US 20110083810A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2011/0083810 A1

(43) Pub. Date: Apr. 14, 2011

Lin et al.

(54) **CONTAINER SEALING MACHINE FOR FOOD PACKAGING**

(76) Inventors: **David Lin**, Shanhua (TW); **Irene H. Lin**, Shanhua (TW)

(21) Appl. No.: **12/577,809**

(22) Filed: **Oct. 13, 2009**

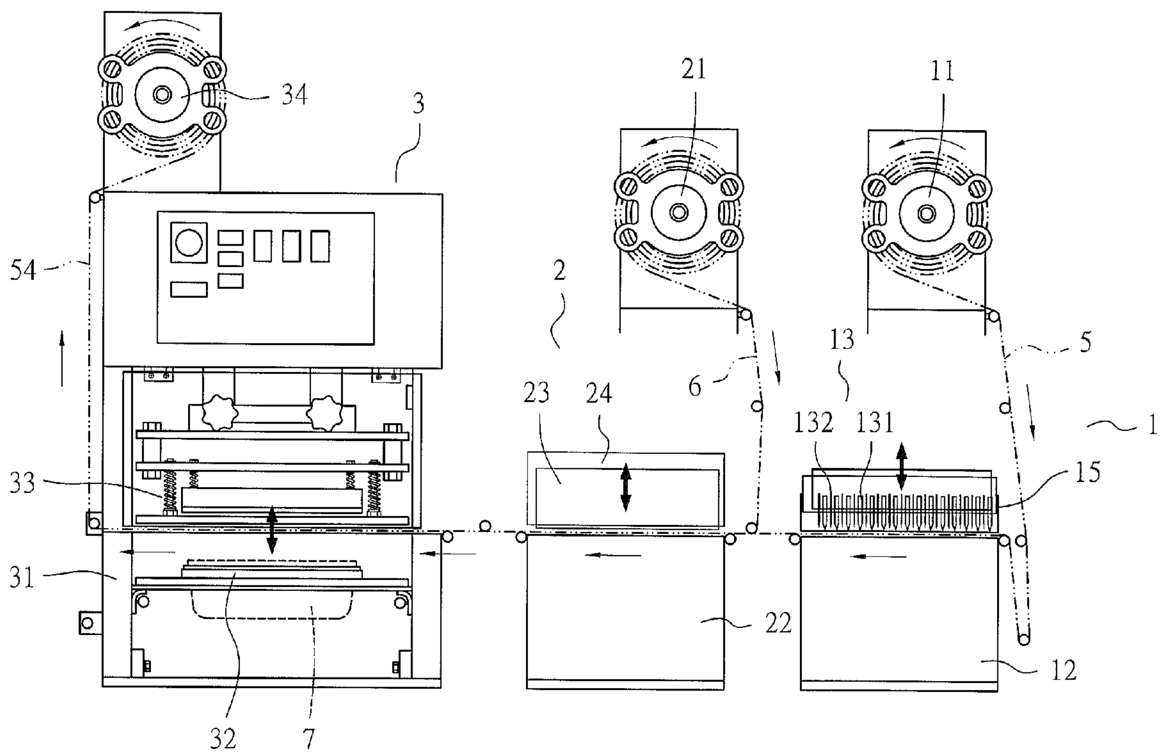
Publication Classification

(51) **Int. Cl.**
B65B 51/10 (2006.01)

(52) **U.S. Cl.** **156/497**

(57) **ABSTRACT**

A sealing machine for a fresh-keeping and cooking container is provided. The sealing machine includes a lidding-film processing unit, a bonding unit, and a heat-sealing unit. The lidding-film processing unit includes die cutters and hot needles for forming line-segment-shaped, spaced slits and dot-shaped atmosphere-modifying breathing holes on a surface of a lidding film passing through the lidding-film processing unit. The processed lidding film then enters the bonding unit and is bonded with an airtight sealing strip whose bottom is provided with adhesive. Afterward, the lidding film bonded with the sealing strip enters the heat-sealing unit so as to cover an opening of a container and be heat-sealed to a heat-sealable rim of the opening. Thus, the lidding film is processed and sealed to the container in a continuous manner to simplify sealing of the container and removal of scraps cut from the used lidding film.



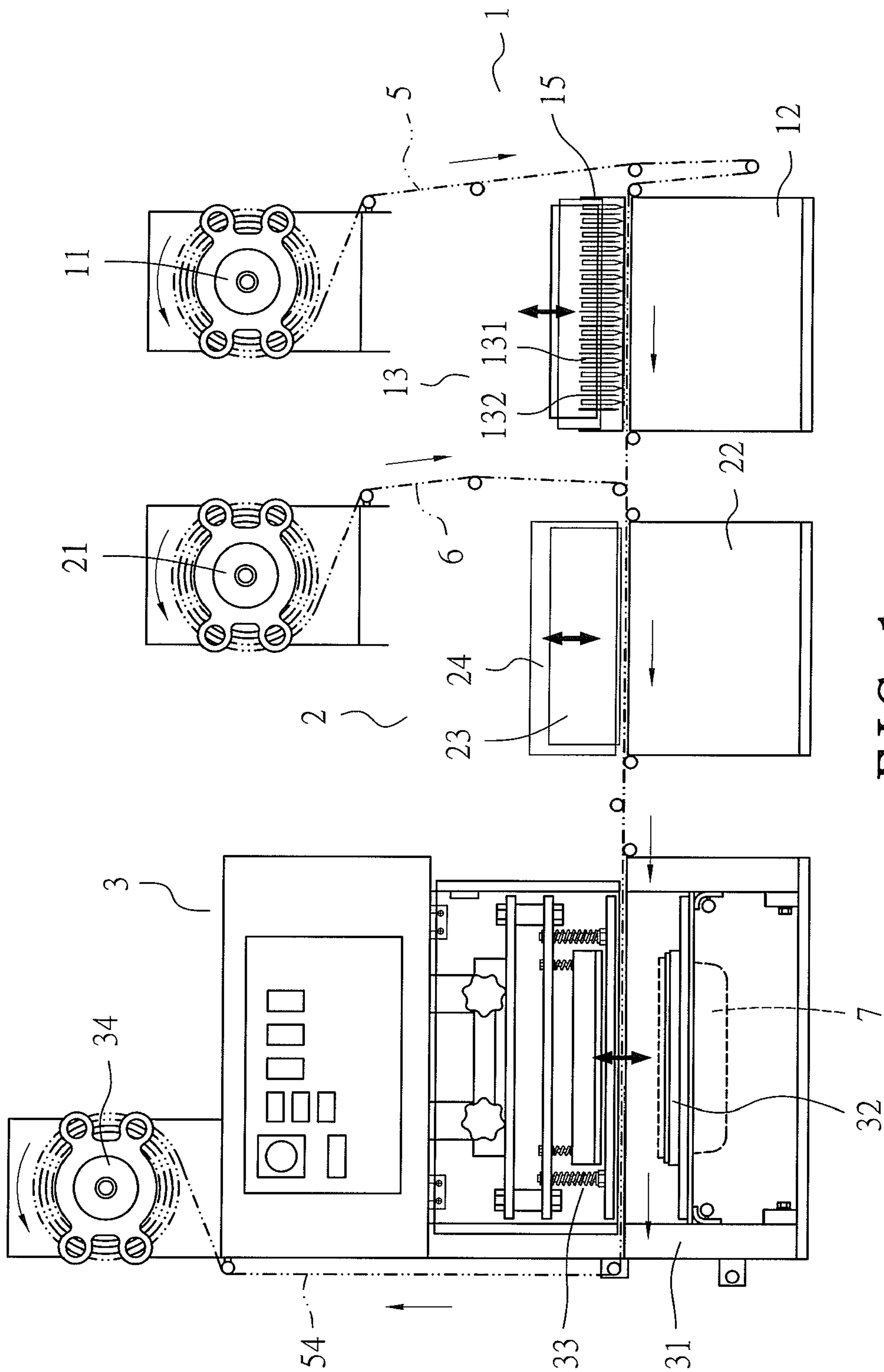


FIG. 1

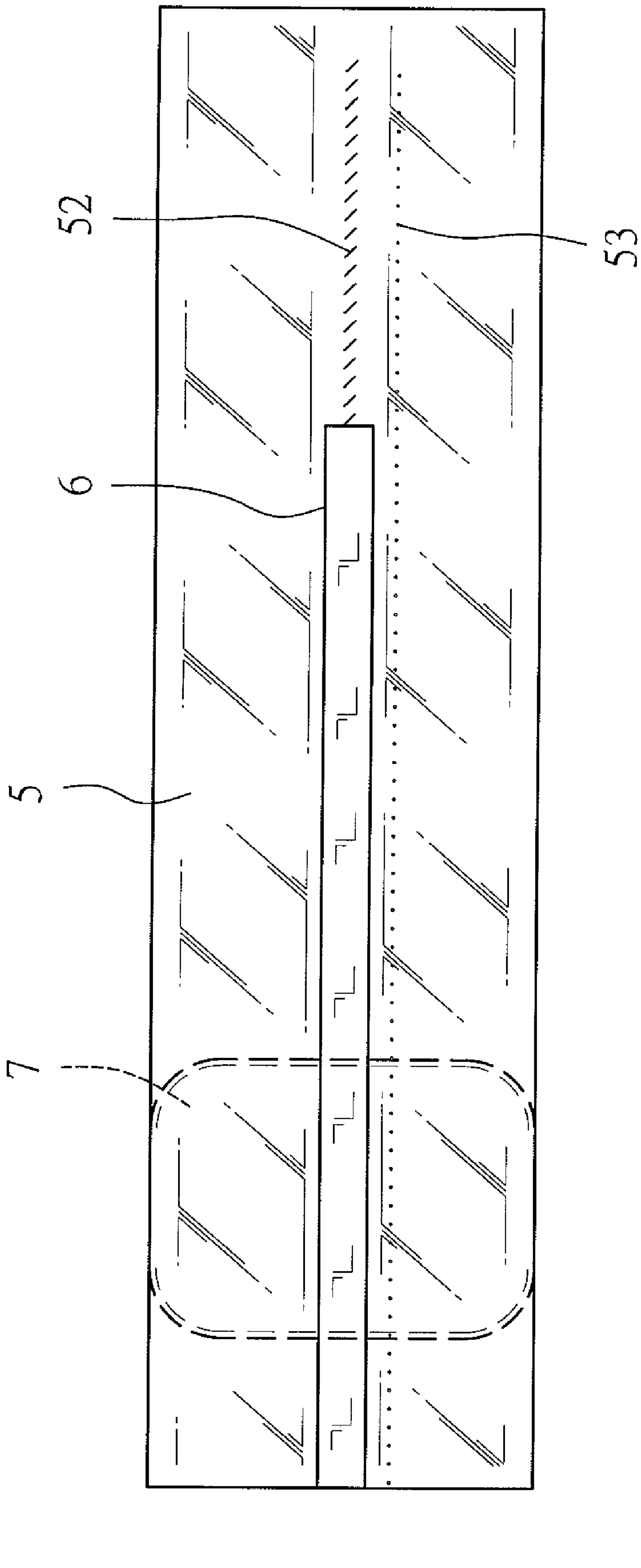


FIG. 2

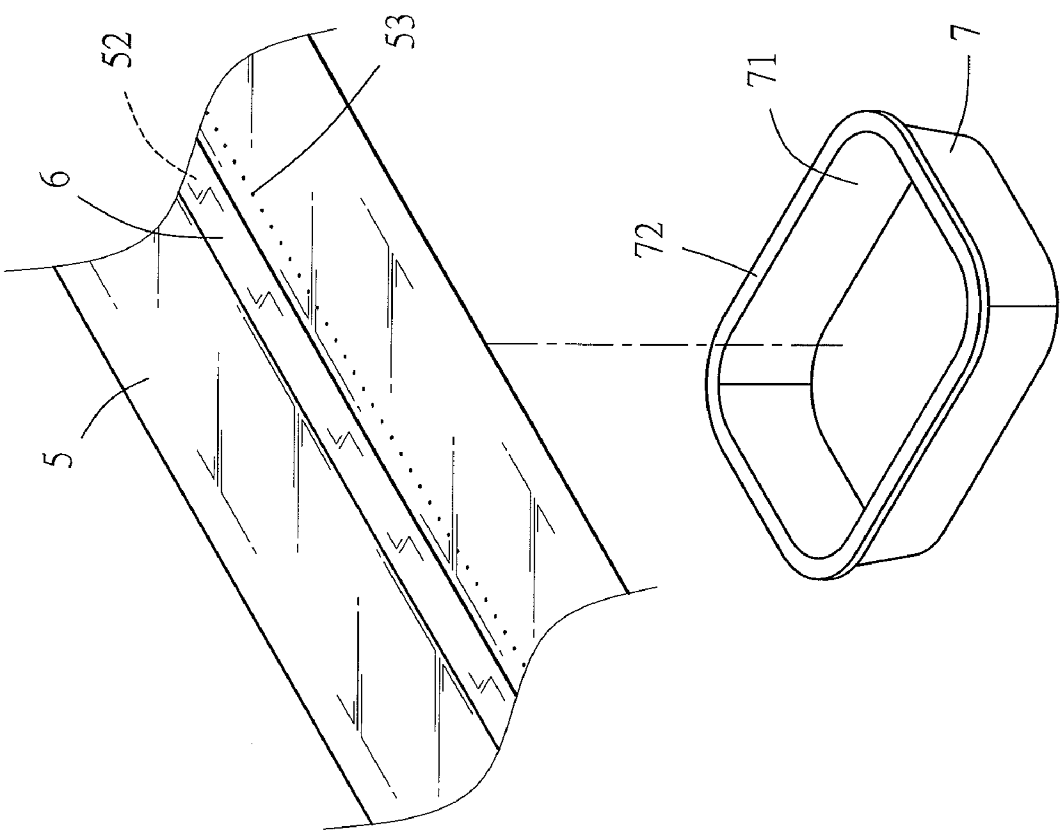


FIG. 3

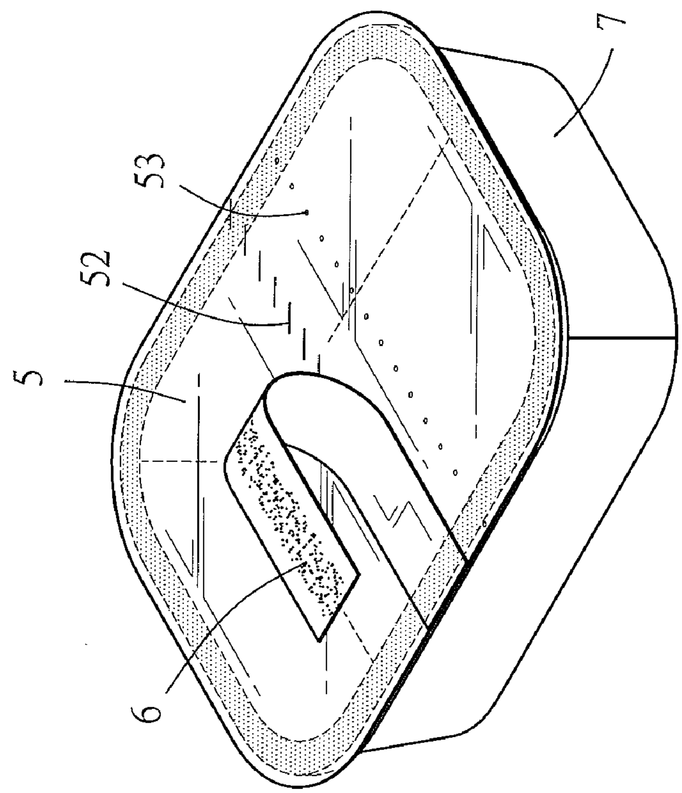


FIG. 5

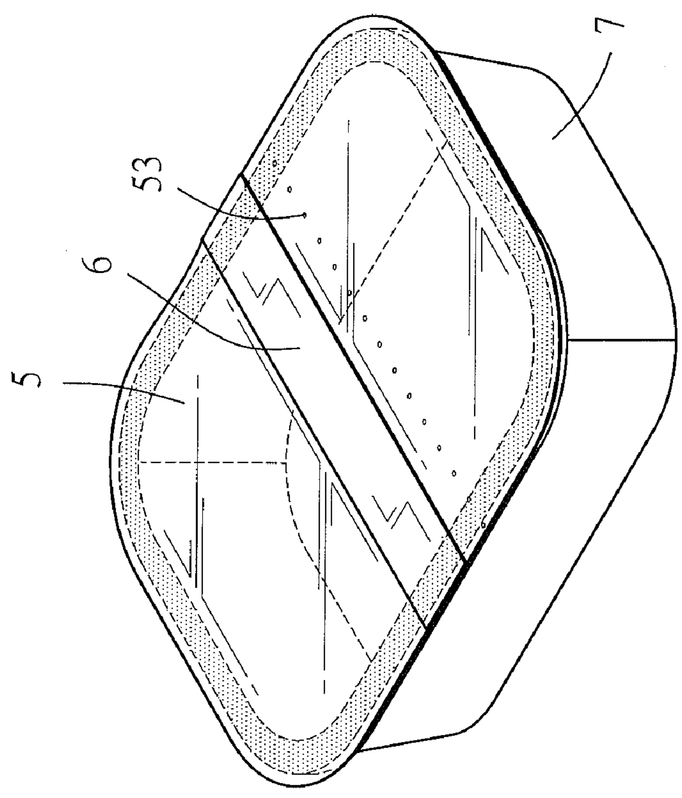


FIG. 4

CONTAINER SEALING MACHINE FOR FOOD PACKAGING

BACKGROUND OF THE INVENTION

[0001] 1. Technical Field

[0002] The present invention relates to a sealing machine for sealing a food container and enabling the sealed container to preserve the freshness of food contained therein in a modified atmosphere and to automatically regulate the build up steam pressure generated during microwave heating. More particularly, the present invention relates to a sealing machine which provides a continuous process of processing a lidding film, filling frozen or refrigerated food into a container, and then sealing opening of the container with the processed lidding film.

[0003] 2. Description of Related Art

[0004] A conventional sealing machine for sealing frozen or refrigerated food is typically configured to work in the following manner. A roll of pre-fabricated lidding film is provided from a roll stock film unwinding set of the sealing machine. Meanwhile, a container filled with food to be frozen or refrigerated is in place at a sealing position of the sealing machine. When the sealing machine is started, the lidding film is unwound and extended downward from the roll of lidding film at the end of the sealing machine so as to pass over the container. The lidding film covering the container is hot-pressed and thus sealed to an opening of the container by a sealing mechanism. After the sealing process, scraps die cut from the edge of lidding film are wound up to a rewinding spool located at an opposite end of the sealing machine. Thus, the opening of the container containing the to-be-frozen or to-be-refrigerated food is sealed.

[0005] In the early days, a commonly used technique to preserve the freshness and quality of fruits and vegetables is to lower the temperature of the Storage environment. In a low-temperature environment, living fruits and vegetables have a reduced metabolic rate, and in consequence the oxidation and consumption of organic sugar, starch, and fat in the fruits and vegetables slow down, which delays the ripening and yellowing of the fruits and vegetables. In addition, it was found decades ago that the metabolic rate of fresh fruits and vegetables can also be decreased, and their shelf life increased, by adjusting oxygen and carbon dioxide concentrations in the packaging area surrounding the fruits and vegetables. In fact, the modified-atmosphere packaging (MAP) technique is an application based on and integrated with the refrigeration technique so as to enhance the effect of freshness prolongation on fruits and vegetables by both refrigeration and atmosphere modification. During the past few decades, studies on freshness preservation, storage, and transportation in a modified atmosphere packaging have thrived. Since different fruits and vegetables have different structure characteristic, the outer surface area of a leafy vegetable that is in contact with air and available for breathing differs from that of a fresh vegetables with a stem or root tuber. A leafy vegetable also has a different metabolic respiration rate from a stem or root tuber. Likewise, total oxygen demand and carbon dioxide emission vary from one species to another. Generally speaking, leafy vegetables have relatively large surface areas, require a relatively larger amount of air for metabolic respiration, and consequently ripen and yellow relatively faster. In order to slow down metabolic respiration, the modified-atmosphere packaging technique requires that storage temperature and oxygen concentration be low, and carbon dioxide concentration be high. By contrast, a fresh vegetable with stem or root tubers, which breathe only through their outer skin, have lower oxygen demand, are less sensitive to the change of oxygen concentration in the environment, and therefore have higher tolerance to variations in temperature and oxygen and carbon dioxide concentrations during storage and transportation. The atmospheric environment contains approximately 20.9% of oxygen and 0.03% of carbon dioxide. If fresh fruits and vegetables are stored in an environment whose temperature is adjusted to a refrigeration temperature of 0° C. to 5° C., whose oxygen concentration is lowered to 2% to 15%, and whose carbon dioxide concentration is raised to 5% to 30%, the shelf life of the fruits and vegetables can be extended significantly from three days to more than ten days, which is helpful to long-term storage and long-distance transportation and distribution of fruits and vegetables in continental countries. For produce grower in areas of capricious weather conditions and having high requirements for freshness and quality, the development of packaging materials for use in modified-atmosphere packaging application is important. Hence, many countries have put great efforts into the research and development of special packaging materials for fruits and vegetables. Presently, freshness preservation techniques for fruits and vegetables can be divided into two major categories, namely controlled-atmosphere packaging (CAP) and modified-atmosphere packaging (MAP). In controlled-atmosphere packaging, the various gas concentrations in a packaged atmosphere are under an active controllable method. More specifically, oxygen and carbon dioxide concentrations in the packaged atmosphere are regulated and kept constant by means of detection equipment and external supply of oxygen and carbon dioxide. Therefore, fruits and vegetables stored in such a packaged atmosphere have their respiration and metabolic rates lowered in exchange for extended shelf life and high quality. However, the control system, including hardware and software, for controlled-atmosphere packaging is costly. On the other hand, modified-atmosphere packaging is carried out by packaging fresh fruits and vegetables with a special air-permeable packaging material such that, due to metabolism and respiration of the fruits and vegetables under a specific storage temperature, coupled with the special gas permeability of the packaging material, oxygen and carbon dioxide concentrations in the packaged atmosphere gradually reach a dynamic equilibrium state and thus meet the required fresh-keeping conditions. The cost of modified-atmosphere packaging is lower than that of controlled-atmosphere packaging.

[0006] While the shelf life of fresh fruits and vegetables can be extended by applying the hardware, software, and packaging materials of the aforesaid two packaging techniques, neither of these packaging techniques provides the dual function of the packaging material disclosed in the present invention, namely atmosphere modification for freshness preservation and automatic regulating the build up hot steam pressure when the packaged fruits and vegetables are directly heated by microwave. Generally, a packaging material for preserving the freshness of fruits and vegetables in a modified atmosphere has an oxygen permeability ranging approximately from 20 to 200000 cc/(day·m^2·atm·25° C.). However, the overall air-regulating capacity of such a packaging material for modified-atmosphere freshness preservation is not enough to regulate the huge instantaneous amount of build up hot steam generated when the packaged fruits and vegetables are heated by microwave especially at the onset of boiling temperature; the packaging material will burst and break when subjected to such vast vapor. Polyethylene or polypropylene bags with a thinner gauge made by their blown films are common packaging materials for fruits and vegetables and have fresh-keeping and air-permeable properties. These bags, though capable of modified-atmosphere freshness preservation, are not suitable for use as closed packages microwave heating because the bags cannot regulate and withstand the vast amount of build up hot steam pressure generated instantly upon microwave heating.

[0007] Fresh fruits and vegetables sealed in a closed container for storage and transportation are basically living plants. When oxygen in the container is continuous depletion, and carbon dioxide concentration becomes too high, the fruits and vegetables sealed in the container begin to rot, yellow, and produce unpleasant odor. In order to prevent fruits and vegetables from rotting due to lack of oxygen, the container is usually perforated by die cutting so as to enable rapid exchange of oxygen between the interior of the container and ambient atmosphere, thus allowing the living fruits and vegetables to survive. When massive gas exchange takes place, however, oxygen and carbon dioxide concentrations inside and outside the container become virtually equal, namely 20.9% of oxygen and 0.03% of carbon dioxide. Now that the fruits and vegetables are stored substantially in an atmospheric environment and are allowed to restore their normal respiration and metabolic rates, the container has lost the ability to significantly extend the shelf life of its content.

[0008] Nowadays, modified-atmosphere freshness preservation of fruits and vegetables is mostly implemented via an air-permeable mixed polymer material. The material is formed into an air-permeable film by co-extrusion, film blowing, or a T-die stretching technique. In addition to complexity of the manufacturing process, the resultant film is also disadvantaged by the fact that its oxygen permeability and carbon dioxide permeability are not applicable to the modified-atmosphere preservation of all fruits and vegetables. More importantly, the resultant air-permeable film cannot be used to regulate the large amount of high-temperature, high-pressure vapor generated in a closed microwave-heated environment. There are many breathable packaging materials on the market that have special air-permeability for the preservation of fruits and vegetables but are not suitable for use in a closed microwave-heated environment. A few examples of these commercially available air permeable packaging materials and their manufacturing technologies are described as follows.

[0009] 1. A plastic material is blended and thoroughly mixed with an inorganic powder. The blended mixture goes through a blowing or T-die extrusion process and is stretched by a mono or two directional stretching tenter so as to form an air-permeable film. For instance, an inorganic powder of calcium carbonate ($CaCO_3$), titanium dioxide (TiO_2), or aluminum oxide (Al_2O_3) is evenly mixed with an organic polymer material such as polyethylene, prior to being extruded into a film. Similar techniques are disclosed in U.S. Pat. Nos. 3,679,540; 4,187,390; 4,350,655; 4,466,931; 4,777,073; and 5,340,646. While the resultant film has special air-permeability and meets the requirements for modified-atmosphere packaging, it generally does not qualify for use in a closed package that is to be directly heated by microwave, for the following reasons: 1) The film has not enough mechanical strength. 2) The film has a low melting point. The material commonly used for making the film is polyethylene or polypropylene, both of which have low melting points. When mixed with a higher percentage of inorganic powder, the elongation ratio of this higher weight percentage of blended inorganic powder is limited. In practice, with a higher solid content, the stretched film tends to break during the stretching process, and the inorganic powder may fall off easily. 3) The formula of the film often includes additives such as a lubricant. The added lubricant or the aforesaid inorganic powder may migrate to or contact with food during microwave cooking and cause an undesirable effect on the human body. Furthermore, the lubricant additive, such as wax, may produce unpleasant odor during microwave heating. In short, the low mechanical strength and low melting point prevent the film from being used in a closed package that is directly heated by microwave. Besides, due to not enough steam pressure regulating ability, the film tends to extend excessively or even rupture when subjected to continuous heating and huge instantaneous build up steam pressure.

[0010] 2. A plastic resin material is blended with an additive having a low molecular weight, such as mineral oil. After the film is formed, the mineral oil is extracted by a special solvent. More specifically, the plastic material is evenly mixed with the mineral oil. Then, the mixture is converted into a film via a T-die or through a film casting process. Furthermore, the mineral oil is extracted and thus removed by the solvent, so as to produce an air-permeable film. The principle of the foregoing manufacturing process is to make a film having a porous structure out of a mixture of incompatible materials and then remove a certain ingredient by solvent extraction. Similar techniques are disclosed in U.S. Pat. Nos. 3,378,507; 3,310,505; 3,607,793; 3,812,224; 4,247,498; 4,466,931; and 5,928,582. While a film thus formed has special air-permeability and meets the requirements for modified-atmosphere packaging, it is generally incapable of regulating the large amount of high temperature, hot steam pressure generated in a closed microwave-heated package and may rupture as a result. Moreover, considerations must be made for the risk of having residual mineral oil in contact with food, as well as for the excessive extension and burst of the film under continuous high temperature.

[0011] 3. Another air-permeable material, as taught by U.S. Pat. No. 5,865,926, is made of an air-permeable non-woven fabric or fibrous web. However, an air-permeable film produced by such a method has a macroporous structure and is unsatisfactory in terms of food packaging, taste, flavor preservation, and efficient use of energy.

[0012] The packaging materials described above are capable of modified-atmosphere freshness preservation but incapable of automatically regulating the build up hot steam pressure generated during microwave heating. To prevent the packaging materials from bursting fracture due to the instantaneous huge build up hot steam and pressure during microwave heating or other cooking means, it is common practice to form pressure-releasing macro holes in the packaging materials or trays by laser microperforation or machine die cutting. Air-permeable packaging materials with macro holes, whose diameters are often greater than 1 mm, can not be used in a closed microwave-heated environment but, owing to their high air-permeability, turn out to be high-permeable packaging materials, which may lead to dehydration of the packaged food. In practice, these macro-hole packaging materials fail to prolong the shelf life of fresh fruits and vegetables. In addition, a packaging material for fruits and vegetables that is perforated by die cutting tends to have a air-permeability so high that not only are the various gas concentrations around the packaged fruits and vegetables substantially the same as those in the ambient atmosphere, but also small insects and fungi are allowed easy access through the holes. Furthermore, in case of overtime microwave cooking, the macro holes may cause the food to lose excessive moisture during the heating process and end up dry and hard.

[0013] Although the foregoing air-permeable packaging materials and their manufacturing methods are well known in the art, those packaging materials do not serve the dual function of modified-atmosphere freshness preservation and proper pressure regulation in a closed microwave-heated environment. More importantly, those packaging materials have a relative high production costs.

BRIEF SUMMARY OF THE INVENTION

[0014] The inventor of the present invention has endeavored to improve microwavable food-packaging materials and their production processes. The present invention relates to the integration of a sealing machine and a container for storing frozen or refrigerated fresh or cooked food, thereby enabling the container to preserve the freshness of its content and be directly heated by microwave. The subject matter of the present invention has never been disclosed in the above-cited prior art.

[0015] The present invention provides a novel design of a sealing machine configured for sealing a container which contains food to be frozen or refrigerated. According to the present invention, a lidding film for covering an opening of a container is processed and then sealed to the container in a continuous fashion so as to simplify sealing of the container and removal of scraps cut from the used lidding film. Heat-sealing the lidding film to a loaded food container may have the following functional appeals: 1) Frozen or refrigerated food can be completely sealed to prevent ice burn which may otherwise result from prolonged frozen storage. Besides, the food can be directly heated by microwave oven in the frozen state and serve when cooked. 2) Fresh fruits and vegetables can be refrigerated and kept fresh in a modified atmosphere packaging for storage and transportation. The fruits and vegetables can also be directly heated by microwave oven and serve when cooked. 3) Fresh fruits and vegetables, such as fresh-cut produce which has been washed, packaged, and vacuum pre-cooled, can stay fresh under refrigeration and be eaten directly. There is no need to open the lidding or to cut a hole to the lidding prior to microwave heating to prevent the bursting fracture.

[0016] The present invention provides a sealing machine for rendering a food container capable of modified-atmosphere freshness preservation as well as automatic build up vast hot steam pressure regulation during microwave heating. The sealing machine includes hot needles configured for quantitatively controlling the diameter and number of melted holes formed in a lidding film sealed to the container. Consequently, the air-permeable composite lidding film has a specific gas permeation capacity and is applicable to fresh fruits and vegetables of different kinds and different weights for extending their shelf life of freshness.

[0017] On the other hand, the lidding film is formed with line-segment-shaped, spaced slits and provided with an airtight sealing strip such that the container is completely air tight during storage and transportation but can rapidly regulate the large amount of high-temperature, high-pressure hot steam generated instantly during microwave cooking, thereby preventing the container from bursting. The amount of vapor that the line-segment-shaped, spaced slits are capable of regulating is far greater than the small gas permeation amount required for preserving the freshness of fruits and vegetables in a modified atmosphere. If the content of the container is frozen cooked food, the hot needles of the sealing machine can be restrained from operation; alternatively, the melted holes formed by the hot needles are located in an area covered with the airtight sealing strip. Thus, a totally air tight food package is formed, with the airtight sealing strip covering the line-segment-shaped, spaced slits, so as to prevent ice burn which may otherwise occur after a long-term frozen storage period. This air tight structure is also suitable for low vacuum packaging or inert gas purging packaging. When food packaged in a container of this structure is heated by microwave, the huge amount of hot steam generated instantaneously is regulated by the plurality of line-segment-shaped, spaced slits, thereby protecting the container from bursting. Meanwhile, water and other liquids in the food are largely preserved during microwave heating and prevented from splashing in the microwave oven, thus reducing the time and water resource required for cleaning the microwave oven.

[0018] More importantly, this packaging material provides a reversible and automatic air permeation and pressure regulation function. Before microwave heating, the packaging material has a closed structure. During heating, the packaging material automatically regulates steam pressure so as for food in the container to undergo a continuously pressurized heating process while the container and the packaging material are protected from bursting. When cooled after microwave heating is stopped, the packaging material substantially resumes its closed structure. This pressure- and temperature-dependent reversible structure is reusable and reheatable, which is a far cry from the conventional food-packaging materials which must be pulled or cut open to the packaging material before microwave heating.

[0019] The inventor of the present invention has also granted several patents for the core techniques of microwavable food-packaging film materials. The disclosed packaging film can be further integrated and benefit the present invention. These patents include Japanese Patent No. 3747004; U.S. Pat. Nos. 7,077,923 and 7,208,215; Korean Patent No. 0536896; Canadian Patent No. 2381146; and Australian Patent No. 780966. The present invention further integrates the mechanical hardware of a sealing machine with a lidding film so as for food packager to provide a more flexible packaging option which selectively combines microwaveable and the ability to preserve freshness according to product needs.

[0020] As mentioned above, the present invention provides a sealing machine for rendering a food container capable of modified-atmosphere freshness preservation as well as automatic pressure regulation to the build up vast hot steam during microwave heating. A container that can be as it is heat-sealed by the sealing machine is made of a material selected from plastic, wood, paper, synthetic paper, and ceramic, or a combination thereof. Each of the lidding film and the sealing strip includes at least one layer of stretched film and is made of a material selected from the group consisting of polyolefin, polyester, polypropylene (PP), polyethylene (PE), polystyrene (PS), polyvinyl chloride (PVC), polycarbonate (PC), polyamide, nylon, polyethylene terephthalate (PET), polyvinyl alcohol (PVA), ethylene-vinyl acetate (EVA), ethylene vinyl alcohol (EVOH), polyvinyl dichloride (PVDC), ethylene-styrene copolymer (ES), wax paper, synthetic paper, glassine paper, polymer-coated paper, paper, and a combination thereof.

[0021] The primary objective of the present invention is to provide a sealing machine for sealing an opening of a container containing frozen or refrigerated food. The sealing machine includes a lidding-film processing unit, a bonding unit for bonding an airtight sealing strip to a lidding film, and a heat-sealing unit for covering the opening of the container with the lidding film. In the lidding-film processing unit, the lidding film is unwound and extended downward from a roll stock of the lidding film so as to pass over a table. Die cutters and hot needles provided at the table move back and forth vertically to form line-segment-shaped, spaced slits and dot-shaped atmosphere-modifying breathing holes at predetermined positions on a surface of the lidding film. The processed lidding film proceeds to the bonding unit, in which a roll of airtight sealing strip located above a table is unwound, extended downward, and laid over the lidding film passing through the bonding unit. Thus, the line-segment-shaped, spaced slits formed on the lidding film are covered by the airtight sealing strip. Then, the airtight sealing strip, whose bottom is provided with adhesive, is bonded to the lidding film by means of a hot-press sealing assembly installed at the table of the bonding unit. Afterward, the lidding film boned with the airtight sealing strip enters the sealing unit configured for sealing an opening of a container. In the sealing unit, a container containing frozen or refrigerated food is in place in a supporting frame of a table. The lidding film passes over the supporting frame and thus covers the container. A heat-sealing assembly provided at the table of the heat-sealing unit seals the lidding film covering the container to a heat-sealable flange along the rim of the opening of the container. Scraps of the used lidding film are cut adjacent to the rim of the opening of the container and wound up around a rewinding spool. Thus, the lidding film which is now covering the container has been processed and sealed to the container in a continuous manner to effectively simplify sealing of the container and removal of the scraps cut from the used lidding film.

[0022] According to the present invention, the dot-shaped atmosphere-modifying breathing holes formed by being melted through by the hot needles may vary in size, depending on the diameter and vertical insertion depth of the slender and pointed hot alloy needles which are resistant to high temperature and each have a round sectional shape. When cooled, the melted breathing holes have fixed shapes and will not close. Thus, the breathing holes form an open structure having a slight but quantifiable air-permeation capacity. To achieve a desired air-permeation capacity, the number and size of the breathing holes are determined by the kinds and total weight of fresh fruits and vegetables to be packaged in the container, as well as by the temperature and duration of storage and transportation. The diameter and air-permeation capacity of the breathing holes are quantitatively tested by a digital optical microscope and an air permeation testing machine, respectively. The diameter of the melted dot-shaped breathing holes ranges from 0.1 mm to 1.5 mm.

[0023] If the hot needles in the sealing machine of the present invention are not actuated, the resultant sealed food container is completely closed. The original oxygen-containing air in the container can be replaced by a gas mixture including a preset percentage of inert gas such as nitrogen and carbon dioxide. Alternatively, the completely air tight food container is processed by vacuum packaging or other food packaging techniques. Nevertheless, during microwave cooking, build up high-temperature, high-pressure hot steam generated from within the packaged food can be regulated via the line-segment-shaped, spaced slits on the lidding film so as to prevent the container and the lidding film from bursting.

[0024] For operational safety, the sealing machine of the present invention is additionally provided with a protection shield outside and around the die cutters and hot needles of the lidding-film processing unit, thereby preventing an operator from being injured during operation. Another safety feature of the sealing machine of the present invention is a protection shield outside and around the hot-press sealing assembly of the bonding unit such that the operator's hands are protected from being squeezed.

[0025] Presented below is an example of applying the present invention to fresh-cut produce or, more specifically, to Babylon which was freshly picked, washed, cut, centrifugally dried, and vacuum pre-cooled. The 342 gm Babylon was placed in microwavable polypropylene (PP) trays each having dimensions of 140 mm×200 mm×50 mm (W×L×H). A laminated PET/PP lidding film, 220 mm in width, was unwound from a spool and processed by the die cutters and the hot needles so as to have a row of equally spaced slits shaped as 7-mm line segments and a row of dot-shaped atmosphere-modifying breathing holes, wherein the two rows are parallel to each other and offset by 3 cm. The lidding film has eight 7-mm line-segment-shaped, spaced slits and ten dot-shaped atmosphere-modifying breathing holes in an area above each fresh-cut produce loaded tray, wherein each melted breathing hole has a diameter of 0.15 mm. The row of line-segment-shaped, equally spaced slits was then covered by and bonded within a 20-mm wide, airtight sealing strip. Finally, the lidding film bonded with the airtight sealing strip was sealed, by the heat-sealing unit, to a rim of the opening of each fresh-cut produce loaded tray. As a result, only the ten 0.15-mm dot-shaped atmosphere-modifying breathing holes were exposed on the lidding film of each tray to provide modified-atmosphere freshness packaging condition. After being refrigerated at a constant temperature of 5° C. for two weeks, the Babylon did not yellow, was free of mold, and did not produce unpleasant odor. When subsequently cooked in a 1100-watt microwave oven full power for five minutes, the large amount of build up hot pressurized steam generated intray during the heating process was automatically regulated via the eight 7-mm line-segment-shaped, spaced slits under the 20-mm wide, airtight sealing strip such that neither the lidding film nor the tray burst.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0026] The invention as well as a preferred mode of use, further objectives, and advantages thereof will be best understood by referring to the following detailed description of an illustrative embodiment in conjunction with the accompanying drawings, wherein:

[0027] FIG. **1** is a schematic drawing showing the operating procedure of a sealing machine according to the present invention;

[0028] FIG. **2** is a top view of a lidding film bonded with an airtight sealing strip according to the present invention;

[0029] FIG. **3** is a perspective view of the lidding film and a container yet to be sealed by the lidding film;

[0030] FIG. **4** is perspective view of the container sealed by the lidding film; and

[0031] FIG. 5 is a perspective view showing the airtight sealing strip being peeled off from the lidding film.

DETAILED DESCRIPTION OF THE INVENTION

[0032] The present invention provides a sealing machine for sealing a food container and thus rendering the food container capable of keeping fruits and vegetables fresh in a modified atmosphere and automatically adjusting pressure generated during microwave heating. Referring to FIG. **1** and FIG. **5**, a sealing machine **4** according to the present invention is configured to seal a heat-sealable rim of an opening of a container **7** containing frozen or refrigerated food. The sealing machine **4** includes a lidding-film processing unit **1**, a bonding unit **2** for bonding an airtight sealing strip **6** to a lidding film **5**, and a heat-sealing unit **3** for covering the opening of the container **7** with the lidding film **5**.

[0033] In the lidding-film processing unit **1** shown in FIG. **1**, the lidding film **5** is reeled out and extended downward to a table **12** from a roll of the lidding film **5** that is wound around a spool **11**. A perforating assembly **13** at the table **12** moves back and forth vertically to effectuate cutting. The perforating assembly **13** includes die cutters **131** and hot needles **132** and is operable in different ways according to the food to be packaged. For instance, if the packaged food only requires modified-atmosphere freshness packaging, the hot needles **132** of the perforating assembly **13** are actuated to melt through the lidding film and thus form dot-shaped atmosphere-modifying breathing holes **53** at predetermined positions on a surface of the lidding film **5** while the lidding film **5** passes through the lidding-film processing unit **1**. If the packaged food only requires microwave cooking, the die cutters **131** of the perforating assembly **13** are actuated to form line-segment-shaped spaced slits **52** at predetermined positions on the surface of the lidding film **5** while the lidding film **5** passes through the lidding-film processing unit **1**. If the packaged food needs modified-atmosphere freshness preservation as well as microwave cooking, both the die cutters **131** and the hot needles **132** of the perforating assembly **13** are actuated to form the desired line-segment-shaped, spaced slits **52** and dot-shaped atmosphere-modifying breathing holes **53** at predetermined positions on the surface of the lidding film **5**, as shown in FIG. **2**, while the lidding film **5** passes through the lidding-film processing unit **1**. An additional protection shield **15** is provided outside and covered the perforating assembly **13** of the lidding-film processing unit **1** to prevent an operator's hands from being operational injury by accident.

[0034] As shown in FIG. **1**, the processed lidding film **5** moves on to the bonding unit **2**, in which a roll stock of an airtight sealing strip **6** is reeled out downward from a spool **21** above a table **22** and is laid over the lidding film **5** that passes through the bonding unit **2**. Thus, referring to FIG. **2**, the airtight sealing strip **6** covers the line-segment-shaped, spaced slits **52** formed on the lidding film **5**. The airtight sealing strip **6**, which has a bottom side provided with adhesive layer material, is bonded to the lidding film **5** by a hot-press sealing assembly **23** installed at the table **22**. A protection shield **24** is additionally provided outside and around the hot-press sealing assembly **23** of the bonding unit **2** to protect the operator's limbs from being squeezed and injured.

[0035] Afterward, referring back to FIG. **1**, the lidding film **5** bonded with the airtight sealing strip **6** advances to the heat-sealing unit **3**, which is configured to seal the rim of the opening of the container **7** after the container **7** is filled with food. The container **7** containing frozen or refrigerated food is in place in a supporting frame **32** of a table **31** so as to be covered by the passing lidding film **5**, as shown in FIG. **3**. The lidding film **5** covering the container **7** is then sealed to a heat-sealable rim **72** of an opening **71** of the container **7**, as shown in FIG. **4**, by means of a heat-sealing assembly **33** installed at the table **31**. Scraps **54** outside the new heat-sealed rim **72** of the container **7** are cut from the lidding film **5** and reeled in by a rewinding spool **34** located at an opposite end of the heat-sealing unit **3**, as shown in FIG. **1**.

[0036] Thus, the lidding film **5** shown in FIG. **5** as covering the opening **71** of the container **7** has been die cut, punctured, sealed airtight, heat-sealed to the rim **72** of the container **7**, and rid of the scraps **54** in a continuous manner. In consequence, the sealing of the container **7** and removal of the scraps **54** are effectively simplified.

[0037] While the present invention is described herein by reference to a preferred embodiment, it is understood that the embodiment is not intended to limit the scope of the present invention. A person skilled in the art can make various changes or modifications to the disclosed embodiment without departing from the concept and scope of the present invention. Therefore, the scope of the present invention is defined only by the appended claims.

What is claimed is:

1. A sealing machine for a fresh-keeping and cooking container, the sealing machine comprising a lidding-film processing unit, a bonding unit for bonding an airtight sealing strip to a lidding film, and a heat-sealing unit for covering an opening of the container with the lidding film;

wherein, in the lidding-film processing unit, the lidding film is unwound and extended downward to a table from a roll of the lidding film, and a perforating assembly at the table is actuated to form line-segment-shaped, spaced slits or dot-shaped atmosphere-modifying breathing holes at predetermined positions on a surface of the lidding film passing through the lidding-film processing unit;

wherein, as the processed lidding film enters the bonding unit, the airtight sealing strip is unwound and extended downward from a roll of the airtight sealing strip above a table of the bonding unit and is laid over the lidding film passing through the bonding unit such that the line-segment-shaped, spaced slits formed on the lidding film are covered, the airtight sealing strip, whose bottom is provided with adhesive, being bonded to the lidding film via a hot-press sealing assembly at the table of the bonding unit;

wherein, as the lidding film bonded with the airtight sealing strip enters the heat-sealing unit configured for sealing the opening of the container, the container, which contains frozen or refrigerated food and is placed in a supporting frame of a table of the heat-sealing unit, is covered by the lidding film passing through the heat-sealing unit, and the lidding film covering the container is sealed to a heat-sealable rim of the opening of the container via a heat-sealing assembly at the table of the heat-sealing unit while scraps cut from the used lidding film are wound around a rewinding spool at an opposite end of the heat-sealing unit; and

wherein the lidding film covering the opening of the container is processed and sealed to the container in a continuous manner to effectively simplify sealing of the container and removal of the scraps cut from the used lidding film.

2. The sealing machine of claim **1**, wherein the perforating assembly of the lidding-film processing unit comprises hot needles.

3. The sealing machine of claim **1**, wherein the perforating assembly of the lidding-film processing unit comprises die cutters configured for forming the line-segment-shaped, spaced slits.

4. The sealing machine of claim **1**, wherein the perforating assembly of the lidding-film processing unit comprises hot needles and die cutters configured for forming the line-segment-shaped, spaced slits.

5. The sealing machine of claim **1**, wherein a protection shield is provided outside and around the perforating assembly of the lidding-film processing unit.

6. The sealing machine of claim **1**, wherein a protection shield is provided outside and around the hot-press sealing assembly of the bonding unit of the sealing machine.

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