Jan. 27, 1959 G. W. HOLMAN 2,871,130

EDIBLE OIL CONTAINERS AND METHOD OF TREATING SAME

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FIG. 1.

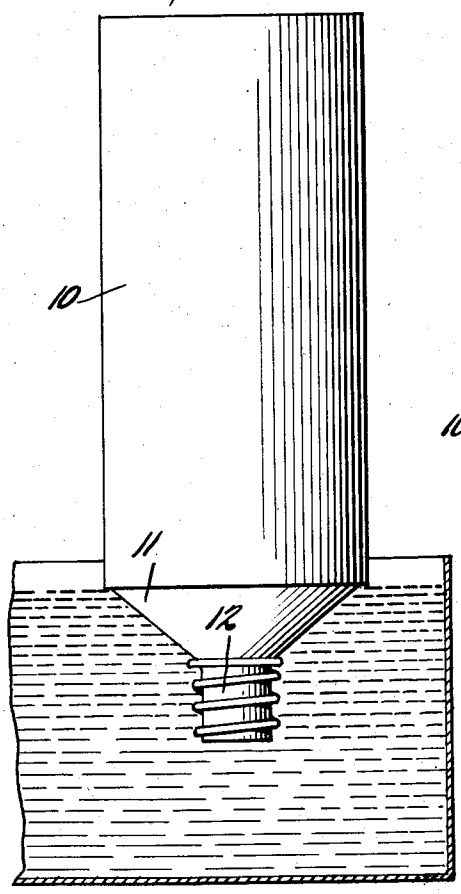
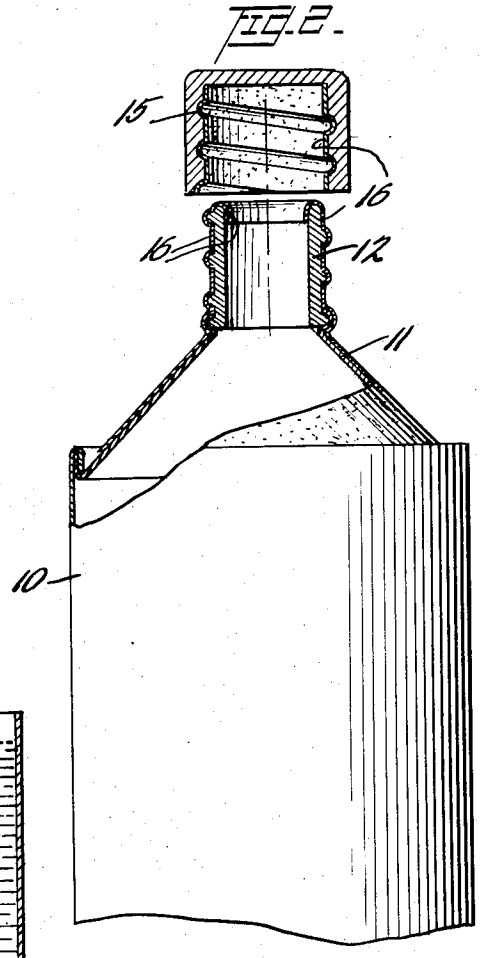


FIG. 2.



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EDIBLE OIl CONTAINERS AND METHOD OF TREATING SAME

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4 Claims. (Cl. 99—171)

This invention relates to the packaging of liquid glyceride oil products and more particularly to a treated container and a method of treating same for packaging such products to inhibit the development of rancid odors.

Certain edible oils, notably liquid glycerides subject to oxidative deterioration and the development of rancidity, such as cottonseed oil, sunflower oil, soybean oil, winterized oil, as well as pourable glyceride shortenings, French dressings and the like, are sometimes packaged in sheet metal or glass containers. Generally the liquid is used in small quantities from time to time by pouring a small amount through the spout of the container. Invariably, a drop or two of liquid will cling to the lip of the pouring spout and subsequently drain down the exterior surface of the spout. After a relatively short time, usually two or three weeks, the droplets which have collected on the outer container surfaces develop an undesirable rancid odor. This undesirable odor is particularly noticeable and most intense on the threaded portion of the spout. This is because the liquid is forced to assume a relatively thin layer on the threaded portion of the spout as the cap is threaded thereon resulting in a large surface to volume ratio and more rapid oxidation. In most cases, the undesirable odor develops before all the contents of the container are used. When a consumer detects the rancid odor, he immediately assumes that the contents in the container have become rancid. In most instances, they have not, because the cap on the container prevents rapid oxidation of the product stored within the container.

In the past, various ways have been sought to overcome this problem. Attempts have been made to inhibit the formation of rancid odors by treating certain externally exposed surfaces of the container with citric or phosphoric acid. It is well known that these acids inhibit the formation of rancid odors when added to a liquid glyceride product. However, it was discovered that coating the exterior surfaces of a container with either citric or phosphoric acid had no inhibiting effect on the formation of rancid odors in the oil draining on such surfaces. In fact, the time at which rancidity developed was accelerated when the exterior spout and adjacent surfaces were coated with either of these chemicals.

It is an object of the present invention to obviate all of the above difficulties.

Another object of the present invention is to coat the exterior surface of a container spout and its adjoining surfaces with a substance which will inhibit the formation of undesirable rancid odors when a glyceride oil product subject to oxidative deterioration and the development of rancidity is allowed to remain in contact with such portions of the container.

A further object of this invention is to coat the surfaces of a container cap exposed to the contact of a glyceride oil product subject to oxidative deterioration and the development of rancidity with a coating which will inhibit the formation of undesirable rancid odors when the product is allowed to stand in contact with the treated surfaces of the container cap.

Briefly and broadly stated, in accordance with the invention, selected surfaces of a container or cap or both are coated with a film of an alkali metal dihydrogen orthophosphate salt, preferably by application of an aqueous solution followed by evaporation of the water to leave a solid film of the alkali metal dihydrogen orthophosphate salt. In so doing, the time required to develop rancidity of the oil on the treated surfaces of the container or cap is tripled or quadrupled as compared to containers or caps not so treated.

The invention may be practiced by the use of any alkali metal dihydrogen orthophosphate salt. For convenience, however, NaH_2PO_4 will be referred to throughout this specification as a preferred example. It will be understood that other alkali metal dihydrogen orthophosphate salts such as KH_2PO_4 can be used wherever reference is made to NaH_2PO_4.

The invention can be practiced with glass or metal containers. The film can be applied with good results to metal containers made of aluminum or tin plated iron, for example. However, the invention is especially useful with glass or tin plated containers since these are commonly used in the trade for marketing liquid or pourable products containing readily oxidizable glyceride oils.

A common form of tin plated iron container is shown, by way of example, in the accompanying drawing, in which—

Figure 1 illustrates one method of applying the solution to the container, and

Figure 2 is an enlarged vertical sectional view through the upper portion of a container body and associated cap member to which the odor inhibiting film has been applied.

In the drawing the container body **10** is of cylindrical shape having at its upper end a conical shoulder **11** terminating in the usual threaded spout **12** through which the liquid contents may be discharged on removal of the internally threaded cap member **15**. The cap member may also be tin plated iron, but may be formed of a moldable plastic material.

The odor inhibiting film **16**, the thickness of which is exaggerated in the drawing, forms a coating on the spout **12** and shoulder **11** and on the inner surface of cap member **15**, the solution containing the inhibiting agent having been applied to the container body by immersing its upper portion in the solution as shown in Figure 1 and dried thereon as hereinbefore described. The container body and/or cap member may, of course, be completely immersed, but this is not ordinarily necessary; preferably only the spout **12** is coated.

It will be appreciated that the container illustrated in the drawing is entirely conventional and that the details thereof form no part of the instant invention and do not limit the scope of the invention.

The film can be applied, for example, by first cleaning the container surface to be treated with any well known commercial cleaner or solvent and then immersing the surface or otherwise treating it with a 10% solution of NaH_2PO_4 comprising 10 grams of NaH_2PO_4 in water to make 100 cc. of solution. The container having the wet film of NaH_2PO_4 solution thereon is then dried at any temperature under 200° C. leaving a solid film of NaH_2PO_4 on the surface of the container which will inhibit the development of rancid odors in a glyceride spilled on the coated area. The drying temperature is preferably kept below 200° C. in order to prevent conversion of the NaH_2PO_4 to $NaPO_3$ which is ineffective. Typical of the oils with which the invention can be used are any liquid glycerides subject to oxidative deterioration and development of rancidity such as cottonseed oil, sunflower oil, soybean oil, olive oil, and winterized vegetable oils, as well as liquid or pourable products containing oxidizable

glyceride oil, such as French dressing, or any commercially available liquid shortening.

The strength of the NaH_2PO_4 solution employed for treatment of the container surfaces can be varied between about 5% and about 20% to get satisfactory results. Erratic results are obtained below about 5%. Above about 20% an objectional white film is formed on the container although protection against the formation of rancid odors is satisfactory.

The NaH_2PO_4 film can be applied with solution temperatures up to 120° F. At temperatures above 120° F. the film thickness decreases appreciably, reducing the effectiveness of the film in inhibiting formation of rancid odors. However, the 120° F. solution temperature is not to be construed as limiting in any way the maximum temperature at which the film can be applied. For instance, a desired film thickness may be achieved at a temperature above 120° F. by applying successive superposed films to the container. It has been determined that an average film thickness between .00030 and .00050 centimeter achieves the objects of the invention irrespective of the manner in which it is applied.

Cleaning the container before applying a simple solution of NaH_2PO_4 is usually required in order to form a uniform film which can not be formed on dirty or oily surfaces. Containers when received from a supplier usually have foreign matter and oily films thereon which are deposited in the course of manufacture. However, it may be desirable to eliminate such preliminary cleaning step, and it has been found that a continuous film of NaH_2PO_4 can be applied to the surface without preliminary cleaning if a wetting agent is mixed with the solution. It has been determined by experiment that by adding an amount of wetting agent (at least .1 percent) sufficient to effect uniform wetting of the container surface with the NaH_2PO_4 solution, a uniform film can be applied to the surface, although the preliminary cleaning step has been omitted. One wetting agent that has been tried with successful results is the sodium alkyl sulfate derived by well known procedures from higher alcohols containing predominantly 10–14 carbon atoms, such as the middle cut fraction of alcohols produced by the reduction of coconut oil. Good results have been obtained by using a solution containing 10 grams NaH_2PO_4 and .2 gram of a typical wetting agent consisting essentially of sodium lauryl sulfate and available commercially under the trademark Duponol PC, in water to make 100 cc. of solution. Other non-toxic synthetic wetting agents such as water-soluble salts of higher mono-fatty acid esters of 1,2-dihydroxy propane-3-sulfonic acid (sodium salt of the coconut oil fatty acid monoester of this sulfonic acid is a specific example), water-soluble salts of higher fatty acid monoesters of lower molecular weight hydroxy alkyl sulfonic acids (e. g. oleic acid ester of the sodium salt of isethionic acid), water-soluble salts of the higher fatty acid amides of lower molecular amino alkyl sulfonic acids (e. g. sodium salt of coconut oil acid amide of N-methyl taurine) and water-soluble salts of the higher alcohol esters of sulfo-carboxylic acids (e. g. sodium salt of the lauryl alcohol ester of sulfoacetic acid) can also be substituted.

It is obvious, of course, that the container cap can be treated in the same manner as the container in order to inhibit development of rancid odors attributable to oxidation of oil clinging thereto.

The following examples illustrate the improved rancidity inhibiting qualities which can be achieved by the instant invention. They are not be be construed as limiting in any way the scope of the invention.

Example I.—The time required for developing an objectionable rancid odor was tested by comparing untreated tin plated containers with tin plated containers having a film of NaH_2PO_4. A 10% solution was made by dissolving 10 grams of NaH_2PO_4 in water with .2 gram wetting agent added to make 100 cc. of solution. The wetting agent was sodium alkyl sulfate derived by the sulfation and subsequent neutralization of higher alcohols containing predominantly 10–14 carbon atoms. The spout and shoulder of treated containers were dipped into the solution at room temperature and then dried for five minutes at 105° C. Treated and untreated containers were filled half full of a liquid shortening product predominantly composed of cottonseed oil subject to oxidative deterioration and the development of rancidity. Four drops of the liquid shortening were deposited on the outer surface of the spout at the threaded portion of both the treated and untreated containers. Caps were placed on the containers and the containers were then subjected to a temperature of 90° F. for an extended period. The containers were recurrently shaken and the caps were removed every two weeks in order to determine whether a rancid odor had developed on the container spouts. Some of the oil on the inner surface of the top of the cap would run down the exterior surface of the container spouts each time they were inspected. Periodic tests made in this manner determine the elapsed time from the beginning of the test until a moderate to very strong rancid odor developed. The following results were observed.

	Time required to develop the rancid odor, weeks
Untreated container	4
Treated container	16

Similar results can be obtained by using KH_2PO_4 in place of NaH_2PO_4 in Example I.

Substantially similar results were obtained by subjecting glass bottles to the same treatment as the metal containers of Example I and comparing the elapsed time, from the beginning of the test until a rancid odor developed, with the time in which rancid odors were detected on untreated glass bottles.

The wetting agent in this example can be omitted from the solution of NaH_2PO_4 without substantially modifying the end result provided the surfaces subjected to treatment are cleaned prior to the application of the solution to enable application of a uniform film.

The improvement noted in Example I can also be shown by using a commercially available olive oil or soybean oil in place of the liquid shortening product.

Treating solutions containing sodium lauryl sulfate specifically instead of the alkyl sulfate mixture of this example can be employed with substantially the same results.

The container cap can be treated in the same manner as the container of this example with marked inhibition of the development of rancid odors attributable to oxidation of oil clinging thereto.

Example II.—Same as Example I except the solution was made using 5 grams of NaH_2PO_4.

	Time required to develop the rancid odor, weeks
Untreated container	2
Treated container	10

Example III.—Same as Example I except the solution was made using 12 grams of NaH_2PO_4.

	Time required to develop the rancid odor, weeks
Untreated container	2
Treated container	16

The purposes of the invention may be achieved by the application to the container (either the container body, the container cap, or both), of a coating which consists entirely of the inhibiting agent, plus such minor amount of wetting agent as may be present. It will, nevertheless, be apparent that the presence of other ingredients, for instance, rust inhibiting agents, binders, and fillers of various kinds which do not defeat the odor inhibiting action of the orthophosphate salt is permissible and may

for various reasons be desirable. The coating may, therefore, be said to consist essentially of the dihydrogen orthophosphate salt, whether or not additional ingredients, not interfering with the normal inhibiting action of the salt, are admixed therewith to form the coating.

What is claimed as new is:

1. A container, an edible oil within said container, said oil developing a rancid odor on oxidation, said container comprising a body portion having a discharge spout member and a cap member removably seated on and embracing said spout member, said cap member and said spout member having parts which interlock when the cap member is seated on the spout member, at least one of said members being provided, on that portion of its surface contiguous to the other of said members when the cap member is seated, with a coating of an alkali metal dihydrogen orthophosphate salt capable of inhibiting the formation of rancid odor.

2. A container, an edible oil within said container, said oil developing a rancid odor on oxidation, said container including a body portion having a spout member provided with an externally threaded portion and a cap

member provided with an internally threaded portion for engaging the externally threaded portion on said spout member to prevent discharge of oil from the latter, the threaded portion of at least one of said members being coated with a film consisting essentially of an alkali metal dihydrogen orthophosphate salt.

3. A container having a discharge spout, an edible oil within said container, said oil being subject to oxidative deterioration, said discharge spout being provided with a surface film of an alkali metal dihydrogen orthophosphate salt.

4. The container claimed in claim 3 wherein the film is NaH_2PO_4.

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