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Package for agricultural products.

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Description

The present invention relates to a packaging container and package used in the storage and transportation of agricultural products such as rice.

In the long period storage of grains, including white rice, wheat, barley, oats, and rye, corn or varieties of beans, and tasted materials such as treated tea leaves and roasted coffee beans, there are many problems such as deterioration of freshness by oxidation, the loss of their taste and flavor, and decline of their quality by the generation of fungi.

Normally, grains are packed in sacks such as hemp sacks, paper sacks, and plastic film bags. However, with these forms of packaging, the above-mentioned quality problems cannot be adequately prevented.

There are commonly known a method for large volume warehouse storage, the so-called Controlled Atmosphere Storage (CAS), in which freshness is preserved by storage under gases for which the composition, temperature, and humidity are controlled therein, and vacuum storage methods in which a high degree of vacuum is provided therein. However, with these methods, the warehouse becomes large-scale, and the costs go up proportionally, and after the products are taken out of the warehouse and enter the distribution or consumers circuitry, the decrease in freshness and quality cannot be prevented.

In addition, it has been proposed that for long distance transportation, the storage room is divided into small scale compartments, and the condition of preservation in each compartment is individually controlled. However, in this case, the preservation and transportation equipment becomes large-scale and after the products are taken out of the storage room, the decrease in its quality cannot be prevented.

On the other hand, in usual packaging, large-sized metal containers and drums has been used. These are very costly, and a non-returnable system cannot be adopted in addition. Because these are not transparent, the contents cannot be seen, and the effect from the standpoint of design and appearance cannot be obtained.

In this case of rice which is a representative grain, in the final distribution process and in the stores, this grain is packed in bags of polyethylene film or paper and is sold. In particular, in the case of the bags of polyethylene film, small apertures are made for preventing the burst of bags, and airing of the bags is keeping. Accordingly, in any case, the problem arises that when rice is stored for a long period, its taste and flavor are lost, and odd smell is arisen. In order to provide good storage characteristics, consideration has been given to the use of aluminum deposited film, but this causes an increase in costs and because the film has a fairly thick aluminum layer, there is the inconvenience that the contents in the bag are invisible. Also, such bags are mostly soft, so their decorativeness in the store is destroyed.

There is known a close contact dormancy packaging method that the rice, which has the property of adsorbing large quantities of carbon dioxide under the high concentrations of the gas, is placed in a bag made of a film which has the very poor permeability for carbon dioxide (for example, a lamination of simultaneous biaxially-oriented nylon film and polyethylene film), rice is packaged after the atmosphere is displaced with high purity carbon dioxide gas, and then the bag is sealed. With the close contact dormancy packaging method, in a short period after sealing the package, the rice is flowable, and after the period, the bag is drawing in the inside, and rugged surface configurations on the packaging bag may be constructed, viz., specifically, close contact dormancy packaging presents the same type of appearance as with the conventional vacuum packaging, and the flowing of the rice is prevented and it becomes hard clumps of hermetically sealed bags.

In this way, when the outer surface of the bag takes on some creasy surface appearance, it is not possible to arrive at an effective design to take advantage of the transparency of the package. In addition, if there is some printing on the bag surface, a highly effective display is not possible, and an effective display in the stores is not obtainable. Also, when handling during transportation, storage, and display, some small cracks are formed in the rugged portion and there is some concern that the hermetrical seal might be broken.

It is therefore an object of the present invention to provide a superior, inexpensive packaging container and package for agricultural products, suitable for the use in a non-returnable package delivery method, which prevent deterioration of the freshness and quality of agricultural products such as grains, and also provide an effective display.

The object of the present invention is achieved by a hermetically sealed package wherein the inside of the keeping-ownshape container is formed from a gas barrier plastic material, into which the agricultural product is filled and hermetically sealed together with an inert gas. Once the agricultural product such as rice is hermetically sealed in this package, it is handled in an integral manner from the packaging area to storage through the distribution channels to the final consumption site. The need for large-scale storage facilities and expensive containers is eliminated, while the loss of freshness and quality of the agricultural product is effectively prevented. Handling is easily carried
out, and there is possibility of adoption of a non-returnable container to provide an efficient storage and transportation system.

The storage and display effect can be improved through the use of a high nitrile resin as the packaging material, or by filling the agricultural product into containers formed from a sheet of that resin.

As a result of searches on the shape of the packaging container and filling method, it has been found that the dual effect of good storage characteristics and display effect can be obtained by filling an excess of an inert gas into a container made of a plastic material having gas barrier properties for storing agricultural products, with the quantity of the inert gas which could be adsorbed by the agricultural products estimated, in such a manner that the original shape of the container is not impaired.

In the drawing, Fig. 1 is a partly sectional view of an example of a container for agricultural products.

Fig. 2 is a partly sectional view of an example of a package according to the present invention.

Fig. 3 is an external view of another example of a package according to the present invention.

Fig. 4 is a partly sectional view taken on line A-A in Fig. 3.

The preparation of the hermetically sealed package is performed at the harvest site of agricultural products such as rice, at the rice cleaning facilities in the case of rice, or at the loading location of the transportation terminal. Thereafter, the hermetically sealed packages are transported right up to the final consumption site or processing site, without being opened in the tight-sealed form, so that the agricultural products such as the rice can be transported or stored with its freshness fully maintained, without any necessity for particular transportation and preservation facilities such as refrigerating facilities. Also, because a plastic material is used, it is low priced, and suitable for use with non-returnable containers.

As such plastic material, it is preferable to provide a plastic material which is superior in gas barrier properties, rigidity, workability, and air tightness when sealed, and transparency.

Examples of such plastic materials are a high nitrile resin having a high content of a nitrile component, and a multi-layered sheet comprising a gas barrier film made of (i) a gas barrier resin such as nylon, polyvinyl alcohol, ethylene - vinyl alcohol copolymer, polyvinylidene chloride and high nitrile resin, and (ii) a sheet of another resin such as polyethylene and polypropylene.

The container for use in the present invention has good characteristics of keeping own shape. The container can have an external shape which is a cylindrical tube, a square tube, or box-shaped.

The agricultural products filled into the container should be materials which can easily lose the taste and flavor. Agriculture products which can be included in this category are, for example, grains, including rices such as white rice, wheat, barley, oats, and rye, beans such as soybeans or red beans, and corn, and tasted materials such as roasted coffee beans, black tea leaves, green tea leaves and flavory tea leaves.

Any of these agricultural products are filled into the container along with an inert gas. Inert gases which are suitable for this application are carbon dioxide gas, nitrogen gas or mixtures of these gases. Filling an inert gas together with the product prevents flavor loss through oxidation and generation of bacteria, mold and insects. It is preferable that a deoxidant such as fine iron powder, sodium sulfate powder be additionally employed for removing oxygen remaining in the container. The same effect can also be obtained when air and such deoxidants are employed at the same time instead of using nitrogen gas. Carbon dioxide is especially desirable because it exhibits dormancy-forming and bacteriostatic characteristics.

The size of the package used in this storage/transportation system depends on the objective of the application. Any suitable size can be used, but taking all things into consideration with respect to the efficiency of the transportation system, including the strength of the container, cost of transportation, and convenience in handling, the 10 to 50 Kg is preferable, and the 20 to 40 Kg is more preferable. Also, the sales unit at the final consumption site and the unit used in the household should be considered, so that a smaller unit, for example, less than 10 Kg could also be more suitable.

Any of the above-mentioned plastic materials can be used for the package. Of these plastic materials, the high nitrile resin is most preferable for packaging agricultural products such as rice since it possesses gas barrier characteristics, transparency, and suitable strength, making it suitable as a packaging material for rice.

High nitrile resins preferably used in the present invention for the packaging material and the container material are copolymers comprising mainly unsaturated nitrile componets such as acrylonitrile and methacrylonitrile, and other monomers such as styrene, butadiene, isoprene, methyl acrylate, ethyl acrylate, methyl methacrylate and ethyl methacrylate, with the content of the unsaturated nitrile being 50 wt.% or more. One or more of these monomers can be polymerized with an unsaturated nitrile such as acrylonitrile.

In addition, the high nitrile resins may be used in combination with a rubber-type polymer such as
butadiene-acrylonitrile copolymer, isoprene-acrylonitrile copolymer, butadiene-styrene copolymer, polybutadiene, and polyisoprene. The high nitrile resin may be obtained by graft polymerization of the unsaturated components and the above-mentioned monomers in the presence of these rubber-type polymers.

As such high nitrile resins, BAREX (made by Sohio chemicals Co., Ltd.) and PANEX (made by Kanegafuchi Chemical Industry Co., Ltd.) are commercially available. A sheet-shaped BAREX is commercially available under the trade mark of ZEXLON from Mitsui Toatsu Chemicals, Inc. BAREX is an acrylonitrile thermoplastic resin which is excellent in gas barrier property, rigidity, transparency, and processability (for example, in deep-draw processing), so that there are no difficulties in forming the container. In addition, this material exhibits superior adhesion property, so that, after the filling, the hermetic sealing of the container is easily performed by heat sealing.

When the high nitrile resin is employed for the packaging material of the present invention, the packaging material can be obtained in sheet form by normal extrusion, calendering, and inflation molding processes. The thickness of the sheet is not restricted, but the 100 μm to 6000 μm is preferable. Also, the packaging container is prepared by forming the high nitrile resin into a sheet by the vacuum molding or by the pressure molding, or by the direct injection molding.

Further, it is possible to use this material for bag packaging in the same way as conventional packaging by normal heat sealing of a multi-layered film laminated from the above-mentioned single films or laminated from the above-mentioned single films and films of polypropylene, polyethylene, polyester, nylon and the like. Also, it is possible to print on the surface.

It is possible for the container cross-section to take various forms such as a circle, triangle, square forms, etc.

The wall thickness of the container varies according to the amount of the contents, the required strength, etc., but usually about 100 to 800 μm is desirable. The strength of a container with a wall thickness of less than 100 μm may be inadequate. On the contrary, a thickness exceeding 800 μm may be acceptable, but the workability is unsatisfactory and the cost is increased.

A lid or a top film of the container can be made of a film with high gas barrier properties such as a single layer of the above-mentioned high nitrile resin or vinylidene chloride resin, or a multi-layer film comprising a film made of a resin such as polypropylene, polyethylene, and nylon, which is overlaid on the above-mentioned single layer. Aluminum and steel can also be used for such lid or the top film.

Fig. 1 is a sectional view of an example of a container of this type. A quantity of agricultural products such as grains 19 is stored in a container body 11 made from a high nitrile resin sheet. On the top of the container body 11, a top film 17 is sealed to a flange section 13 formed on the container body 11. Further, a rib 15 is provided on the container body 11 with the effect of increasing the strength, or to improve the design.

Dried grains such as rice and wheat have the property of adsorbing inert gases, especially carbon dioxide gas, and after filling to the conventionally used containers, the inside pressure is lowered and the walls of the hermetically sealed container are pulled towards inside, so that the external shape of the container is distorted. When the container is distorted, the outside appearance is impaired and cracks appear in the container walls, which cause a break in the seal.

In addition, when the container becomes indented, the surrounding area is weakened, and cracks appear because of the use of handling and loading equipment during the storage and transportation. In the worst case, the hermetic seal is broken. Even if the hermetic seal structure does not break, when the container becomes rugged, the display effect is reduced.

To prevent this type of problem from occurring, the container may essentially maintain its original condition even after the packed agricultural product has adsorbed the filled gas. That is, it is necessary that the container have keeping-ownshape characteristics. This may be attained by increasing the strength of the container, in other words, by using a thick plastic sheet or applying a firm heat seal, or by strictly controlling the amount of the inert gas filled. However, this results in an increase in production costs. It has been found that keeping-ownshape characteristics can be provided comparatively simply by the following system:

The inert gas is filled into the container, taking into consideration the amount of gas which may be adsorbed in the packed grains, such as rice. After the gas is adsorbed, the inside of the container is maintained at a suitable pressure so that the container is not distorted.

Fig. 2 is a partial sectional view of the form of a container which has adopted the system above. A package 21 in which the rice is stored is formed from a plastic sheet with high gas barrier properties. The package 21 is formed from a container body 23 which is cylindrical or has a square cross section, a top cover 25 which seals an opening in the bottom of the container. In addition, as shown in Fig. 1, the container body 23 and the bottom plate 27 may also be integrally formed. The previously mentioned high nitrile resin may easily be
processed into this kind of form because it has superior deep-drawing processing characteristics. Thus it is preferable to adopt such molding method. The top cover 25 may be created in advance to provide a pull top sealing means.

In the package 21 after a predetermined amount of rice 29 has been stored, and after the air has been removed by means of a gas replacement method, high purity carbon dioxide gas, nitrogen gas used for food, or a mixture of carbon dioxide gas and nitrogen gas is filled under a predetermined pressure and sealed by means of the top cover 25.

The volume of rice 29 stored in the container 21 and the filled volume of charging gas comprising carbon dioxide gas are determined so that the freshness and quality of the rice 29 can be properly maintained. However, even after the filled charging gas remaining, it is desirable that the gas be pressure-filled under the required pressure, which should be maintained to the degree that the package itself is able to maintain the original external shape when the rice 29 was filled.

In addition, to maintain the shape in this way, a certain vacant space 31 remains with respect to the amount of the rice 29 stored in the package 21, and it is desirable to utilize this space as the filling station of the charging gas.

Figs. 3 and 4 show another example of a package according to the present invention. A package 41 is fabricated in a bag form which can be filled through a lower section 43 which has a predetermined area formed at the time the rice 29 is stored. The opening is closed by a tear section 45 by heat sealing.

The carbon dioxide gas prevents the reduction of freshness caused by oxidation and the propagation of aerobic bacteria, and also provides a dormancy-forming and bacteriostatic effect on rices such as white rice, so that the white rice can be stored under favorable conditions.

The charging of the carbon dioxide gas can be accomplished by commonly known methods, but the use of dry ice is also an excellent method. The required quantity of dry ice can be inserted into the container body to charge the gas. A cooling effect is also obtained.

Claims

1. A package for agricultural products comprising a container with a particular shape formed from a gas barrier plastic material, in which an agricultural product is tightly sealed, together with an excess of an inert gas, with the amount of said inert gas adsorbed by said agricultural product taken into consideration, in such a manner that said particular shape of said con-

2. The package as claimed in claim 1, wherein said inert gas is selected from nitrogen gas, carbon dioxide gas and a mixture thereof.

3. The package as claimed in claim 1 or 2, wherein said plastic material is a high nitrile resin comprising a copolymer of (i) an unsaturated nitrile component as the main component, and (ii) a monomer component which is capable of being copolymerized with said unsaturated nitrile component.

4. The package as claimed in claim 3, wherein said plastic material is a high nitrile resin comprising a copolymer of (i) an unsaturated nitrile component in an amount of 50 wt. % or more, and (ii) a monomer component which is capable of being copolymerized with said unsaturated nitrile component.

5. The package as claimed in claims 3 or 4, wherein unsaturated nitrile component is selected from acrylonitrile and methacrylonitrile, and said monomer component is selected from styrene, butadiene, isobutylene, methyl acrylate, ethyl acrylate, methyl methacrylate and ethyl methacrylate.

6. The package as claimed in any one of claims 3 to 5, wherein said high nitrile resin is a copolymer obtained by copolymerizing (i) acrylonitrile and (ii) a monomer component which is capable of being copolymerized with said acrylonitrile in presence of a conjugated diene synthetic rubber.

7. The package as claimed in anyone of claims 3 to 6, wherein said high nitrile resin is a mixture of said copolymer and a conjugated diene synthetic rubber.

8. The package as claimed in claims 6 or 7, wherein said conjugated diene synthetic rubber is selected from butadiene-acrylonitrile copolymer, isoprene-acrylonitrile copolymer, butadiene-styrene copolymer, polybutadiene and polyisoprene.

9. The package as claimed in any one of claims 1 to 8, wherein said package is in the form of a bag or a molded container.
10. The package as claimed in any one of claims
1 to 9, wherein said agricultural product is a
grain such as rice.

Patentansprüche

1. Verpackung für landwirtschaftliche Produkte,
umfassend einen Behälter mit einer speziellen
Gestalt, die aus einem gasundurchlässigen
Kunststoffmaterial gebildet ist, in welchem ein
landwirtschaftliches Produkt zusammen mit ei-
 nem Überschuß an Inertgas, wobei die Menge
an Inertgas, die durch das landwirtschaftliche
Produkt adsorbiert wird, berücksichtigt wird, in
solcher Weise fest eingegossen ist, daß sich
die spezielle Gestalt des Behälters aufgrund
der Abnahme des Innendrucks des Behälters,
die durch die Adsorption des Inertgases durch
das landwirtschaftliche Produkt verursacht
wird, nicht merklich ändert.

2. Verpackung nach Anspruch 1, in welcher das
Inertgas aus Stickstoffgas, Kohlendioxidgas
und einer Mischung davon ausgewählt ist.

3. Verpackung nach Anspruch 1 oder 2, in wel-
cher das Kunststoffmaterial ein Harz mit ho-
hem Nitrilgehalt ist, welches ein Copolymer (i)
o einer ungesättigten Nitril-Komponente als
Hauptkomponente und (ii) einer Monomer-
Komponente, die in der Lage ist, mit der unge-
sättigten Nitril-Komponente copolymerisiert zu
werden, umfaßt.

4. Verpackung nach Anspruch 3, in welcher das
Kunststoffmaterial ein Harz mit hohem Nitrilge-
halt ist, welches ein Copolymer (i) einer unge-
sättigten Nitril-Komponente in einer Menge von
50 Gew.-% oder mehr und (ii) einer Monomer-
Komponente, die in der Lage ist, mit der unge-
sättigten Nitril-Komponente copolymerisiert zu
werden, umfaßt.

5. Verpackung nach Anspruch 3 oder 4, in wel-
cher die ungesättigte Nitril-Komponente aus
Acrylnitril und Methacrylnitril ausgewählt ist
und die Monomer-Komponente aus Styril, Bu-
tadien, Isobutylen, Methacrylat, Ethylacrylat,
Methylmethacrylat und Ethylmethacrylat aus-
gewählt ist.

6. Verpackung nach irgendeinem der Ansprüche
3 bis 5, in welcher das Harz mit hohem Nitril-
gehalt ein Copolymer ist, das erhalten wird
durch Copolymerisation von (i) Acrylnitril und
(ii) einer Monomer-Komponente, die in der
Lage ist, mit dem Acrylnitril copolymerisiert zu
werden, in Anwesenheit eines synthetischen
konjugierten Dien-Kautschuks.

7. Verpackung nach irgendeinem der Ansprüche
3 bis 6, in welcher das Harz mit hohem Nitril-
gehalt eine Mischung des Copolymeren und
eines synthetischen konjugierten Dien-Kaut-
schuks ist.

8. Verpackung nach Anspruch 6 oder 7, in wel-
cher der synthetische konjugierte Dien-Kaut-
schuk aus Butadien-Acrylnitril-Copolymer, Iso-
pren-Acrylnitril-Copolymer, Butadien-Styrol-Co-
polymer, Polybutadien und Polysopren ausge-
wählt ist.

9. Verpackung nach irgendeinem der Ansprüche
1 bis 8, die in Form eines Beutels oder eines
geschnittenen Behälters vorliegt.

10. Verpackung nach irgendeinem der Ansprüche
1 bis 9, in welcher das landwirtschaftliche Pro-
dukt ein Getreide wie beispielsweise Reis ist.

Revendications

1. Un emballage pour produits agricoles compre-
nant un récipient ayant une forme particulière,
réalisé en une matière plastique formant bar-
rière aux gaz, dans lequel un produit agricole
est isolé de façon étanche, conjointement avec
un excès de gaz inerte, la quantité dudit gaz
inerte adsorbé par le dudit produit agricole étant
prise en considération, de manière que ladite
forme particulière dudit récipient ne soit pas
sensiblement modifiée suite à la diminution de
la pression interne dudit récipient suite à l’ad-
sorption dudit gaz inerte par le dudit produit agricole.

2. L’emballage selon la revendication 1, dans lequel
le ledit gaz inerte est choisi parmi l’azote, le
dioxyde de carbone et leurs mélanges.

3. L’emballage selon la revendications 1 ou 2, dans
lequel ladite matière plastique est une résine
à haute teneur en nitrile comprenant un copolymère de (i), un composant nitrile insatu-
ré à titre de composant principal et (ii) un
composant monomère susceptible d’être copo-
lmérisé avec ledit composant nitrile insa-
5. L'emballage selon la revendication 3 ou 4, dans lequel ledit composant nitrile insaturé est choisi parmi l'acrylonitrile et le méthacrylonitrile et ledit composant monomère est choisi parmi le styrène, butadiène, isobutylène, méthyl acrylate, éthyl acrylate, méthyl méthacrylate et éthyl méthacrylate.

6. L'emballage selon l'une quelconque des revendications 3 à 5, dans lequel ladite résine à haute teneur en nitrile est un copolymère obtenu par copolymérisation de (i) acrylonitrile et (ii) un composant monomère susceptible d'être copolymérisé avec ledit acrylonitrile en présence d'un caoutchouc synthétique de type diène conjugué.

7. L'emballage selon l'une quelconque des revendications 3 à 6, dans lequel ladite résine à haute teneur en nitrile est un mélange dudit copolymère et d'un caoutchouc synthétique diène conjugué.

8. L'emballage selon la revendication 6 ou 7, dans lequel ledit caoutchouc synthétique diène conjugué est choisi parmi un copolymère butadiène-acrylonitrile un copolymère isoprène-acrylonitrile, un copolymère butadiène-styrène, le polybutadiène et le polyisoprène.

9. L'emballage selon l'une quelconque des revendications 1 à 8, dans lequel ledit emballage se présente sous la forme d'un sac ou d'un récipient moulé.

10. L'emballage selon l'une quelconque des revendications 1 à 9, dans lequel ledit produit agricole est un produit en grains, tel que du riz.