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NONLEAFING ALUMINUM PASTE AND METHOD OF MAKING SAME

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This invention relates to metallic pigment pastes for use in the preparation of polychromatic coatings or finishes and non-lea-
 5 fying aluminum metallic finishes as distinguished from substantially unwetted metallic powders, on the one hand, and paints, lacquers, enamels and the like including a coating base or vehicle as well as a pigment, on the other hand. More particularly this invention relates to non-lea-
 10 fying aluminum pastes and their methods of manufacture. The present application is a continuation in part of my application Serial No. 456,417, filed August 27, 1942, which in turn was a division of my application Serial No. 360,501, filed October 9, 1940, which issued January 26, 1943, as
 15 Patent No. 2,309,377, both for Non-lea- fying aluminum paste and method of making same.

It has been known for some time that a non-lea-
 20 fying finish can be prepared by carefully grinding an ordinary leafing pigment, in the form of a powder or a paste, either in a liquid carrier or solvent which is compatible with the coating base with which the pigment is adapted to be used, or in the base itself. Such a grinding operation so alters the surface of the pigment by
 25 mechanical action as to make it non-lea- fying. The grinding, however, not only increases the length of time required for, and the cost of, preparation of the pigment or paint, but also constitutes a fire hazard when the pigment is
 30 ground in powder form.

It is therefore the object of the present invention to provide a new and improved method of producing a non-lea-
 35 fying aluminum paste which avoids the necessity for grinding, and wherein the delea- fying action is brought about by chemical, rather than mechanical, means.

Another object of this invention is to provide a new and improved method of producing a non-lea-
 40 fying aluminum paste which has the capacity of at once producing a non-lea- fying coating material, when mixed with a suitable coating base or film-forming vehicle, without the long delay which is unavoidable if reliance is placed on the reaction of the vehicle or some ingredient there-
 45 of on a leafing pigment in order ultimately to obtain a non-lea- fying effect.

Inasmuch as the paste produced by the method herein disclosed is itself of novel composition, the invention also encompasses the product as
 50 well as the process by which it is made.

The basis of the present invention resides in the discovery that certain highly polar materials, especially when in solution, have the property of chemically destroying the leafing characteristics of otherwise full leafing aluminum powder when combined with such powder to form a paste. The term "highly polar material" is used herein to mean a material having a dielectric constant of at least 10 or higher, and
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preferably of 20 or higher, on the scale of dielectric constants (see Industrial Chemistry of Colloidal and Amorphous Materials, by Lewis, Squires and Broughton, MacMillan Co., page 15), such scale being readily derivable from standard chemical texts and handbooks. It is believed that the delea-
 5 fying action of the polar active material is due to a rearrangement of the oriented molecules of stearic acid already present on the flakes of the powder, so that by virtue of what is thought to be a preferential "wetting" action, the surfaces of the powder particles are readily
 10 "wetted" by the vehicle when the paste so made is thereafter mixed to provide a coating material, such as a paint, lacquer, enamel or the like. It has been found that a paste of this character disperses more readily than others when mixed with the base of a polychromatic paint, enamel or lacquer finish, and also gives greater covering since the "wetting" process tends to minimize
 15 agglomeration.

In general, the preferred method of the present invention consists in simply adding to a regular, full leafing aluminum powder a suitable carrier in which has been incorporated a delea-
 25 fying agent consisting of one or more materials of the group composed of highly polar alcohols, esters, ketones and aldehydes in an amount proper to provide a pigment paste as understood in the
 30 art.

The carrier of the paste may be selected as desired from among the many available, having due regard to its compatibility with the coating base to which the paste will thereafter ultimately be added, although it is generally preferred to use either xylol or toluol because of the wide range of paints, lacquers, enamels and the like with which they are compatible. The group of suitable carriers also includes the straight chain
 40 hydrocarbon thinners marketed as mineral spirits, kerosene, gasoline, petroleum naphtha, and the like, as well as aromatic thinners such as benzol and coal tar naphthas, and hydrogenated petroleum naphthas containing high percentages of aromatics.

The following is one example of a working formula which has proven to be quite successful in practice in producing a non-lea-
 45 fying aluminum paste according to the present invention:

	Pounds
Aluminum powder (fully polished and leaf- 50 ing).....	60
Ethyl acetate.....	20
55 Toluol.....	20
	100

This formula may be varied by substituting for the ethyl acetate such other highly polar materials from the group composed of alcohols,

esters, ketones and aldehydes, as methyl, ethyl or butyl alcohol, butyl acetate, ethyl lactate, glycerolabiate, acetone, benzaldehyde, etc., the speed of reaction being largely dependent upon the amount of the acetate or other deleafing agent relative to that of the toluol or whatever other carrier may be used compatibly with the color base. For example, another working formula is:

	Pounds	
Aluminum powder (full leafing)-----	65	
Benzaldehyde-----	5	
Xylol-----	30	
	100	

In place of benzaldehyde, acetone, methyl alcohol, or glycerolabiate can be substituted with equally good results.

A liquid carrier embodying a relatively high percentage of alcohol, ethyl acetate, acetone, or the like, will also provide the desired deleafing action, the highly polar liquid being either used alone, or dissolved in a thinner compatible with the coating in which the paste is to be dispersed. In any event, as the present invention is concerned with a paste, as distinguished from a coating material composed of a coating base or film-forming vehicle in which a pigment has been dispersed, the aluminum powder will at least be on the order of 50% or more of the materials constituting the paste, depending somewhat on the consistency of the paste desired. On the other hand, the quantity of liquid used is such as to assure at least a complete wetting of the powder going into the paste. The speed of reaction may be decreased by diminishing the relative proportions of the deleafing agents, and the speed of reaction may also be increased by increasing the relative proportions of the deleafing agents, or by using a small amount of alcohol in addition to one or more of the other deleafing agents referred to.

In practicing the method of the present invention, the usual procedure is to first dissolve or suspend the deleafing agent or agents in the carrier, and then add to the liquid mixture thus formed the leafing powder to form a paste. In some instances, however, it may be preferred to simply add the deleafing agent to a previously formed paste composed of leafing powder and carrier. Under normal conditions of temperature, pressure, humidity and the like, the leafing characteristics of a paste conforming to the present formula above recited will be almost completely, if not entirely, destroyed in less than 48 hours after the paste has been formed. This time may be decreased by varying the proportions and/or materials of the deleafing agents, as above indicated, or by increasing the temperature at which the mixture of carrier and deleafing agent or agents is permitted to act upon the leafing aluminum pigment. Agitation of the materials when forming the paste, or agitation of the paste itself, will also decrease the time required for the deleafing reaction.

There is thus provided by the present invention a novel, simple and economical method of producing a non-leafing aluminum paste which is susceptible of direct dispersion in a wide variety of coating bases for the production of polychromatic finishes. The paste, which is also novel in composition, may be directly dispersed in a color base to produce a non-leafing polychromatic coating without the necessity for grinding or

otherwise treating the material to render it non-leafing and without the long delay that is unavoidable if reliance is placed on the vehicle of the coating material to effect ultimately a non-leafing effect. Not only does a paste prepared in accordance with the present invention disperse more rapidly in the coating base and provide greater covering than ordinary leafing materials, but it has also been found that, because of the fact that the pigment is all within the film, rather than partially on top thereof, it can be applied without giving rise to the well known, objectionable smudging effect which results when some object is accidentally drawn across the air dried surface of the paint.

Although the method of preparing, and the composition of, the non-leafing paste of the present invention have been described herein in some detail, and a specific formula has been set forth as exemplary of its practical application, it is to be expressly understood that the invention is not limited to the particular examples given, but that the ingredients of the paste, their relative proportions and the particular mode of preparation of the paste may be varied within limits which will be clearly apparent to those skilled in the art without departing from the underlying concept of the invention. Reference is therefore to be had to the appended claims for a definition of the scope of the invention.

What is claimed is:

1. A method of making a pigment in the form of a non-leafing aluminum paste from a normally-leafing aluminum powder while retaining the shape and size of the aluminum particles, which comprises combining without grinding a deleafing agent composed of at least one material selected from the group consisting of the relatively highly polar alcohols, esters, ketones and aldehydes, a hydrocarbon thinner and a normally-leafing aluminum powder in such proportions as to form a pigment paste to substantially destroy the leafing characteristics of said powder by the chemical action of the deleafing agent thereon and produce a paste which when mixed with a vehicle will at once provide a non-leafing coating material.

2. A method of making a pigment in the form of a non-leafing aluminum paste from a normally-leafing aluminum powder while retaining the shape and size of the aluminum particles, comprising the steps of dissolving in a hydrocarbon thinner a deleafing agent composed of at least one material from the group consisting of the relatively highly polar alcohols, esters, ketones and aldehydes, and then combining without grinding the liquid mixture thus formed with a normally-leafing aluminum powder to form a pigment paste and destroying the leafing characteristics of said powder by the chemical action of the deleafing agent thereon to produce a paste which when mixed with a vehicle will at once provide a non-leafing coating material.

3. The method of making a pigment in the form of a non-leafing aluminum paste from paste composed of a normally-leafing aluminum powder and a hydrocarbon thinner, while retaining the shape and size of the aluminum particles, which comprises adding to said paste a deleafing agent composed of at least one material selected from the group consisting of the relatively highly polar alcohols, esters, ketones and aldehydes in such proportions as to form a pigment paste to destroy the leafing characteristics of the aluminum powder by the chemical action of the deleafing

agent thereon and produce a paste which when mixed with a vehicle will at once provide a non-leaving coating material.

4. An aluminum paste pigment adapted to be mixed with a film-forming vehicle to produce non-leaving paints, enamels and lacquers, comprising a normally-leaving aluminum powder whose leaving film is mechanically left intact, a hydrocarbon thinner and at least one deleafing

5. material selected from the group consisting of highly polar alcohols, esters, ketones and aldehydes, the aluminum powder constituting more than 50% of the total weight of the paste and the thinner and deleafing constituent of the paste being sufficient to completely wet the powder particles.

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