nm is suitably 30 % or higher. If sucrose in a soft drink is to be inspected, the transmittance with respect to the wavelength range of 1100 to 2200 nm is suitably 30 % or higher. If hair is to be detected, the transmittance with respect to the wavelength ranges of 800 to 900 nm and 1710 to 1770 nm is suitably 30 % or higher. Lights with wavelengths of 1710 to 1770 nm used for inspection to detect

hair is a spectrum of the thiol group (SH group) in cystine.

[0072] According to the above embodiment, the inspection lights used for microorganism inspection have wavelength ranges of 1100 to 1150 nm and 1400 to 1600 nm; however, under certain inspection conditions, wavelengths outside the ranges of 1100 to 1150 nm and 1400 to 1600 nm may allow microorganism inspection. Accordingly, it is not essential that the long-wavelength-light transmitting region 10b of the container of the present invention is made of a material having a transmittance of 30 % or higher with respect to light with a wavelength of 1100 to 1150 nm and light with a wavelength of 1400 to 1600 nm. The long-wavelength-light transmitting region 10b of the container of the present invention suitably has a transmittance of 30 % or higher with respect to light with the wavelength required under the conditions of a given inspection. That is, the transmittance with respect to light with the wavelength λ required depending on the inspection condition in an inspection of a nutritional component, where the wavelength λ nm is within the near-infrared range (not less than 700 nm and not higher than 2500 nm) ($700 \leq \lambda \leq 2500$) is suitably 30 % or higher.

[0073] According to the above embodiment, the entire container 10 has a transmittance of 75 % or lower with respect to light with a wavelength of 520 nm or lower; however, this feature is not essential in the present invention. It is required that the container 10 of the present invention is constructed such that the portions of the container body 11 other than the bottom have a transmittance of 75 % or lower with respect to light with a wavelength of 520 nm or lower, and thus the bottom of the container body 11 may be formed of a colorless transparent material, for example.

[0074] In such implementations, light with a wavelength of 520 nm or lower can enter the interior of the container body 11 through the bottom of the container 10. However, during distribution of the containerized enteral nutrient, substantially no light may enter the container through its bottom. For example, if a container containing the enteral nutrient is stored in an opaque bulk container with its bottom positioned downward to be stored or transported, the bottom of the container is always covered with the bulk container such that no light enters the interior of the container through its bottom. Further when a container containing the enteral nutrient is placed on a showcase with its bottom positioned downward, the bottom of the

container is always covered with the showcase such that no light enters the interior of the container through its bottom. As such, even if the bottom of the container has a transmittance higher than 75 % with respect to light with a wavelength of 520 nm or lower, substantially no light with a wavelength of 520 nm or lower enters the interior of the container. Thus, it is possible to mostly or completely prevent light with a wavelength of 520 nm or lower from deteriorating or decreasing nutritional components, flavor or the like of the enteral nutrient 1 even if the bottom of the container is formed of a material having a transmittance higher than 75 % with respect to light with a wavelength of 520 nm or lower.

[0075] The embodiments illustrated above are merely examples for carrying out the present invention. Accordingly, the present invention is not limited to the above-illustrated embodiments, and the above-illustrated embodiments can be modified as appropriate without departing the spirit of the present invention.

EXAMPLES

[0076] [Experiment 1]

To determine the color tones that pass near-infrared rays, Experiment 1 was conducted to determine the relationship between color tone and light transmittance.

[0077] First, five different commercially available plastic sheets, 5 mm thick, that are colored and transparent were prepared. The colors of the plastic sheets were green, blue, red, orange and brown. The light transmittance of each of these plastic sheets with respect to the wavelength range of 300 to 800 nm was measured. The measurement was done using an ultraviolet and visible spectrophotometer from Shimadzu Corporation (type number: UV-2450). FIG. 11 is a graph showing the results of the measurements of Experiment 1.

[0078] The results of Experiment 1 show that the red and orange plastic sheets had a transmittance of 5 % or lower with respect to lights with wavelengths of 520 nm and less (ultraviolet and visible lights) and a transmittance of 92 % or higher with respect to lights with wavelengths of 700 nm and more (near-infrared light) as shown in FIG. 11.

[0079] [Experiment 2]

Experiment 2 was conducted in the following manner to evaluate the

lightproof properties of orange, white and transparent containers. Vitamin B₂ (VB₂), a nutritional component susceptible to light, was chosen and the lightproof properties of each of the containers were evaluated by measuring the contents of vitamin B₂ in samples before illumination and after the commencement of illumination.

[0080] The procedure of Experiment 2 will be described in more detail.

[0081] First, a commercially available liquid diet (product name: Meibalance Mini (Registered Trademark), from Meiji Co., Ltd.) was loaded into orange, white and transparent containers, which were labeled Example 1, Comparative Example 1 and Comparative Example 2. Then, the amount of VB₂ contained in each of the liquid diets in Example 1 and Comparative Examples 1 and 2 (hereinafter referred to as VB₂ content) was measured to provide an initial value of VB₂ content. The measurement of VB₂ content was conducted by the process of high performance liquid chromatography defined by a notification by the Chief of the Health Promotion Subsection on Newly Developed Foods, "Methods for Analyzing Nutritional Components under Nutrient Indication Standard" (April 26, 1999, Ei-Shin No. 13).

[0082] Subsequently, while the containers were illuminated with light at 15000 lux, they were stored in an atmosphere at a temperature of 25 °C. 1 week, 2 weeks, 3 weeks and 4 weeks after the commencement of illumination, samples were taken and the VB₂ content of each of the samples was measured in the same manner as when they started to be stored.

[0083] The VB₂ contents in the samples after illumination were divided by the initial value of VB₂ content obtained before illumination to calculate the retention rate of VB₂ after illumination relative to the initial value. If a sample had a retention rate of 30 % or higher, the sample was determined to retain the nutritional component (VB₂) well, which means that the container had sufficient lightproof properties.

[0084] The results of Experiment 2 are shown in FIG. 12. The broken line in the graph indicates the retention rate of 70 %. The graph of FIG. 12 shows that Example 1 and Comparative Example 1, which used colored containers, retained the nutritional component (VB₂) well, which means that the containers had sufficient lightproof properties. On the other hand, as to Comparative Example 2 which used a transparent container, the retention rate decreased to below 70 % after 2 weeks of illumination, and continued to gradually decrease thereafter.

[0085] Thus, the results of Experiment 2 show that, if a liquid diet is stored in a colored container as opposed to a transparent one, nutritional components susceptible to light (VB₂ in this example) can be retained well.

[0086] [Experiment 3]

Experiment 3 was conducted in the following manner to evaluate the lightproof properties of the orange container. In this experiment, vitamin A (VA), vitamin E (VE) and vitamin K(VK), which were lipid-soluble nutritional components, and vitamin B₆ (VB₆), vitamin B₁₂ (VB₁₂) and folic acid, which were water-soluble nutritional components, were chosen.

[0087] The procedure of Experiment 3 will be described in more detail.

[0088] Samples identical with Example 1 of Experiment 2 were prepared. Then, the amounts of VA, VE, VK, VB₆, VB₁₂ and folic acid contained in the liquid diet (hereinafter also referred to as VA content, VE content, VK content, VB₆ content, VB₁₂ content and folic acid content, respectively) were measured to provide initial values of the contents of the nutritional components. The VA, VE and VK contents were measured by the process of high performance liquid chromatography defined by the notification by the Chief of the Health Promotion Subsection on Newly Developed Foods, "Methods for Analyzing Nutritional Components under Nutrient Indication Standard" (April 26, 1999, Ei-Shin No. 13). Further, the VB₆, VB₁₂ and folic acid contents were measured by the microbe quantitative method defined by the same notification.

[0089] Subsequently, while this container was illuminated with light at 15000 lux, it was stored in an atmosphere at a temperature of 25 °C for 4 weeks. Then, 4 weeks after the commencement of illumination, samples were taken and the VA, VE, VK, VB₆, VB₁₂ and folic acid contents in the sample were measured in the same manner as when it started to be preserved.

[0090] The content of each nutritional component in the samples after illumination was divided by the initial value of the content of this nutritional component before illumination to calculate the retention rate of this nutritional component after illumination relative to the initial value. If the sample had a retention rate of 70 % or higher, the sample was determined to retain the nutritional component well, which means that the container had sufficient lightproof properties.

[0091] The results of Experiment 3 are shown in FIG. 13. The results in

the table of FIG. 13 show that the retention rates of the lipid-soluble nutritional components (VA, VE and VK) and the retention rates of the water-soluble nutritional components (VB₆, VB₁₂ and folic acid) were all in the range of 92 to 100 %, showing that each nutritional component was retained well, which means that the container had sufficient lightproof properties. In other words, it was found that, if a food/drink product such as a liquid diet is stored in an orange-colored container, lipid-soluble nutritional components and water-soluble nutritional components can be prevented from deteriorating due to illumination.

[0092] In the Examples, Experiments 2 and 3 were only conducted on the orange container, and no experiment was conducted on the red container. However, the results of Experiment 1 show that the behavior of the light transmittance with respect to the red wavelengths is similar to that for the orange wavelengths; moreover, the wavelength range with low light transmittance is larger than that for the orange wavelengths. This allows estimations that the red container has higher lightproof properties than the orange container.

[0093] [Experiment 4]

Experiment 4 was conducted in the following manner to determine whether the contents of food/drink products preserved in orange and white containers can be inspected using near-infrared rays (with wavelengths of 700 nm to 2500 nm).

[0094] The procedure of Experiment 4 will be described in detail.

[0095] First, an orange container and a white container were prepared. Then, the light transmittance of each of these containers was measured. The measurement for the orange container was done by changing the wavelength from 250 nm to 2500 nm. The measurement for the white container was done by changing the wavelength from 500 nm to 2500 nm. The measurement used an ultraviolet and visible spectrophotometer from Shimadzu Corporation (type number: SolidSpec-3700DUV).

[0096] If near-infrared rays pass through a container, this means that the quality of the contents of a food/drink product loaded into the container can be inspected using near-infrared rays. If the transmittance with respect to near-infrared rays is 30 % or higher, the quality of the contents can be inspected to a sufficient degree.

[0097] FIG. 14 is a graph showing the results of the measurements of

Experiment 4. FIG. 14 shows that the orange container had a transmittance of 55 % or higher with respect to the near-infrared wavelength range of 800 to 2200 nm. In particular, it had a transmittance of 70 % or higher with respect to the wavelength ranges required to inspect the state of microbial contamination (i.e. 1100 to 1150 nm and 1400 to 1600 nm). On the other hand, the white container had a transmittance of lower than 30 % with respect to the entire near-infrared wavelength range.

[0098] Thus, the results of Experiment 4 shows that, if a food/drink product or the like is loaded into an orange container, the quality of the contents (i.e. product) can be inspected using near-infrared rays without removing the food/drink product from the container.

[0099] [Experiment 5]

In this experiment, deep orange, light orange, deep brown, and light brown container bodies were used and an enteral nutrient containing no microorganisms and an enteral nutrient containing predetermined amounts of various microorganisms were loaded into the container bodies, and "Compovision" from Sumitomo Electric Industries, Ltd. was used to inspect their quality. Then, it was determined whether microorganisms could be detected by measuring reflection through the long-wavelength-light transmitting region of each container body.

[0100] The results of the experiment show that it was determined that there was an abnormality for all the containers containing microorganisms. These results show that orange translucent and brown translucent containers allow non-invasive microorganism inspection.

INDUSTRIAL APPLICABILITY

[0101] The present invention is useful for containers for containing enteral nutrients, food/drink products or the like. Further, the present invention is useful for enteral nutrients, food/drink products or the like loaded into containers in a sealed manner. Furthermore, the present invention is useful for a method of inspecting or producing enteral nutrients, food/drink products or the like loaded into containers in a sealed manner.

CLAIMS

1. A container comprising:
a filling opening through which a content is to be loaded; and
a containing assembly for containing the content,
wherein the containing assembly is entirely constructed to have a transmittance of 75 % or lower with respect to light with a wavelength of 520 nm or less, and
the containing assembly includes a long-wavelength-light transmitting region having a transmittance of 75 % or lower with respect to light with a wavelength of 520 nm or less and a transmittance of 30 % or higher with respect to light with a wavelength of 1100 to 1150 nm and light with a wavelength of 1400 and 1600 nm, and
the long-wavelength-light transmitting region is orange-colored and translucent, brown-colored and translucent, or red-colored and translucent.
2. The container according to claim 1, wherein:
the containing assembly is entirely constructed to have a transmittance of 35 % or lower with respect to light with a wavelength of 520 nm or less, and
the containing assembly includes a long-wavelength-light transmitting region having a transmittance of 35 % or lower with respect to light with a wavelength of 520 nm or less and a transmittance of 30 % or higher with respect to light with a wavelength of 1100 to 1150 nm and light with a wavelength of 1400 to 1600 nm.
3. The container according to claim 1 or 2, wherein the long-

wavelength-light transmitting region has a transmittance of 70 % or higher with respect to light with a wavelength of 1100 to 1150 nm and light with a wavelength of 1400 to 1600 nm.

4. The container according to any one of claims 1 to 3, wherein the long-wavelength-light transmitting region further has a transmittance of 30 % or higher with respect to light with a wavelength of 740 to 770 nm, light with a wavelength of 900 to 950 nm, light with a wavelength of 1150 to 1260 nm, light with a wavelength of 1320 to 1400 nm, light with a wavelength of 1650 to 1930 nm, and light with a wavelength of 2090 to 2420 nm.

5. The container according to any one of claims 1 to 3, wherein the long-wavelength-light transmitting region further has a transmittance of 30 % or higher with respect to light with a wavelength of 1150 to 1400 nm and light with a wavelength of 1600 to 2200 nm.

6. The container according to any one of claims 1 to 5, further comprising: a lid for sealing the filling opening and having a transmittance of 75 % or lower with respect to light with a wavelength of 520 nm or less.

7. The container according to any one of claims 1 to 6, wherein the filling opening is sealed by means of an adhesive member.

8. The container according to any one of claims 1 to 7, wherein the entire containing assembly is a long-wavelength-light transmitting region.

9. The container according to any one of claims 1 to 7, wherein a bottom of the containing assembly is a long-wavelength-light transmitting region.

10. The container according to claim 1, wherein a portion of the containing assembly other than a bottom is covered with a packaging member having a transmittance of 35 % or lower with respect to light with a wavelength of 520 nm.

11. A container comprising:
a filling opening through which a content is to be loaded; and
a containing assembly for containing the content,
wherein a portion of the containing assembly other than its bottom is
constructed to have a transmittance of 75 % or lower with respect to light
with a wavelength of 520 nm or less, and
the containing assembly includes a long-wavelength-light
transmitting region having a transmittance of 75 % or lower with respect to
light with a wavelength of 520 nm or less and a transmittance of 30 % or
higher with respect to light with a wavelength of 1100 to 1150 nm and light
with a wavelength of 1400 to 1600 nm, and
the long-wavelength-light transmitting region is orange-colored and
translucent, brown-colored and translucent, or red-colored and translucent.

12. A containerized enteral nutrient or a containerized food/drink
product comprising:
the container according to any one of claims 1 to 11; and
an enteral nutrient or a food/drink product loaded into the container
in a sealed manner.

13. A method of inspecting quality of a content of a containerized enteral nutrient or a containerized food/drink product including the container according to claim 1 and an enteral nutrient or a food/drink product loaded into the container in a sealed manner, comprising the step of:
conducting an inspection by illuminating the long-wavelength-light transmitting region with an inspection light with a wavelength of 1100 to 1150 nm and light with a wavelength of 1400 to 1600 nm.

14. A method of manufacturing a containerized enteral nutrient or a containerized food/drink product including the container according to claim 1 and an enteral nutrient or a food/drink product loaded into the container in a sealed manner, comprising the steps of:
preparing the container;
loading the content into the containing assembly of the container that has been prepared and sealing the filling opening; and
illuminating the long-wavelength-light transmitting region with an inspection light with a wavelength of 1100 to 1150 nm and light with a wavelength of 1400 to 1600 nm to inspect the quality of the content.