Patented Aug. 7, 1945

2,381,653

UNITED STATES PATENT OFFICE

2,381,653

METHOD OF PRODUCING RAPID DRYING COATING COMPOSITIONS

Folsom E. Drummond, Metuchen, N. J., assignor to New Wrinkle, Inc., Wilmington, Del., a corporation of Delaware

No Drawing. Original application April 10, 1939, Serial No. 266,959, now Patent No. 2,268,022, dated December 30, 1941. Divided and this application September 24, 1941, Serial No. 412,095

9 Claims. (Cl. 106—264)

This invention relates to method of producing rapid drying coating compositions, and is a division of my co-pending application Serial No. 266,959, filed April 10, 1939, which was granted December 30, 1941, as Patent No. 2,268,022.

More particularly my invention refers to method of producing rapid drying compositions of the drying oil and wrinkle finish type. The invention, however, is applicable broadly in the production of protective and decorative coating compositions such as varnishes, paints, enamels, printing inks and the like.

I have discovered that the drying of coating compositions can be controlled so as to produce either rapid drying smooth surface compositions or compositions drying to a wrinkle finish, the control being exercised by varying the amount of compounds present having conjugated double bond structure of the general formula

$$(-CH=CH-)_x$$

wherein x is equal to 2, 3 or 4. Examples of compounds which comprise conjugated double bonds are unsaturated acids such as the following:

$CH_3-(CH_2)_5-(CH=CH)_2-(CH_2)_7COOH$

Iso-linoleic acid

$CH_3-(CH_2)_2-(CH=CH)_2-CH_2-CH=CH(CH_2)_7COOH$

Iso-linolenic acid

$CH_3-(CH_2)_3-(CH=CH)_3-(CH_2)_7COOH$

Elaeostearic acid

$CH_3-(CH_2)_3-(CH=CH)_3-(CH_2)_4-CO-(CH_2)_2COOH$

Licanic acid

$CH_3-CH_2-(CH=CH)_4-(CH_2)_7COOH$

Octadecatetraenoic acid

These unsaturated fatty acid compounds are constituents of many fats, especially drying and semi-drying oils. In general, the higher the number of conjugated double bonds (—CH=CH—) in the compound the more readily reactive it is. Similarly under the same conditions the greater the percentage amount of conjugated double bond compound in the coating film the shorter is the drying time.

In the formulation of rapid drying coating compositions of the drying oil type, according to my invention, utilization is made principally of the tri-glycerides of the fatty acids having poly-conjugated double bond molecular structure as heretofore mentioned.

Typical examples which illustrate the glycerides employed are:

(a) Triglyceryl-isolinoleate

$CH_3-(CH_2)_5-(CH=CH)_2-(CH_2)_7-COO-CH_2$
$CH_3-(CH_2)_5-(CH=CH)_2-(CH_2)_7-COO-C-H$
$CH_3-(CH_2)_5-(CH=CH)_2-(CH_2)_7-COO-CH_2$

(b) Triglyceryl-isolinolenate

$CH_3-(CH_2)-(CH=CH)_2-CH_2-CH=CH(CH_2)_7COO-CH_2$
$CH_3-(CH_2)-(CH=CH)_2-CH_2-CH=CH(CH_2)_7COO-C-H$
$CH_3-(CH_2)-(CH=CH)_2-CH_2-CH=CH(CH_2)_7COO-C-H_2$

(c) Triglyceryl-elaeostearate

$CH_3-(CH_2)_3-(CH=CH)_3-(CH_2)_7-COO-CH_2$
$CH_3-(CH_2)_3-(CH=CH)_3-(CH_2)_7-COO-C-H$
$CH_3-(CH_2)_3-(CH=CH)_3-(CH_2)_7-COO-C-H_2$

(d) Triglyceryl-licanate

$CH_3-(CH_2)_3-(CH=CH)_3-(CH_2)_4-CO-(CH_2)_2-COO-CH_2$
$CH_3-(CH_2)_3-(CH=CH)_3-(CH_2)_4-CO-(CH_2)_2-COO-C-H$
$CH_3-(CH_2)_3-(CH=CH)_3-(CH_2)_4-CO-(CH_2)_2-COO-C-H_2$

(e) Trigylceryl-octadecatetraenate

$CH_3-CH_2-(CH=CH)_4-(CH_2)_7-COO-C-H_2$
$CH_3-CH_2-(CH=CH)_4-(CH_2)_7-COO-C-H$
$CH_3-CH_2-(CH=CH)_4-(CH_2)_7-COO-C-H_2$

By incorporating various amounts of the tri-unsaturated glycerides in the conventional non-wrinkling paint oils the drying properties may be greatly enhanced and the waterproofing and flexibility of the product increased. Further by compounding the paint oils with a sufficient amount of fatty acid triglyceride compounds having three or more conjugated double bonds in the molecular structure, drying oils such as linseed, perilla, soya bean and the like, paint oils may be made to function as a wrinkling oil similar to China-wood oil. For bringing this about the oil and glyceride are combined by heating so that the product contains sufficient amount of glyceride having 3 or more conjugated double bond linkage so that the desired drying properties can be obtained. The percentage by weight of the glyceride added varies with each oil but may comprise upwards of 50 per cent by weight for producing wrinkling drying oil products. In this case the percentage amount of triglyceride is preferably in the neighborhood of 90 per cent of the paint oil composition.

Preferably the triglycerides are used since they produce the most pronounced drying effect. However, the use of di-unsaturated glycerides in

place of the tri or mixtures thereof may be employed if desired. Further utilization may be made of the fatty acids alone when a sufficient amount of glycerol or glyceride constituents is present in the oil mixture. The fatty acids alone in the absence of glycerol or glyceride compound do not exhibit good drying properties.

Formulations made using the glycerides having only 2 conjugated double bonds produce a drying oil paint vehicle having superior drying and waterproofing qualities to those of linseed oil. Addition of suitable metallic driers to these modified drying oil vehicles will further enhance the drying of the composition to a smooth non-wrinkling film when applied and air dried or baked at low temperatures.

Typical examples of non-wrinkling oil vehicles are as follows:

Example 1

	Per cent by weight
Linseed oil	15 to 40
Triglyceryl-isolinoleate	85 to 60

Example 2

Linseed oil	15 to 40
Triglyceryl-isolinolenate	85 to 60

Example 3

Perilla oil	15 to 40
Triglyceryl-isolinoleate	85 to 60

Example 4

Perilla oil	15 to 40
Triglyceryl-isolinolenate	85 to 60

Example 5

Soya bean oil	10 to 30
Triglyceryl-isolinoleate	90 to 70

Example 6

Soya bean oil	10 to 30
Triglyceryl-isolinolenate	90 to 70

Example 7

China-wood oil	40 to 60
Triglyceryl-isolinoleate	60 to 40

Example 8

China-wood oil	40 to 60
Triglyceryl-isolinolenate	60 to 40

In the examples of paint and varnish vehicles given the drying and semi-drying oils may be used either in the raw state, refined or in blown condition as desired. Various mixtures of the different oils also may be utilized. Further use may be made of other oils, for example oiticica, poppy seed oil, sunflower oil, as well as fish and marine mammal oils heretofore used in paint and varnish coating compositions.

The mixture of oil and glyceride is heated to incorporate the fatty acid glyceride to form a homogeneous composition. Heating the oil and glyceride mixture to a temperature of 350 to 450 degrees F. for one half to one hour is sufficient to produce a satisfactory product.

Suitable driers or drier combinations may be incorporated in the modified oil vehicles if desired, such as the acetate, resinate or linoleate of cobalt, manganese or lead.

The glyceride modified oil vehicles illustrated in Examples 1 to 8 may be compounded with suitable resins, natural or synthetic; for example, kauri, congo, damar, pontianak, manila, elemi, mastic or synthetic resins such as "Cumar," ester gum, phenol formaldehyde resin, glycerol-phthalic acid resin particularly of the oil soluble type or mixtures of these. The coating compositions employing the glyceride modified oil vehicles may be either air dried or baked to produce a dry, smooth, flexible, water-resistant film. A baking temperature range between 250 to 400 degrees F. for one-half to one and one-half hours may be employed.

For the production of similar coating compositions wherein the film readily dries to a wrinkle finish surface, modified oil vehicles comprising large percentages of fatty acid glycerides having 3 or more conjugated double bond molecular structure are employed.

Typical examples of wrinkling oil vehicles are:

Example 9

	Percent by weight
Linseed oil	5 to 25
Triglyceryl-elaeostearate	95 to 75

Example 10

Linseed oil	5 to 25
Triglyceryl-licanate	95 to 75

Example 11

Linseed oil	20 to 40
Triglyceryl-octodecatetraenate	80 to 60

Example 12

Perilla oil	5 to 25
Triglyceryl-olaeostearate	95 to 75

Example 13

Perilla oil	5 to 25
Triglyceryl-licanate	95 to 75

Example 14

Perilla oil	20 to 40
Triglyceryl-octodecatetraenate	80 to 60

Example 15

Soya bean oil	5 to 20
Triglyceryl-elaeostearate	95 to 80

Example 16

Soya bean oil	5 to 20
Triglyceryl-licanate	95 to 80

Example 17

Soya bean oil	10 to 25
Triglyceryl-octodecatetraenate	90 to 75

In compounding the oil compositions of Examples 9 to 17, the fatty acid glycerides are thoroughly incorporated with the oils to provide a homogeneous drying oil vehicle in a similar manner to that described in Examples 1 to 8. It will be understood also that raw, refined or blown drying oils may be used in preparing the wrinkling oils. In general when using blown or prepolymerized oils less amount of the glyceride constituent is required to produce a product which will dry in a given time.

The glycerides having triple or more conjugated double bonds may also be blended with tung oil or oiticica, which are wrinkling oils, to modify their wrinkling characteristics. In like manner the incorporation of natural or synthetic resins and driers may be made.

The compositions comprising the modified drying oil may be applied as a film by flowing or spraying and baked at temperatures of the order of 250 to 350 degrees F. for one to two hours to produce a wrinkle finish. Enamels require somewhat longer and higher temperatures of baking. For thinning the paint oil vehicles, petroleum

naphtha, toluol, or mixtures of the two may be employed.

Further in utilizing the wrinkling oils of Examples 9 to 17 the use of various natural or synthetic resins may be made to provide a resinous type coating composition. Various resins may be added to the composition in order to modify the properties comprising natural and synthetic resins such as heretofore mentioned. When it is desired to give added flexibility to the films, a suitable plasticizing agent such as castor oil, dibutyl phthalate or tri-cresyl-phosphate may be incorporated. The paint oil compositions herein illustrated can also be used in making enamels and similar pigmented compositions. To produce such compositions 5 to 25% of a suitable pigment is ground into the glyceride modified oil or resinous oil composition and the required amount of thinner such as petroleum naphtha and the like is added.

Clear varnish-like compositions may be applied over various articles and baked either to a wrinkle finish or a smooth glossy surface depending upon whether the oils are those of Examples 1 to 8 or the wrinkling oils of Examples 9 to 17. Thin coatings may also be applied over materials such as paper, foil, parchment and the like to produce a light transmitting sheet applicable for making various articles such as window shades, drapes, lamp shades and the like. The coating compositions of this invention may also be applied over metal, wood, pottery, glass, paper, leather and the like, and baked or air dried to a flexible, tough film. Various ornamental effects of the wrinkle finishes can be produced by varying the percentage of poly-conjugated double bond glyceride constituent in the paint oil. Other modified results of the finish may be obtained by variations in the method of applying the compositions. Further one or more coats may be applied to an article and dried and thereafter cellulose lacquer or like composition disposed thereover.

It will be understood that while I have described and illustrated certain specific embodiments of my invention, I do not intend that my invention be limited to or circumscribed by the specific details of procedure and proportions indicated in view of the fact that the details of my invention may be varied and modified over a wide range within the spirit and scope of the appended claims.

It will be further understood that the term "nonwrinkling drying oils," as used in the claims, is intended to encompass drying oils and semi-drying oils of the type used in the examples hereinbefore set forth.

I claim:

1. The method of accelerating the rate of drying consisting of incorporating into drying oil a high molecular weight fatty acid glyceride of the class consisting of diglyceride and triglyceride, said fatty acid having 18 carbon atoms and a polyconjugated double bond structure of the formula (—CH=CH—)x, wherein x is equal to a value the lower limit of which is 2 and the upper limit 4; and heating said oil-glyceride mixture to a temperature of from 350° to 450° F. for one-half to one hour.

2. The method of accelerating the rate of drying consisting of incorporating into drying oil high molecular weight fatty acid triglycerides, said fatty acid having 18 carbon atoms and a polyconjugated double bond structure of the formula (—CH=CH—)x, wherein x is equal to a value the lower limit of which is 2 and the upper limit 4; and heating said oil-triglyceride mixture to a temperature of from 350° to 450° F. for one-half to one hour.

3. The method of accelerating the rate of drying consisting of incorporating into drying oil a high molecular weight fatty acid glyceride of the class consisting of diglyceride and triglyceride, said fatty acid having 18 carbon atoms and a polyconjugated double bond structure of the formula (—CH=CH—)x, wherein x is equal to 2; and heating said oil-glyceride mixture to a temperature of from 350° to 450° F. for one-half to one hour.

4. The method of accelerating the rate of drying consisting of incorporating into drying oil a high molecular weight fatty acid glyceride of the class consisting of diglyceride and triglyceride, said fatty acid having 18 carbon atoms and a polyconjugated double bond structure of the formula (—CH=CH—)x, wherein x is equal to 3; and heating said oil-glyceride mixture to a temperature of from 350° to 450° F. for one-half to one hour.

5. The method of accelerating the rate of drying consisting of incorporating into drying oil a high molecular weight fatty acid glyceride of the class consisting of diglyceride and triglyceride, said fatty acid having 18 carbon atoms and a polyconjugated double bond structure of the formula (—CH=CH—)x, wherein x is equal to 4; and heating said oil-glyceride mixture to a temperature of from 350° to 450° F. for one-half to one hour.

6. The method of accelerating the rate of drying consisting of incorporating into drying oil high molecular weight fatty acid triglycerides, said fatty acid having 18 carbon atoms and a polyconjugated double bond structure of the formula (—CH=CH—)x, wherein x is equal to 2; and heating said oil-triglyceride mixture to a temperature of from 350° to 450° F. for one-half to one hour.

7. The method of accelerating the rate of drying consisting of incorporating into drying oil high molecular weight fatty acid triglycerides, said fatty acid havng 18 carbon atoms and a polyconjugated double bond structure of the formula (—CH=CH—)x, wherein x is equal to 3; and heating said oil-triglyceride mixture to a temperature of from 350° to 450° F. for one-half to one hour.

8. The method of accelerating the rate of drying consisting of incorporating into drying oil high molecular weight fatty acid triglycerides said fatty acid having 18 carbon atoms and a polyconjugated double bond structure of the formula (—CH=CH—)x, wherein x is equal to 4; and heating said oil-triglyceride mixture to a temperature of from 350° to 450° F. for one-half to one hour.

9. The method of accelerating the rate of drying consisting of incorporating into drying oil a metallic drier and a high molecular weight fatty acid glyceride of the class consisting of diglyceride and triglyceride, said fatty acid having 18 carbon atoms and a polyconjugated double bond structure of the formula (—CH=CH—)x, wherein x is equal to a value the lower limit of which is 2 and the upper limit 4; and heating said oil-glyceride mixture to a temperature of from 350° to 450° F. for one-half to one hour.

FOLSOM E. DRUMMOND.