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(54) GAS PERMEABLE POLYMER LABEL FOR CONTROLLED RESPIRATION

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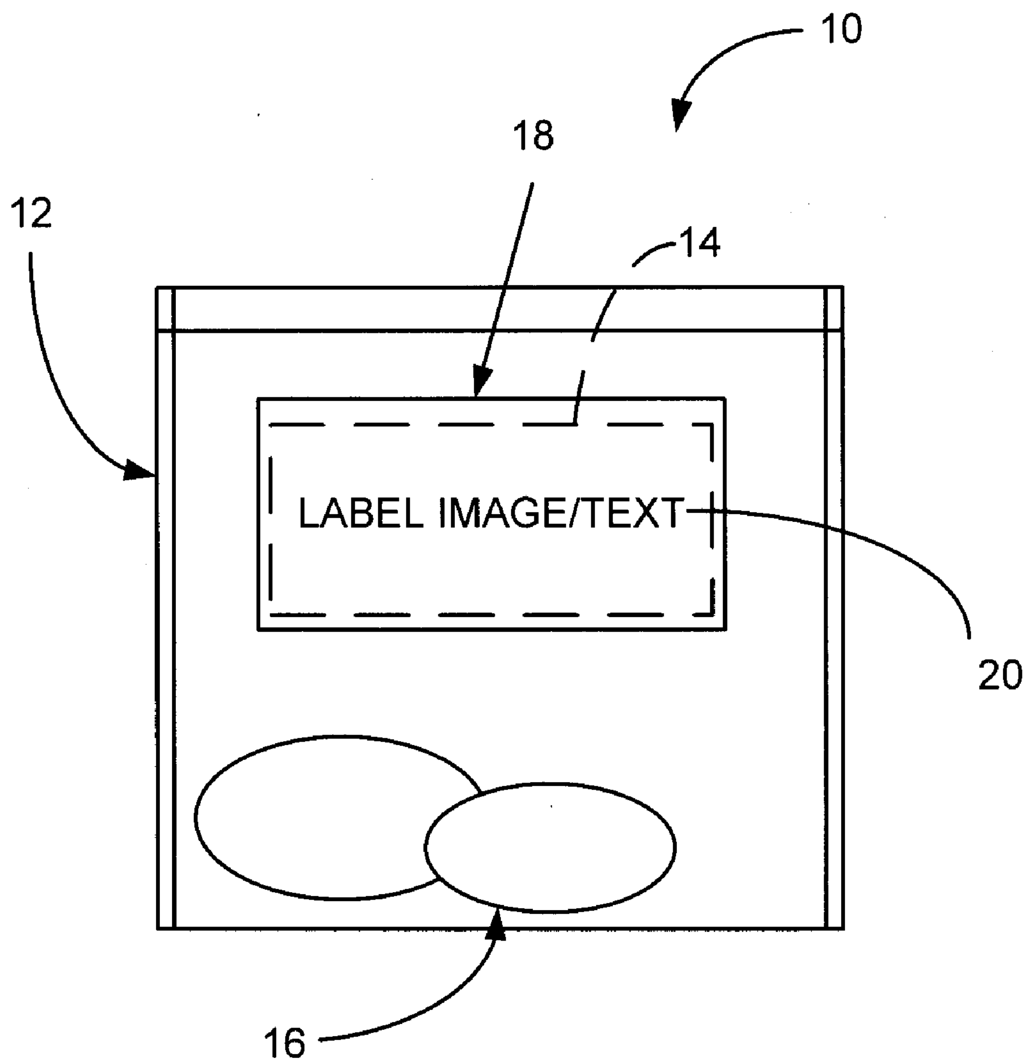
(57) **ABSTRACT**

The present document describes a label for installation over an opening of a container to be loaded with produce. The label comprises: a polymer-based film; and micro-perforations through the polymer-based film, whereby upon the polymer-based film being sealingly installed over the opening of the container, the micro-perforations controllably transfer a gaseous substance (such as oxygen and/or carbon dioxide) into or out of the container, through the label, and according to a respiration rate of the produce to be loaded in the container.



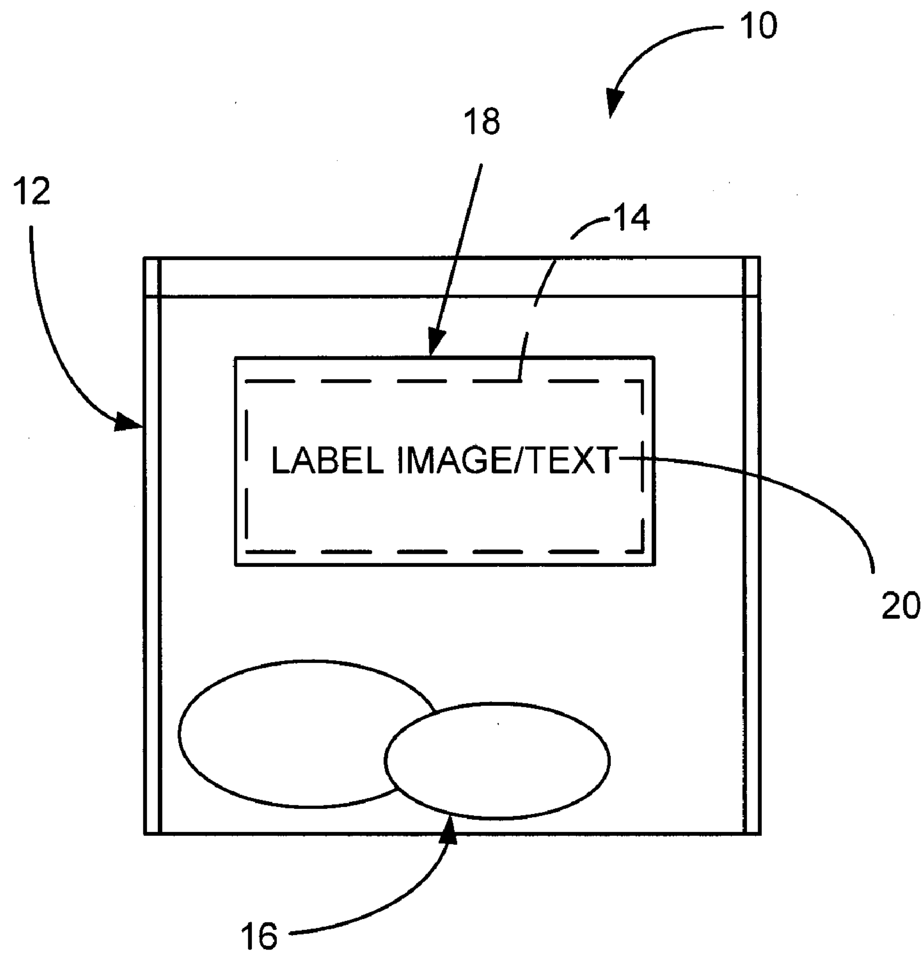


Fig. 1

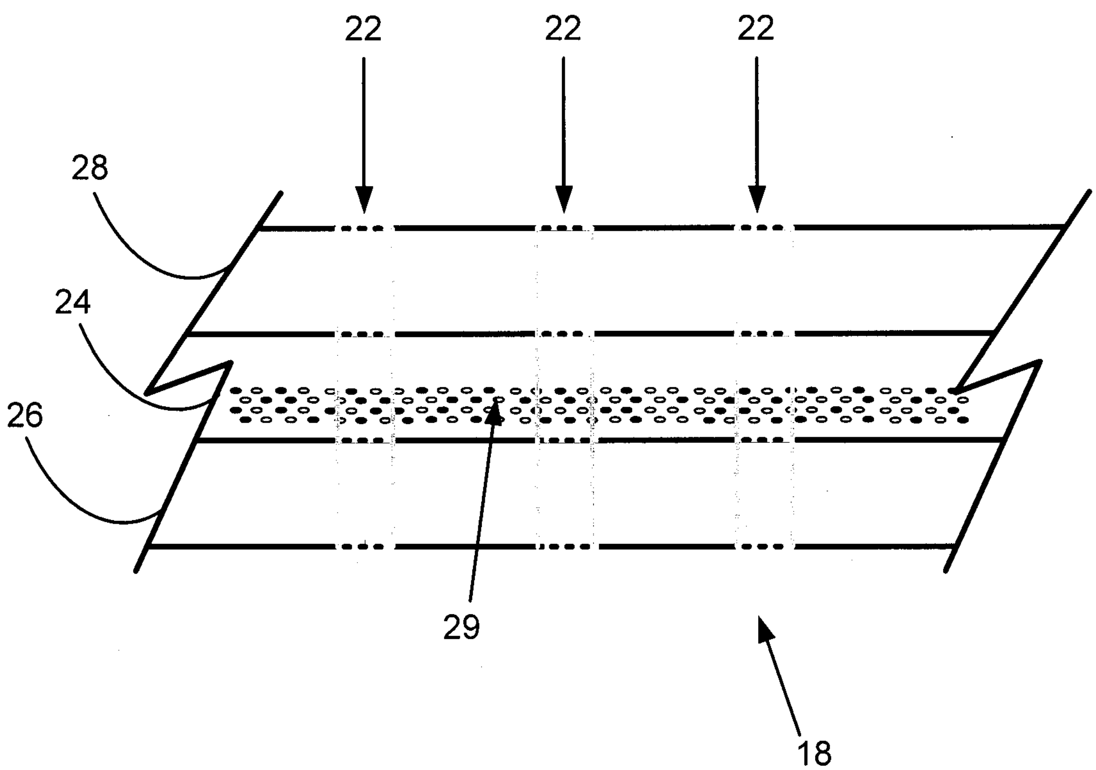


Fig. 2

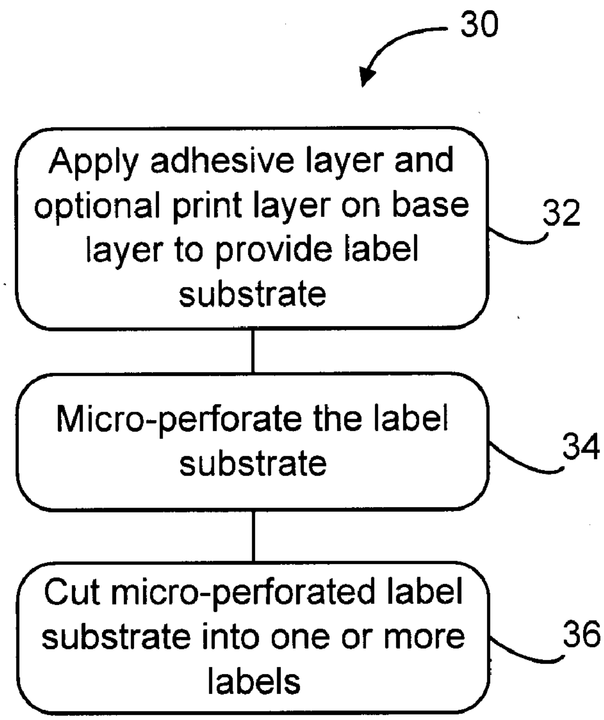

30
Apply adhesive layer and optional print layer on base layer to provide label substrate
32
Micro-perforate the label substrate
34
Cut micro-perforated label substrate into one or more labels
36

Fig. 3a

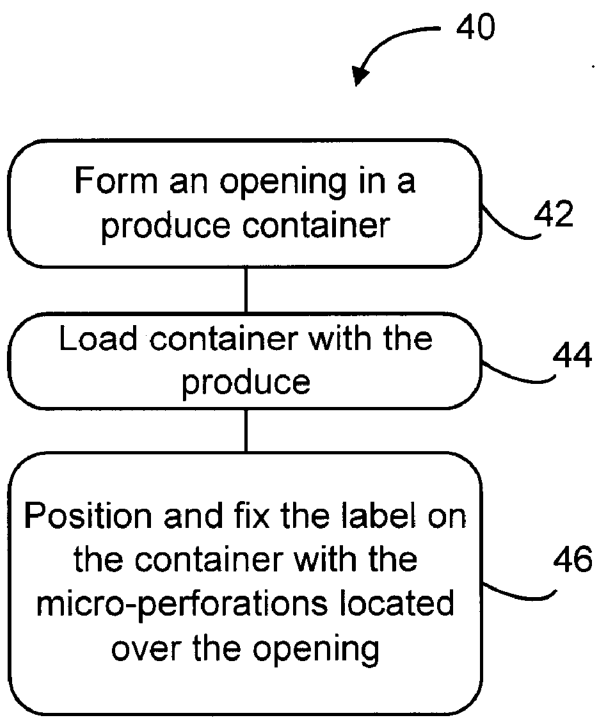

40
Form an opening in a produce container
42
Load container with the produce
44
Position and fix the label on the container with the micro-perforations located over the opening
46

Fig. 3b

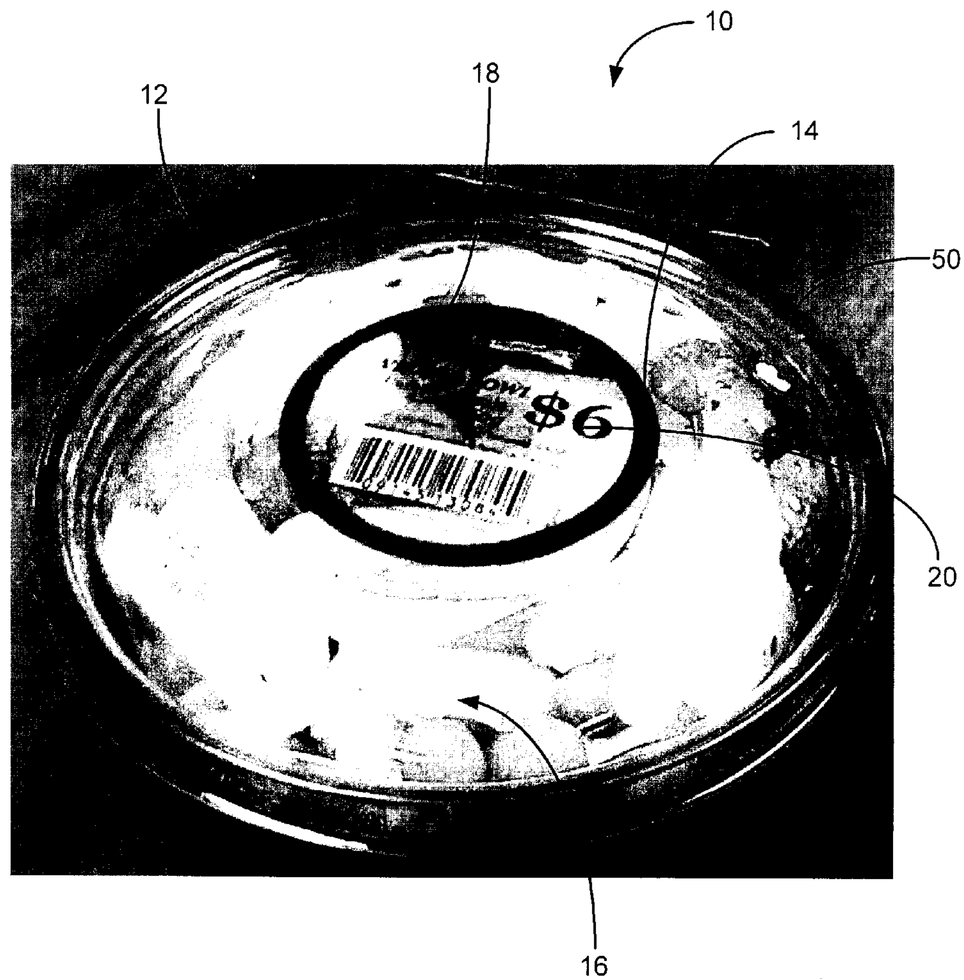


Fig. 4

GAS PERMEABLE POLYMER LABEL FOR CONTROLLED RESPIRATION

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority of U.S. provisional patent application 61/212,120, filed Apr. 8, 2009. For the US only, the foregoing US provisional patent application is hereby incorporated by reference.

TECHNICAL FIELD

[0002] This description relates to packaging for food. More particularly, the present specification relates to labels, methods of making such, and the labelling of containers, to provide gas permeable packaging solutions.

BACKGROUND

[0003] The quality and shelf life of fresh produce is enhanced by enclosing them in packaging that is capable of controlling levels of certain gases such as oxygen, carbon dioxide and water vapour (moisture) in the environment of the produce.

[0004] Such packaging is generally referred to as "Modified Atmosphere Packaging" (MAP). Fresher products to the consumer, less waste from spoiled produce, better inventory control, and appreciable overall savings for the food industry are only some of the resulting benefits of MAP.

[0005] Typically available produce containers are however not suitable for achieving Modified Atmosphere (MA). For example, typical lid closable trays made out of rigid plastic material, and which are subsequently wrapped by a shrink band placed around the lid and tray in order to ensure a hermetic sealing of the overall package, do not allow for appropriate gas permeability. Oxygen inside such packaged trays is quickly consumed by the produce stored therein, which leads to accelerated produce degradation and limited shelf life.

[0006] Typical containers, such as the above-noted tray and lid example, are also typically incapable of providing MA. By Modified Atmosphere (MA), it is intended to refer to the packages ability to modify its interior atmosphere via a controlling of ingress and egress of certain gases.

[0007] As produce are known to have characteristic respiration rates under non-packaged conditions (i.e. the produce's consumption rate of Oxygen and production rate of Carbon Dioxide for example), some gas permeable packages are specifically designed to be able to provide an optimal MA meant to slow aging and degradation of a specific produce. Such specifically engineered containers are however designed for specific types of produce.

[0008] As many vendors and/or distributors typically supply a wide variety of produce such as fruits, vegetables and meats for example, and thus require a number of differently engineered MA containers, there is need for a packaging solution which offers easy and rapid market penetration; a packaging solution which is adaptable to packaging processes which are already in place throughout the industry.

SUMMARY

[0009] The packaging solution herein disclosed proposes an improved label which is gas permeable and capable of MA.

[0010] The present disclosure seeks to provide an improved label that addresses one or more disadvantages associated with prior art produce packaging and/or labeling, or at least provides useful alternatives thereto.

[0011] According to an embodiment, there is provided a label for installation over an opening of a container to be loaded with produce, the label comprising: a thin layer of material; and micro-perforations through the label, whereby upon the label being sealingly installed over the opening of the container, the micro-perforations controllably transfer a gaseous substance into or out of the container, through the label, and according to a respiration rate of the produce to be loaded in the container.

[0012] According to another embodiment, there is provided a gas permeable package comprising: a container for holding produce, the container defining an opening to an interior space of the container; a label sealingly affixed to the container to cover the opening; the label comprising a thin layer of material; and micro-perforations practiced therethrough for controllably transferring a gaseous substance into or out of the container, through the label, and according to a respiration rate of the produce to be loaded in the container.

[0013] According to another embodiment, there is provided a method for labeling a container loaded with produce, the method comprising: forming an opening within a container to be loaded with produce; loading the produce into the container, the produce having a given respiration rate; sealingly installing a label to the container, the label comprising: micro-perforations positioned over the opening once the label adhered to the container, the micro-perforations for controllably transferring a gaseous substance into and out of the container according to the respiration rate of the produce therein.

[0014] In the present specification, the term "produce" is intended to refer to fresh fruits and vegetables, flowers, or any other type of produce that presents various respiration rates which are to be taken into consideration in order to maximize their shelf life.

[0015] In the present specification, "shelf life" is intended to refer to the time until the produce is no longer suitable for consumption and/or presentation to customers and shall be discarded. In one example, this is the time until the produce presents fully-ripe or over-ripe characteristics, whichever the case may be.

[0016] In the present specification, "micro-perforations" refer to perforations having a well-defined area which allow a controlled transmission of gases through the package.

[0017] In the present specification, the expression "controlled respiration" or "controlled respiration rate" is intended to refer to the control of the amount of gas that is allowed to pass through a material. A sealed container made of such breathable material is able to control the amount of humidity which is allowed to enter and escape from the interior volume of the container, while permitting oxygen and carbon dioxide to pass through adequately. Produce (also referred to as foodstuff) stored in an interior volume of such a container is able to breathe according to a controlled respiration rate; the rate being dependent on a specific design of the micro-perforations in the material and which allow such breathing to take place. Such a control on the type and the amount of gazes which are permitted to enter and escape the sealed container similarly provides for the control of the internal pressure and humidity level inside such containers. The gaseous environment inside the package may therefore be kept different compared to an exterior gaseous environment (e.g., oxygen levels can be lower inside than outside the package, an amount of water molecules can also be kept higher inside the container, and the like).

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] Further features and advantages of the present disclosure will become apparent from the following detailed description, taken in combination with the appended drawings, in which:

[0019] FIG. **1** is a schematic front elevation view of a labeled package (e.g., a bag), in accordance with an embodiment;

[0020] FIG. **2** is a schematic cross-sectional view of the label of FIG. **1**;

[0021] FIG. **3***a* is a method for fabricating the labeled package of FIG. **1**, in accordance with an embodiment;

[0022] FIG. **3***b* is a method for labeling a container loaded with produce to produce the labeled package of FIG. **1**, in accordance with an embodiment; and

[0023] FIG. **4** is a photograph of the labeled package of FIG. **1**, with a printed label, in accordance with an embodiment.

[0024] It will be noted that throughout the appended drawings, like features are identified by like reference numerals.

DETAILED DESCRIPTION

[0025] There is generally described below, with reference to the appended drawings a labeled package **10** comprising a container **12**, here in the form of a reclosable bag, for holding fresh produce **16**. The bag **12** is labeled with a label **18** in accordance with embodiment as described herein.

[0026] As seen in the embodiment shown in FIG. **1**, the bag **12** takes the form of a closeable recipient which is optionally made of a translucent polymer material. The label **18** is in turn made of a polymer material, such as polyester, and is microperforated to provide a controlled respiration rate for the produce **16** stored inside the bag **12**. The micro-perforations of the label are such that the label itself is gas permeable and capable of controlling a respiration through its membrane by way of controlling a type and/or an amount of gas passing there through. In this way, for example, a moisture level inside the bag **12** is kept constant, while further maintaining an optimal respiration rate for the produce **16**.

[0027] In the illustrated embodiment of FIG. **1**, the bag **12** has an opening **14** defining an opening periphery at a location where the label **18** is to be positioned. The size of the opening **14** is variable and dependent on an overall size of the bag **12** and/or a size of the label **18** to be installed, affixed or adhered. The label **18** is then positioned over the opening **14** such that its adhesive under-coating (not shown) adheres to the periphery (also referred to as one or more edges) of the opening **14**. The label **18** is made to adhere to the container so as to create and airtight, sealed package **10** which is able of gas permeability via the label **18** alone.

[0028] The label is printable over its exterior or upper surface area **20**, although may remain unprinted as desired. In one instance, the area **20** has printed information pertaining to the produce **16**, a producer, a vendor, a price, or any other useful information.

[0029] The label **18** is made of various polymer structures, such as any number or combinations of specific polymer structures suitable for food contact: polypropylene, polyethylene or combination of polyethylene and polypropylene for example. In one embodiment, the label **18** is made of a combination of a paper coated with a plastic layer. The label **18** has a thickness varying from about 25 to about 175 microns.

[0030] Now referring to FIG. **2**, which shows a cross-sectional schematic view of a specific embodiment of a label **18** with micro-perforations **22**.

[0031] In the illustrated example, the micro-perforations **22** have a diameter in the order of about 30 to about 150 microns. In another instance, the micro-perforations **22** have a diameter from about 30 to about 90 microns in size, whereas in yet another instance, the diameters range from about 30 to about 60 microns. In some instances, the distribution of the microperforations **22** is uniform over the entire surface of the label **18**, or an area thereof such as a center or middle-portion. In other instances, the micro-perforations are grouped over a specific area of the label.

[0032] Referring to FIG. **1** and FIG. **2**, in one embodiment, the size, position, and distribution of the micro-perforations **22** are dependent on the characteristics of the produce **16** and/or of the container **12**. For example, a respiration rate of the produce **16** as well as a quantity of produce **16** in the container **12** is considered. Other characteristics which are known to have an incidence on a type and an amount of gas transfer(s) to be allowed and maintained by the label **18** are optionally considered in order to provide an optimal conservation environment for the produce **16**. In this way, the produce's shelf life is extended.

[0033] Other non-limiting characteristics which are optionally considered in designing the micro-perforations include: produce moisture retention, ideal moisture levels, a shape or size of the produce, the container, or a combination thereof. For example, size of one or more micro-perforations **22** is chosen based on a moisture level to be kept inside the container **12**, so as to retain or to allow an escape of water molecules.

[0034] Still in reference to FIG. **2**, the label **18** in accordance to the illustrated example has a base layer **24** (also referred to herein as a thin layer of material), an optional adhesive layer **26** and an optional print layer **28**. The print layer can be replaced simply by printing (i.e., printed text or image).

[0035] As described above, the base layer **24** is made of a combination of polymers or paper-type materials, such as cardboard or wax paper, coated with polymer. Materials for the base layer **24** can also include translucent plastics, cellulose-based films and corn-based films alone or in combination.

[0036] In the illustrated embodiment, the adhesive layer **26** is provided as an under-coating, or on a reverse side of the label **18** intended to be adhered to a container. In one embodiment, the adhesive layer is of a permanent type, although kept suitable for food contact and ingestion. In another embodiment, the adhesive layer is non-permanent to allow removal and re-adherence. Such a label is usable to open the container via the opening to access the produce therein. In such an embodiment the label **18** in fact could replace the lid (or cover) entirely.

[0037] It is noted that the adhesive layer **26** is optional when the adhesive is provided on the container **12** instead; e.g., in the periphery of opening **14**.

[0038] In addition, in a particular example, the adhesive layer **26** of the label **18** is provided adjacent the print layer **28**, both applied on a same side of the base layer **24**. This embodiment is used in cases where the label is affixed to the container via adherence on an interior wall of the container, as later described.

[0039] Non-limiting examples of adhesives which can be used include either water or solvent based adhesives; acrylic or rubber emulsions such as soluble rubber or maleic anhydride (MAH) adhesives for example, which are permanent or not; or any food-grade approved adhesive compositions, glues or epoxies which are adapted to adhere to a variety of surfaces such as paper, corrugate, metals, glass, vinyl, foam, fabric, polystyrene, polypropylene, polyethylene, paper, or corrugate under whichever conditions such as cold, hot, damp or dry conditions. In one embodiment for example, the adhesive layer is a transparent, non-tacky and flexible film composition such as a vinyl acetate-maleate copolymer resin available on the market as a blend of isopropyl acetate and toluene.

[0040] Other means of installing the label are also contemplated. Examples include any type of airtight seal. Examples of such airtight seals include the zipper lock type closures which are commonly found on plastic food bag. Of course, a combination of any of the installation schemes described herein would also be feasible.

[0041] The print layer **28** is present when the label **18** is printed with a layer of ink suitable for proper adherence to the upper or front side of the label **18** opposite the adhesive layer **26**. Any inks which are suitable for printing on a polymer-based material such as any suitable food-safe inks are used.

[0042] In one embodiment, the label **18** is a self-adhesive permanent label **18** in that the adhesive layer **26** does not require the application of extra moisture in order to obtain an adhesive effect of the layer. In one example, once applied, such an adhesive layer **26** is protected with a backing paper (not shown) until it is removed prior to sticking the label **18** on the container **12**.

[0043] Still in reference to FIG. **2**, it is noted that an additive compound **29** is optionally added to the base layer **24**. The additive compound **29** can additionally or alternatively be added to the adhesive layer **26**. Such an additive compound **29** is intended to be used for example, to provide a control on a ripening rate of the produce stored in the container, or to improve translucence of the container by controlling any fogging effect occurring from the moisture level inside the container. Non-limiting examples of additives which are optionally used include food grade anti-fog agents and ripening agents such as food grade ethylene absorption additives.

[0044] The label **18** is fabricated according to any type of suitable manufacturing method such as one illustrated in FIG. **3***a*. In this example, the method **30** involves the following steps:

[0045] In step **32**, an adhesive layer is applied over a thin layer of material in order to form a label substrate. This step is accomplished in one example by coating at least one side of a sheet of film material forming the base layer with a layer of adhesive substance. The other side or the same side is optionally printed by way of applying a print layer.

[0046] Then, in step **34**, at least a portion of the label substrate is micro-perforated to provide micro-perforations through the label substrate, which includes the base layer, the adhesive layer and the print layer when applied in step **32**. The micro-perforations are designed in size and distribution over the label substrate so as to controllably transfer on ore more given gaseous substances through the label substrate, and based on the respiration rate of the fresh produce to be contained in the container. For example, the micro-perforations have a size which is able to allow the ingress of oxygen while venting out carbon dioxide and retaining moisture inside in accordance to the produce's needs for longer shelf life.

[0047] In one embodiment of step **34**, the label substrate is micro-perforated according to a pre-established design, by subjecting the label substrate to a number of small high voltage electric discharges (intense energetic sparks) which vaporize the substrate at their application location. In another example, a laser is used to produce the micro-perforations.

[0048] In step **36**, the label substrate is cut to form one or more gas permeable labels in accordance with a final size and shape. While this step is optionally done prior to step **32** and/or **34**, in this embodiment, the label substrate is cut to provide one or more finished self-adhesive labels. Alternatively, cut lines are created in order to supply sheets of multiple pre-formed labels and allow produce distributors to themselves cut and separate the labels from one another.

[0049] Alternatively, the above method **30** is varied such that the base layer is micro-perforated (step **34**) prior to the coating of the adhesive and optional print layer (step **32**). In such a variation, the layering technique used to apply the adhesive layer and the optional print layer on the base layer does not reclose the micro-perforations. For example, the type of adhesive and the ink used are composed of small enough particles which eliminate any risks of clogging micro-perforations.

[0050] Additionally or alternatively, in one embodiment, the adhesive layer is applied over a given area of the label, while the micro-perforated area occupies another area of the label different than the given area used by the adhesive layer.

[0051] In a similar fashion, in one instance where both the adhesive layer and the print layer are applied over a same side of the base layer in step **32**, the adhesive layer is applied over a given area of the label which is different than the area occupied by the print label. For example, the adhesive layer is positioned along a periphery of the label, while the print layer is at a middle-portion of the label.

[0052] In the above method **30**, it is noted that the application of the adhesive layer in step **32** is optional when for example the adhesive is to be instead applied on the container prior or during the affixing the label thereon.

[0053] In addition, in some cases, the final cutting step **36** is performed prior to the printing of the label (application of the optional print layer).

[0054] The final label is capable of maintaining a given respiration rate in accordance to the sizes and shapes of the micro-perforations.

[0055] Now referring to FIG. **3***b*, there is shown a method **40** for labeling a container which is to be or is previously loaded with produce.

[0056] In step **42**, an opening is formed within a container (or a lid portion thereof) which is to be loaded with produce.

[0057] In step **44**, the produce is loaded into the container. The produce can be any produce which has a given pre-established respiration rate, or range of thereof, as known from the type of quantity of produce stored in the container.

[0058] In step **46**, the gas permeable label is fixedly and sealingly positioned onto the container, over the opening. The gas permeable label has an adhesive film which is meant to adhere along the periphery of the opening in order to provide for an airtight seal with the container. In this way, the overall package respires from the label. This is possible since the micro-perforations are provided through the adhesive film at a location on the film which is in-line or at least corresponding to a location of the opening once the gas permeable label is positioned onto the container.

[0059] In one embodiment, the adhesive film of the label is such that in step **46**, a slight pressure is applied on the label to affix it to the container.

[0060] The micro-perforations allow for the label to controllably transfer one or more gaseous substances into and out of the container in order to maintain a given gaseous environment inside the container, as provided from the respiration rate of the produce.

[0061] In an example, the label has an adhesive layer for allowing the label to be adhered along a periphery of the opening.

[0062] FIG. **4** is a photograph of the package **10** of FIG. **1**, with the label **18** being printed with package information such as: a description of the produce **16** inside the container **12**; a purchasing price; a vendor's name; a bar code associated to the package; and the like.

[0063] In this example, the produce **16** comprises a mix of cut and washed vegetables including carrots and baby tomatoes. Any other produce can however be packaged, such as any vegetable, fruit, meat, fish, nuts, baked goods, and the like.

[0064] The gas permeable, micro-perforated label **18** as per the above description is positioned over the opening **14**, which is here circular and formed on a top surface of the container **12**. In one embodiment, the size of the opening **14** is such as to create an opening area between about 150 mm^2 and 600 mm^2. In another embodiment, the size of the opening **14** has an opening area between about 600 mm^2 and 1000 mm^2. The size of the opening **14** is however adjustable and dependent on the container's shape and size, as well as the quantity and/or type of produce **16** therein.

[0065] In one embodiment, the label **18** is affixed from an interior side of the container **12**. For example, the container **12** in the picture of FIG. **4** has a lid **50** onto which is located the opening **14**. The label **18** is affixed from the interior side of the lid **50** using adhesive located between the label and the periphery of the opening **14**. In this way, the container is loadable with produce after the installation of the label thereto, but prior to the closing of the lid **50**.

[0066] Although shown as a rigid clam shell tray container with the foldable lid **50**, the container **12** can be any type of container such as a bag made of plastic-type material or a differently shaped container such as a bottle, a box, or any other hollow interior recipient for storing produce, not necessarily re-closable or re-sealable.

[0067] While preferred embodiments have been described above and illustrated in the accompanying drawings, it will be evident to those skilled in the art that modifications may be made therein without departing from the scope of this disclosure. Such modifications are considered as possible variants comprised in the scope of the disclosure.

1. A label for installation over an opening of a container to be loaded with produce, the label comprising:
- a thin layer of material; and
- micro-perforations through the thin layer of material, whereby upon the label being sealingly installed over the opening of the container, the micro-perforations controllably transfer a gaseous substance into or out of the container, through the label, and according to a respiration rate of the produce to be loaded in the container.

2. The label of claim **1**, wherein the thin layer of material comprises at least one of a polymer-based film, a layer of translucent plastic, a layer of paper-based material a cellulose-based film, and a corn-based film.

3. The label of claim **1**, comprising printing on at least a portion of the thin layer of material, the print layer for providing labeling information.

4. The label of claim **1**, comprising a layer of adhesive over at least a portion of the thin layer of material.

5. The label of claim **1**, comprising an additive in any one of the layers of the label.

6. The label of claim **1**, wherein the label has a thickness from about 25 to about 175 microns.

7. The label of claim **1**, wherein the micro-perforations have a diameter from about 30 to about 150 microns.

8. The label of claim **6**, wherein the diameter is from about 30 to about 90 microns.

9. The label of claim **6**, wherein the diameter is from about 30 to about 60 microns.

10. The label of claim **1**, wherein the micro-perforations are uniformly distributed over a middle-portion area of the label.

11. The label of claim **10**, wherein the additive comprises at least one of: an ethylene absorption agent for slowing a ripening rate of the produce to be stored in the container; and an anti-fog agent for improving a translucence of the container once labelled.

12. A gas permeable package comprising:
- a container for holding produce, the container defining an opening to an interior space of the container;
- a label sealingly affixed to the container to cover the opening; the label comprising a thin layer of material; and micro-perforations practiced therethrough for controllably transferring a gaseous substance into or out of the container, through the label, and according to a respiration rate of the produce to be loaded in the container.

13. The gas permeable package of claim **12**, wherein the thin layer of material comprises at least one of a polymer-based film, a layer of translucent plastic, a layer of paper-based material a cellulose-based film, and a corn-based film.

14. The gas permeable package of claim **12**, wherein the container comprises a lid and the opening is defined in the lid.

15. The gas permeable package of claim **12**, further comprising an adhesive for affixing the label to the container.

16. The gas permeable package of claim **15**, wherein the label comprises the adhesive.

17. The gas permeable package of claim **16**, comprising an additive in any one of the layers of the label.

18. The gas permeable package of claim **12**, wherein the label is printed portion on at least a portion of the thin layer of material, to provide labeling information.

19. The gas permeable package of claim **12**, wherein the label has a thickness from about 25 to about 175 microns.

20. The gas permeable package of claim **12**, wherein the micro-perforations have a diameter from about 30 to about 60 microns.

21. The gas permeable package of claim **12**, wherein the micro-perforations are uniformly distributed over a middle-portion area of the label.

22. The gas permeable package of claim **12**, wherein the container comprises at least one of a bag, a box, and a closeable bowl-like container.

23. A method for labeling a container loaded with produce, the method comprising:

forming an opening within a container to be loaded with produce;

loading the produce into the container, the produce having a given respiration rate;

sealingly installing a label to the container, the label comprising: micro-perforations positioned over the opening once the label adhered to the container, the micro-perforations for controllably transferring a gaseous substance into and out of the container according to the respiration rate of the produce therein.

* * * * *