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PROCESS OF TREATING VEGETABLE AND ANIMAL OILS AND PRODUCT OBTAINED THEREBY

Ivor M. Colbeth, East Orange, N. J., assignor to The Baker Castor Oil Company, New York, N. Y., a corporation of New Jersey

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14 Claims. (Cl. 87—12)

This invention relates to the production of compounds or compositions by treating vegetable or animal oils with compounds of boron. The invention is also applicable to the treatment of fats and the higher fatty acid esters of monohydric and dihydric alcohols to obtain valuable products therefrom.

In carrying out this invention vegetable or animal oils, such as castor, rape seed, linseed, cotton seed, corn, fish, whale, cod liver, etc., are treated at elevated temperatures with boric anhydride, boric acid, borax or other similar boron compounds until foaming ceases, or substantially ceases whereupon the oils are transformed into tough, rubber-like materials that vary in transparency from quite translucent or almost transparent to almost opaque.

The materials thus formed appear to be solids but are in fact very viscous liquids that are resilient at room temperatures. When shapes of most of these materials are left to stand on flat surfaces they gradually flow or spread out on the surfaces over wide areas after about twenty-four to forty-eight hours. They can be rolled into sheets of different thicknesses by passing them in a heated state between rolls and such sheets break with clear, cochoidal, glass-like fractures when suddenly bent while they are cool or cold. However, if they are bent slowly they can be folded back on themselves without breaking.

As a specific example of carrying out this invention castor oil is treated with about 1% to 10% by weight of a boron compound, such as borax, boric acid or boric anhydride at a temperature of about 200° C. for about 30 minutes or until foaming substantially completely ceases. Somewhat higher temperatures may be used for a shorter time and lower temperatures require longer times. By the time the foaming ceases, the oil is converted into a tough, elastic or resilient material that is almost transparent and will bounce almost as well as a golf ball when thrown against a solid surface, such as a floor or wall. This resilient product will flow slowly even when cold, but sheets of it can be broken by suddenly bending them and pieces of other shapes can be shattered if struck sufficiently hard.

This castor oil product does not melt even when heated to temperatures up to about 200° C. to 250° C., but becomes more brittle at these elevated temperatures than it is at lower temperatures. It will decompose without melting when it is heated to about 300° C. or higher. When heated still higher it will burn slowly.

The toughness of this material may be regulated or increased by oxidizing the castor oil either before it is treated with the boron compound or during such treatment. The oxidation may even be accomplished by kneading the boron treated product in a dough mixer or rubber mixer and contacting air with it, thus carrying on simultaneous oxidation and mixing either during the time the reaction with the boron compound is going on or after this reaction.

The product has the property of "shortness" in contrast to the property of distensibility which is characteristic of ordinary blown or oxidized vegetable and animal oils. It is also much more soluble in the ordinary commercial solvents, such as carbon disulfide, acetone, alcohol, ether, etc. than are the oils which have been oxidized or have been solidified by causing them to polymerize.

The product may be mixed or compounded with nitrocellulose in widely different proportions, without requiring any other plasticiser or colloiding agent, to form products that can be rolled into tranparent sheets or formed into objects that will retain their shape. Pigments and fillers may be added and the product may be molded by heating it to soften it and pressing it in molds. The sheets or other objects made from it may be embossed or polished, or the product may be subjected to the usual operations to which celluloid is subjected.

Although the product does not seem to be a solvent for cellulose acetate, it may be intimately mixed with cellulose acetate with the aid of cellulose acetate solvents, such as acetone, for example, thus forming products similar to those which can be formed by mixing it with nitrocellulose.

The product of this invention can be used to form plastics, from which sheets, etc. can be formed, by mixing it with cellulose esters, such as cellulose acetate or nitrocellulose, in which this product or modified oil is four or five times as much as the cellulose ester. This proportion is very much higher than the permissible proportion of the oil itself which could be added to cellulose esters with success.

Other uses of the product of this invention which may be mentioned are that it may be mixed with gums or resins to form binding materials or cements which are substantially transparent, or, on account of its "shortness" it can be used to replace waxes and nitrocellulose in the manufacture of stencils.

It is preferable, and in most instances necessary, to oxidize the oils other than castor oil before treating them with the boron compound, in order

to obtain a product that contains oxyacid radicals possessing the characteristics described above.

Although it is not fully known what happens when the castor oil or oxidized vegetable and animal oils are treated with boron compounds, as described above, investigations which have been made indicate that water is formed causing foaming and that it is necessary to have hydroxyl groups other than those found in the acid groups or carboxyls in the oil in order to cause the desired reaction to take place. At any rate, it has been found that it is necessary to oxidize some oils, i. e., those which do not contain oxy groups in addition to treating them with the boron compound in order to obtain satisfactory results. Mixtures of one or more oils may be used in the boron treatment.

The products produced in accordance with the invention possess great elasticity, rebounding about 66% of their height when dropped on a hard surface; they are soluble in numerous ordinary solvents; they are chemically stable at ordinary temperatures and also up to temperatures approximating 300° C.; they can be intimately mixed with cellulosic esters, and the mixtures will not separate into layers upon standing; they will rapidly dry to non-tacky films; they are practically odorless and colorless; they will form films and coatings either alone or in conjunction with cellulosic esters, resins, etc. These characteristics are particularly true of the product when it is made by using castor oil.

I claim:

1. The process which comprises treating vegetable or animal oil containing an oxyacid radical with a boron compound by heating until foaming practically ceases and a tough resilient product is formed that will flow slowly when it is cold.

2. The process which comprises treating oxidized vegetable or animal oil containing an oxyacid radical with a boron compound by heating until foaming practically ceases and a tough resilient product is formed that will flow slowly when it is cold.

3. The process which comprises treating castor oil with a boron compound by heating until foaming practically ceases and a tough resilient product is formed that will flow slowly when it is cold.

4. The process which comprises treating castor oil with a boron compound at a temperature of about 200° C. until foaming practically ceases.

5. The process which comprises treating castor oil with a boron compound at a temperature of about 200° C. for about 30 minutes.

6. The process which comprises treating castor oil with a boron compound at an elevated temperature until foaming practically ceases and a tough resilient product results which will flow slowly when it is cold.

7. The process which comprises oxidizing a vegetable or animal oil that has an oxy acid radical and treating it with a boron compound by heating until foaming practically ceases and a tough resilient product is formed that will flow slowly when it is cold.

8. A tough, resilient vegetable or animal oil product containing boron chemically combined with the oil.

9. A tough, resilient vegetable or animal oil product containing boron chemically combined with the oil and which product increases in brittleness up to about 250° C.

10. A tough, resilient vegetable or animal oil product containing boron chemically combined with the oil and which product decomposes without melting at about 300° C.

11. A tough, resilient vegetable or animal oil product containing boron chemically combined with the oil and which product bends slowly without breaking but breaks with a conchoidal fracture by sudden bending.

12. A tough, resilient castor oil product thickened by heat treatment with a small amount of boron which is chemically combined with the oil.

13. The process which comprises oxidizing vegetable or animal oil until it contains an oxy acid radical, and heating it in the presence of a boron compound until foaming practically ceases and a tough resilient product results that will flow slowly when it is cold.

14. The process which comprises oxidizing castor oil and heating it in the presence of a boron compound until foaming practically ceases and a tough resilient product results that will flow slowly when it is cold.

IVOR M. COLBETH.