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PACKAGING OF COFFEE

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No Drawing. Continuation of application Serial No. 456,693, August 29, 1942. This application August 14, 1944, Serial No. 549,481

5 Claims. (Cl. 99—152)

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This invention relates to the packaging of foods, and is concerned especially with packaging, in gas impervious containers, of foods which give off gases after packaging with consequent strain on and possible destruction of the package.

More specifically, the invention is directed to improvements in the packaging of roasted, freshly ground coffee, which gives off such substantial amounts of carbon dioxide gas after packaging that the pressure of the gas thus liberated may cause serious bulging or even rupture of gas impervious bags, canisters, or other containers used in the packaging.

A principal object of the invention is the provision of a method for preventing the bulging or rupture of gas impervious containers in which roasted freshly ground coffee is packaged.

Another important object of the invention is the provision of an improved gas impervious, vapor transmission proof, package for roasted freshly ground coffee which will not bulge or rupture due to the pressure of carbon dioxide gas given off by the coffee.

A further object of the invention is to provide a method of packaging, and an improved package, which will improve the keeping qualities and flavor of coffee.

These and other objects of my invention will become apparent on further reading of the following specification and claims.

This is a continuation of my application for patent Serial No. 456,693, filed August 29, 1942.

In the marketing of ground coffee the general practice has been to roast the coffee, grind it and package it almost immediately thereafter in order to retain as much as possible of the aroma and flavor, and at the same time avoid oxidation by atmospheric oxygen. Optimum results in these directions suggest the use of airtight, gas impervious, containers. Unfortunately, however, immediate packaging in such containers results in the building up, by the carbon dioxide which escapes from the freshly ground coffee, of pressures sufficiently high to put a severe strain on the container. When, for example, the container is a flexible bag, which is desirable, particularly if it can be made with paper, the pressure may cause objectionable bulging and even bursting. This, I believe, is the principal reason that gas impervious bags have not gone into general use for the packaging of freshly ground roasted coffee, even in these days of scarcity of steel and tin.

The pressure developed by carbon dioxide appears to be due, not to any continuing chemical

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reaction, but to a simple escape of the gas which has been held in the cells of the coffee bean. In the course of ten hours, or thereabouts, the pressure in a gas impervious package of freshly ground roasted coffee builds up to about 6 pounds per square inch, the curve of pressure development flattening out after these first few hours.

Several methods have been proposed to overcome the difficulties caused by this development of pressure within gas impervious packages. In connection with the use of glass jars and tin cans, vacuum packing has been practiced. In such packed coffee is opened. a hissing noise is heard tainer to leave space for expansion. Even so, the pressure of the liberated carbon dioxide more than compensates for the vacuum packing, with the result that when a can or jar of vacuum-packed coffee is opened, a hissing noise is heard which is due, not to incoming air, but to escaping carbon dioxide. The problem with flexible bags and other non-rigid containers is that if a material is utilized which is sufficiently impermeable to prevent the ingress of atmospheric oxygen and the egress of gas, the containers will be distorted and often ruptured by the developing pressure of the carbon dioxide. It has been proposed to provide containers with mechanical escape valves but this has not worked out successfully in practice. So far the use of gas impervious bags for the packaging of coffee has not been practical.

The basic principle of my invention involves the provision, within the package, of a reagent which will combine with the carbon dioxide and thus lower its vapor pressure sufficiently to prevent objectionable strain on the container, whether the container be a metal can, a flexible bag, or other form of gas impervious or vapor transmission proof enclosure. While my invention is not limited to the use of a particular reagent, I have found especially effective the anion-exchange materials such as the m-phenylene diamine formaldehyde resins and the aniline formaldehyde resins of Adams and Holmes (Chemistry and Industry, January 1935), or biguanidine-formaldehyde synthetic resins (Swain U. S. Patent No. 2,251,234), or equivalent materials.

The reagent may be utilized in a wide variety of ways, therefore my invention is not limited to any specific form, physical state, or manner of presentation, or exposure, of the reagent. Materials of the anion-exchange class were first described by Adams and Holmes in Chemistry and Industry in January, 1935, and comprise generically synthetic resins formed by condensing an aromatic amine, such as m-phenylene diamine

or aniline, with an aldehyde, such as formaldehyde. Among other substances having similar properties which have been described in the patent literature are modified m-phenylene diamine resins, a biguanidine formaldehyde resin, oxidized dyestuffs such as "aniline black," and certain metallic oxides and hydroxides (e. g. iron and aluminum oxides and hydroxides), particularly in gel form. Certain materials of this general type have come into rather widespread commercial use for the removal of free acids from liquids, particularly in the preparation of highly purified water equivalent to distilled water in its low dissolved solids content. In the preparation of such highly purified water, the water is usually first subjected to a hydrogen exchange treatment whereby the salts in the water, e. g. the alkali metal and alkaline earth sulfates and chlorides, are converted to the corresponding free mineral acids, such as sulfuric and hydrochloric acids; the liquid is then subjected to treatment with an anion-exchange material, which takes up and retains the free mineral acids. When exhausted, the hydrogen-exchange material is regenerated with a solution of a strong acid, such as sulfuric or hydrochloric; and the exhausted anion-exchange material is regenerated with a solution of an alkali, such as sodium or potassium hydroxide, carbonate, or bicarbonate, or with ammonium hydroxide.

The chemical reaction by which the anion-exchange materials take up free acids is not completely understood. As a working hypothesis, however, it may be assumed that if the anion-exchange material has been regenerated with sodium hydroxide and, as a result, is saturated with hydroxyl ions, the action involved in removing say, hydrochloric acid from a liquid, is as follows, "A" representing the nucleus of the anion-exchange material:

$$A{-}OH + HCl \rightarrow A{-}Cl + H_2O$$

The anion-exchange materials which have found greatest favor are the synthetic resins. These are made, for the most part, by reacting solutions of the appropriate reagents under proper conditions, causing the reaction mixture to set to a gel, and drying the gel.

In carrying out my invention, I can employ the anion-exchange resins either in the liquid, gel, or dried form. In the dried form, the material may be used, for example, as a fine powder or coarser particles enclosed in a permeable paper structure. It has been demonstrated that a commercially available, anion-exchange material, in dry granular form, in the proportion of one-half ounce thereof to one-half pound of ground freshly roasted coffee, disposed in an airtight container, prevented completely the development of any pressure within the container, whereas in the absence of such material, pressures developed under the same conditions of test that were sufficient to balloon and burst the best kind of flexible container with which I am familiar, and to exert objectionable internal strains on non-flexible containers.

As previously mentioned, the anion-exchange substance may likewise be used in the form of the undried gel. The advantage here is that a larger amount of the material may sometimes be incorporated in the carrier in this way, where such larger amount is desirable. Gelation may be brought about by concentration, by acidification, or by any other appropriate procedure, depending on the particular resin involved.

In some cases it will be found desirable to treat the anion-exchange substance, before final washing, drying and insertion in the package, with a solution of sodium or potassium hydroxide, in order to increase the supply of hydroxyl ions, and to remove traces of odor.

Reference has already been made to the anion-exchange properties of certain metallic oxides and hydroxides. Ferric and aluminum hydroxides are especially active in this respect. In utilizing these substances for carrying out my invention, they may be employed in dried form (as previously described for the synthetic resins); they may be incorporated into the carrier in the form of undried gelatinous precipitate (formed, for example, by reacting solutions of ferric chloride and sodium hydroxide, or aluminum sulfate and ammonium hydroxide) which is subsequently dried; or they may be formed in situ, by impregnating the carrier first with one reagent and then the other, and subsequently drying.

It is obvious that the amount of any type of reacting material employed for carbon dioxide removal within a vapor transmission proof package should be adjusted as experience dictates. The ideal condition, of course, is to employ just enough of the reagent to remove all of the carbon dioxide liberated, and at the rate of liberation, in order to avoid a condition of either positive or negative pressure on the container. Economy of the reagent is aided by extending its surface as much as possible, and making this surface readily accessible. The form, size and location of the inserts or carriers containing the reagent are all factors to be considered. Instead of incorporating the reagent in, or with, an insert carrier, it may be desirable to coat the inner wall or walls of the container with an anion-exchange substance in its liquid reaction mixture state prior to gelation. The coating obviously will be dried prior to insertion of the coffee. In preparing anion-exchange materials for use in the process of this invention it is not necessary to add agents designed to impart the mechanical strength and stability required when such materials are to be subjected to regeneration and re-use. The diluting effect of such agents on the activity of the materials is thus avoided.

As an example of a flexible material suitable for use in the packaging of coffee by the process of this invention I suggest an inner liner of rubber hydrochloride laminated to glassine paper by a micro-crystalline wax adhesive. The adhesive adds to the gas impervious characteristics of the laminated sheet, the rubber chloride liner can be heat sealed, which is of value in forming and sealing the container, and the glassine forms a protective covering that can be printed attractively.

Other applications and means of application of the principle of my invention will naturally suggest themselves to those skilled in the art as they become familiar with the invention. All modifications and extensions of the invention are deemed as being within the scope of the accompanying claims.

I claim:

1. A method of packaging freshly ground roasted coffee which comprises placing the coffee in a bag formed of gas impervious material, disposing within the bag a synthetic resin having

anion-exchange properties and immediately thereafter sealing the open end of the bag.

2. A method of packaging freshly ground roasted coffee which comprises placing the coffee in a bag formed of gas impervious material, disposing within the bag a fabric impregnated with a synthetic resin having anion-exchange properties and immediately thereafter sealing the open end of the bag.

3. A method of packaging freshly ground roasted coffee which comprises placing the coffee in a gas impervious container, within which is disposed a substance having anion-exchange properties, and thereafter sealing the open end of the container.

4. A package comprising freshly ground roasted coffee and a synthetic resin having anion-exchange properties sealed within a gas impervious bag.

5. A method of packaging freshly ground roasted coffee which comprises placing the coffee in a gas impervious container, placing therein an anion-exchange material capable of removing carbon dioxide from the package and thereafter sealing the open end of the container.

ABRAHAM SIDNEY BEHRMAN.

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Certificate of Correction

Patent No. 2,430,663. November 11, 1947.

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It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Column 2, line 13, strike out the words "packed coffee is opened, a hissing noise is heard", and insert instead the words and hyphen *packing it is customary to use an oversized con-*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 8th day of June, A. D. 1948.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.