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[54] **PLASTIC COOKING FILM**

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[51] **Int. Cl.** **B32b 3/30**

[58] **Field of Search** ..... 161/116, 120, 131, 134, 161/DIG. 3; 264/293; 156/209, 219; 206/46 F; 229/87 F; 99/171 H, 171 LP; 426/106, 129

[56] **References Cited**

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[57] **ABSTRACT**

Cooking films and methods for prodcuing same, having the characteristic of eliminating or substantially reducing the incidence of "bumping." Plastic film material suitable for cooking foods at temperatures between 325° F. is surface roughened by methods including embossing, scoring, and the addition of particulate matter to the film.

5 Claims, No Drawings

PLASTIC COOKING FILM

BACKGROUND OF THE INVENTION

The invention pertains to plastic film materials, typically in the form of a flat wrap or bag, used for wrapping meat and like food articles during roasting, baking and like cooking in an oven. More specifically, the invention provides a plastic film material and a method for making same, having means incorporated therein to eliminate or substantially reduce the incidence of violet rupture of the enclosure when the film material is used to enclose meat or other articles during cooking at oven temperatures, typically between 325°F. and 450°F.

Suitable plastic film materials have been utilized to wrap food articles during cooking at oven temperatures in two basic forms. The plastic film can be pre-formed into a bag into which the article is placed before cooking, or the film material can be in the form of a flat wrap in which the food is wrapped prior to cooking.

Various means have been proposed for maintaining the film material closed around the food articles to be cooked. In the case of pre-formed roasting bags, the open end of the bag can be closed by separate tie cords or wires. A particularly advantageous integral means for keeping the bag closed is described in U.S. Pat. application Ser. No. No. 261,231 filed June 9, 1972, entitled "Unitary Cooking Bag." The aforementioned patent application discloses integral strips of metal foil having deadfold characteristics, disposed adjacent the open edge of the bag in various configurations. After insertion of the articles to be cooked, the open end of the pre-formed bag may be twisted or folded to deadfold condition to quickly provide a suitable closure.

Roasting film in the form of a flat wrap can advantageously be formed into an enclosure around the article to be cooked by providing metal foil bands having deadfold properties, of various configurations adjacent opposite edges of the flat material. A particularly advantageous flat roasting wrap is disclosed in pending U.S. Pat. application Ser. No. 71,563 filed Sept. 11, 1970 and now abandoned, and sold in the U.S. by Colgate-Palmolive Company under the trademark REVEAL. Any suitable means can be used to close the roasting bags or flat wraps of the invention to enclose the article to be cooked; the foregoing means merely being descriptive of common and particularly advantageous embodiments.

The cooking enclosures of the invention, whether a preformed bag or flat wrap, must be made from a relatively thin but tough, highly flexible, inert, transparent, heat-resistant film capable of a high degree of heat transmission. As used herein, the term "heat resistant" indicates that the referred-to material does not melt, chemically decompose, physically disintegrate, become soft or sticky to an undesirable degree or become unsuitable for cooking food in any manner at oven cooking temperatures, typically between 325°F. and 450°F., usually about 400°F. Suitable heat-resistant film is formed from thermoplastic polymeric materials such as polyesters and polyamides, e.g., polymers of ethylene glycol and terephthalic acid and nylon. A preferred polyester film is available from E. I. DuPont Company under the trademark MYLAR. This film is advantageously the oriented heat set polyethylene terephthalate film product produced according to U.S. Pat. No. 2,465,319 issued Mar. 11, 1949 to Whinfield et al. This

film may be produced in quite thin, highly flexible but tough sheets. It is transparent and has a melting point about 489°F. The film is resistant to change when exposed to high oven temperatures such as are required for roasting or baking and at the same time has a very high direct transmission factor for heat energy. Thus, the film transmits all the heat necessary for cooking directly to the meat surface while at the same time permitting observation of those surfaces to monitor cooking progress. The film has outstanding resistance to chemical degradation in the presence of water or oils extracted from the meat during the cooking process. For purposes of the invention, the film may have a thickness between 0.25 to 1 mil; a film thickness of 0.45 to 0.55 mil being preferred.

The violent rupture of plastic film enclosures used for cooking foods at oven temperatures is known in the art as "bumping." This phenomenon occurs when a liquid having a substantially lower boiling point than the oven roasting temperature, such as water, is trapped beneath a layer of oil or melted fat from the article being cooked. The lower boiling liquid becomes superheated but cannot boil. Eventually, the superheated liquid bursts through the oil or fat layer with enough force to occasionally burst the enclosure and disperse cooking juices on the oven surfaces. A primary advantage of the present invention is to provide a method for treating heat-resistant plastic film to substantially reduce or entirely eliminate bumping.

The bumping phenomenon has been observed when food articles that produce liquid water and fat when cooked at oven temperatures, are roasted in a plastic film enclosure. Usually, a specific ratio of water to fat has to be present in the bottom of the enclosure before a violet rupture during roasting can occur. If the ratio of oil to water in the bottom of the enclosure during roasting is less than about 1:4 or greater than about 40:1, bumping is unlikely to occur.

SUMMARY OF THE INVENTION

In accordance with the invention, a method for treating a heat-resistant plastic film to entirely eliminate or substantially reduce the incidence of violent rupture when the film is used to roast food articles such as meats, is provided. The new method includes the impartation of surface irregularities to at least the surface of the film that faces the article to be cooked. The surface irregularities can be uniformly or randomly spaced grooves; a pattern of embossments, or a surface roughness provided by any appropriate means including mechanical abrasion, chemical treatment, or ultrasonic or electronic bombardment of the film. Effective surface irregularities can also be imparted to the film by casting the film onto a rough surface having an appropriate density of protrusions (protrusions per square inch) and by extruding or casting a plastic mixture containing suitable particles that ultimately form a rough surface on the finished film. Suitable particles include silica clays, bentonite, and complex magnesium silicates having a particle size from below 1 micron up to about 50 microns. The particles can be present in the to-be formed plastic mixture in an amount from about 0.1 to about 10% by weight, preferably 0.1 to 2% by weight.

To be most effective in reducing the incidence of bumping, the surface irregularities should be as dense as practical without weakening the film or approximating a smooth surface, e.g., a large portion of the surface

irregularities should be individually distinct. A maximum number of projections, preferably from 100 to 1,000 or more per square inch on the side of the film facing the interior of the enclosure and terminating in sharp or slightly rounded peaks which form effective centers for nucleate boiling, should be provided. The projections typically have a height of from about 20 to about 100 mils.

SPECIFIC EMBODIMENTS

The following examples more particularly illustrate preferred and specific embodiments of the invention:

EXAMPLE I

A sheet of polyester film 18 inches wide, 24 inches long, and 0.70 mil thick is scored with a regular pattern of parallel and transverse lines spaced about 1/16 inch apart by running the film over the edge of a serrated metal bar. The resulting film has a pattern of 1/16 inch squares defined by the score lines. This film can substantially reduce the potential bumping effect when used to wrap foods, particularly meats, prior to oven roasting.

EXAMPLE II

A sheet of nylon film 18 inches wide, 24 inches long, and 0.8 mil thick and available from I. E. DePont Company under the trade designation Nylon 66 is heated to 400°F. and passed through a pair of embossing rolls under a pressure of about 200 pounds per inch of nip. The embossing rollers have a series of projections and recesses resulting in a pattern of about 800 raised projections per square inch, each projection having a slightly rounded peak and a height of about 50 mils.

EXAMPLE III

Example II is repeated using a Mylar polyester film. The film is heated to 450°F. before passing through the embossing rollers.

EXAMPLE IV

A length of Mylar polyester film 18 inches wide and 1 mil thick is subjected to the action of a gaseous atmosphere consisting of a mixture of ozone and oxygen (3.34% ozone) in the presence of ultraviolet light having wave lengths within the range of 2,500 and 3,200 A for about 1 minute according to the procedure described in U.S. Pat. No. 2,876,187.

The treated polyester film is then passed through embossing rollers of Example II after being heated to 375°F., resulting in a pattern of embossments on the film surface having a density of 800 embossments per square inch and a height of about 50 mils.

EXAMPLE V

A length of Mylar polyester film 18 inches wide and ½ mil thick was immersed in 96% sulfuric acid solution at room temperature for a period of 5 seconds after which it was removed from the acid and immediately quenched in a bath of 10% aqueous ammonium hydroxide, also at room temperature. Both surfaces of the film develop a chalky, opaque appearance. The film is then rinsed with water, blotted dry, heated to about 200°F., and passed through the embossing rollers of Example II. After embossing, the chalky, opaque surface appearance present after quenching disappears, resulting in an embossed transparent film having about 800 slightly rounded embossments per square inch of surface.

The embossed films of Examples II – IV can substantially reduce the potential bumping effect when used to wrap food, particularly meats, prior to oven roasting.

Although not completely understood at this time, it is believed that the provision of numerous projections on the surface of the film facing the interior of the enclosure reduces the incidence of bumping by permitting the trapped superheated liquid to boil and form small bubbles that can escape through the fat or oil barrier.

Observation has shown that when the typical plastic film roasting enclosure is used to roast meats, a layer of liquid water is trapped under a layer of fat in the bottom of the enclosure during roasting. Boiling of the liquid water is not apparent even though the temperature is typically over 350°F. As previously indicated, when the oil:water ratio is within a specific range and other conditions, such as temperature and time are met, the superheated water may violently burst through the oil layer, possibly rupturing the enclosure as well. The provision of a dense pattern of surface protrusions on the inner surface of the film forming the enclosure results in the trapped water boiling in the form of small gaseous bubbles (nucleate boiling) that escape through the fat layer thereby avoiding the potential bumping phenomenon.

The provision of surface projections or irregularities to the film in accordance with the invention, also results in minimizing contact surface between the article being cooked, usually meat, and the film, thereby eliminating or substantially reducing meat to film sticking. The surface irregularities also provide small localized "drop pockets" on the top surface of the film, which permit the cooking juices to drip out and baste the meat during cooking rather than running down the sides of the film.

We claim:

1. A wrapping material for surrounding a food article during oven cooking said wrapping material comprising a plastic, heat resistant, film material having a thickness from about 0.25 to about 1.0 mil, means for maintaining said film material in close proximity to said food article, said film material having an inner surface and an outer surface, said inner surface including a pattern of irregularities having a density from about 100 to 1,000 per square inch and including rounded projections extending from said inner surface from about 20 to about 100 mils whereby said wrapping material is resistant to bumping when a liquid oil-water component is present in a ratio of oil to water of from about 1:4 to 40:1.

2. The wrapping material of claim **1**, wherein said plastic film is selected from the group consisting of nylon and polyester films.

3. The wrapping material of claim **2**, wherein said plastic film is polyethylene terephthalate.

4. The wrapping material of claim **1**, wherein said surface irregularities include a regular pattern of embossments.

5. The wrapping material of claim **1**, wherein said plastic film is in the form of a flat unsupported single ply sheet.

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