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METALLIC PIGMENT

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This invention relates to the production of metallic pigments in a form convenient for mixing with the desired vehicle, which effects a more convenient covering power of the metal powder, and eliminates the "dusting" nuisance of metals in their customary powdered state, and likewise imparts to the metal flake an increased leafing power, or at least does not cause a diminution in leafing power, as is often the case with products of this type and nature, especially upon standing for a considerable period of time.

This application is a continuation in part of my co-pending application, Ser. No. 755,635, filed Dec. 1, 1934, for "Production of metallic pigment paste."

So called "bronze powders" consist of minute metallic particles in flake form, this shape giving the greatest covering and leafing properties. These powder particles vary in size from about 200 to 325 mesh this being the number of meshes per linear inch of sieve through which they will pass. Such fine powders, especially when composed of comparatively light metals as aluminum, dust easily into the air, are troublesome to handle, and difficult to "wet."

I have found that a powder of this character may conveniently be made into the form of a paste by mixing with it a solvent of the vehicle it is desired to employ, in which condition the dusting property is substantially eliminated or reduced to a point where it is commercially non-objectionable, such paste containing therein a product tending to augment the leafing characteristics, the pigment mixture mixing readily with the vehicle.

Furthermore, the leafing power of the powder in the form of paste is greatly increased over that exhibited by the dry powder. The leafing or covering power of the pigment in paste condition is increased in the present invention in at least two ways, not only because the metallic particles are completely separated or substantially so from each other by the solvent or solvent combination which is used to form the paste, but also because of and by virtue of the introduction into the solvent portion of certain colloidal sol agents, whose primary function is not only to preserve the initial brilliancy and leafing characteristics of the metal flake as of the degree when first produced or after having been submitted to an ageing operation, but even to augment that brilliancy and increase the leafing propensity, or at least to preserve them unimpaired for an indefinite period, by the incorporation with the solvent portion of certain organic sublimable solids and/or a colloidal sol.

This not only makes it easier to obtain a uniform distribution of the metallic particles throughout the viscous vehicle of the paint, lacquer, varnish, enamel, or other type of protective coating, but by increasing the physical stability of the mixture as a whole, normal coalescence of individual particles is substantially entirely prevented, and the individual particles remain as such, free movement upon dilution, with no observable agglomeration or coalescence, heretofore observed in the art. A more effective use of the metallic particles, or pigment may thus be obtained, on account of an increased opacity and covering power per unit weight of metallic flake.

Metallic powders, especially of the aluminum metal type, in contact with organic liquids of the class normally employed in protective coating compositions, usually accelerate decomposition of such liquids, sometimes with the liberation of acids or products which act as acids and which appear to attack the thin metal particles, causing them to adhere or coalesce. Metallic pigments therefore are not mixed with their vehicles until immediately before use in the majority of instances, in order to minimize such difficulties primarily due to decomposition.

Whilst this decomposition is more marked with the entire vehicle, the intensity and speed of decomposition depending in a measure upon the nature of the vehicle and the relative purity and compatibility of the components constituting the same, decomposition also occurs with the solvent alone, especially with such organic liquids as commercial petroleum hydrocarbon fractions, usually highly complex and of widely varying chemical composition, and containing relatively small amounts of various impurities depending primarily upon the nature of the original petroleum product operated upon and the precision of purification to which it has been subjected. Such hydrocarbon fractions are frequently used as diluents of vehicles for metallic pigments, either alone, or where cellulose esters are employed as in the lacquer type of protective coatings, in conjunction with esters, ketones, alcohols and other bodies having a solvent, colloiding, or plasticizing action upon the cellulose compound.

This tendency to decomposition is especially noticeable when these hydrocarbon mixtures contain small and varying amounts of impurities such as sulfur and/or nitrogenous compounds. The decomposition of the solvent has a deleteri-

ous effect upon the brilliancy and the leafing quality of the metallic powder, especially when that powder is aluminum.

It therefore is a further object of the present invention to stabilize pastes or mixtures of metallic powders, especially when the metallic particles are in flake or leaf form, when said powders are incorporated with solvents of the type or nature of those used in protective coatings, as of the classes hereinbefore indicated, and in so stabilizing the same, to permit the augmentation of leafing characteristics which usually proceeds upon storage and ageing of powders of this nature when properly prepared.

In accordance with the present invention, stabilization is attained, and preserved, thus allowing normal augmentation of leafing characteristics to develop and increase, by adding to the mixtures of metallic powders with organic solvents or solvent combinations, certain neutral hydrocarbon, alcoholic or ketonic bodies of relatively high boiling point, readily sublimable at ordinary temperatures, soluble in the solvents normally used in protective coatings of this nature, of relatively high stability yet of comparatively low volatility, examples being naphthalene, and other substituted naphthalenes and naphthalenic bodies, natural and synthetic camphors and camphoraceous bodies and camphor substitutes, only when they fulfill the conditions and exhibit the properties as heretofore enumerated, and which when added to the liquid portion of the paste or colloidal sols, tend to preserve and stabilize the paste.

In each instance, however, the stability-inducing body or bodies promoting leafing characteristics are compatible with the vehicle solvent, and in those protective coatings and compositions of lacquer type, wherein cellulose esters are employed as a portion or all of the non-metallic non-evaporable solids portion, the leafing-enhancing bodies herein disclosed, possess the additional value that often they are direct or ancillary solvents for the cellulose compound, thus admitting of a greater amount of cellulose ester nonsolvent portion in the composition, as the petroleum hydrocarbon fractions heretofore mentioned.

Simple mixtures of metallic powder with an organic liquid of the type used in protective coatings, are likely to separate into layers of greater and lesser pigment concentration, so that the paste will lack homogeneity. This is true of pastes containing as much as 65% metallic pigment.

To prevent or delay such a separation, thickening or viscosity-inducing agents which apparently form true colloidal sols with the liquids are employed. Such agents not only maintain the initial homogeneity of the paste, but by virtue of their presence, in the quantity ratios as herein disclosed, prevent or slow up decomposition to the point wherein it is unnoticeable or unobjectionable, and thereby permit the augmentation of leafing characteristics to proceed without inhibition, primarily by maintaining in the composition upon standing, a stabilizing influence or condition, optimum for the promotion of leafing and the conservation of brilliancy.

As a specific example exemplifying my invention, I may take 32.5 grams polished aluminum powder in leaf form, mix the same mechanically with 19 grams petroleum hydrocarbon fraction of suitable boiling range and of relatively high purity from components not hydrocarbons, and in which is incorporated 0.2 to 0.8 gram camphor or analogous aromatic ketone. The addition of 10% camphor—as a specific example—to a petroleum fraction boiling at about 160 to 180 deg. C. increases the leafing power of the paste made therefrom from 10% to 20% above that made in the absence of camphor, or camphor equivalent.

For example, I prepared a liquid as follows: 90 gms. petroleum fraction of boiling range approximately as above stated, and 10 gms. gum camphor was heated together until the camphor was dissolved, although it is not necessary to heat camphor with such a petroleum fraction in order to induce solution. One gm. of aluminum stearate and 3 gms. commercial highly purified stearic acid, presumably containing a relatively small amount of stearin(e), were then added and the mixture heated until complete solution was obtained. After cooling to approximately room temperature, pastes made by mixing 35 gms. of this liquid with 65 gms. aluminum powder in flake form showed 20% greater leafing power than that obtained in the same manner but without the addition of the camphor.

In a formula representative of my invention employing a metal with a sol, I select an aluminum powder conforming to the physical and chemical specifications heretofore indicated, and prepare a colloidal sol as follows:

Take 200 parts of a petroleum or coal tar distillate within the boiling range of about 155 to 175° C. This hydrocarbon fraction may be composed entirely of aliphatic hydrocarbons or a mixture of aliphatic and aromatic hydrocarbons. I have found a mixture of decanes to dodecanes, combined with the xylenes to produce especially advantageous and unobvious results in connection with high molecular acids and their metallic salts in this connection.

To the mixture of hydrocarbons is added 0.6 gram metallic stearate as aluminum stearate, the mixture being introduced into a flask of suitable size provided with reflux condenser. The mixture is heated to incipient ebullition for about a half hour, cooled to around 80° C., and there is then added 6 to 6.5 parts commercial stearic acid or equivalent. When completely dissolved, cool to room temperature.

The sol is now in normally suitable condition for immediate use, or it can be further homogenized by passing the same through a colloid mill, as one with a tight gap about one one-thousandth inch (0.001") for about two minutes, when it may be stored for use.

Solutions or sol made with all aromatic hydrocarbons or coal tar distillates, such as high flash naphtha, I have found appear more stable than with some of the petroleum distillates of aliphatic hydrocarbons, and are excellent solvents, comparatively speaking, of metal high molecular weight aliphatic esters as aluminum stearate. Furthermore, in commercial naphthas of various grades and origins there appears to be present in minute quantity or quantities a body or bodies which exerts a distinct stabilizing function or influence upon the composition as a whole, assisting in the preservation of the metal particle paste for prolonged periods.

An excellent composition has been obtained by me by incorporating 66.6 parts metal particle with 33.4 parts of the composition above, stirring gently in order to avoid abrasion or attrition, which has a tendency to diminish the leafing propensity. It is preferable to allow the material to stand for a time before use, say about 24

hours, when a definite equilibrium appears to be reached.

The above forms an excellent paste for decorative work and protective coatings. It usually has a leafing property of the order of 60% or higher, together with good physical and chemical stability.

Or, I may take 67 parts of aluminum particle as in the foregoing example, and add thereto the following: A petroleum or coal tar distillate or admixture thereof, of boiling range in the vicinity of 175° C. Take 28.4 parts of this purified hydrocarbon mixture and dissolve therein 0.1 part anhydrous aluminum stearate, 1% stearic acid (hot pressed) and 3.5 parts camphor, camphoraceous body or camphor substitute, provided the same is substantially all soluble in the hydrocarbon portion. This paste will have an initial leafing and mirroring capacity of from 10% to 20% in excess of a paste as made by the formula outlined in the preceding example. This increased leafing will persist for an indefinite period, especially if the paste is stored in a hermetically sealed container. The augmented leafing property slowly diminishes after the container contents has been exposed to the air, but the physical and chemical stability of the paste is excellent.

In another series of examples, using the quantities of components above enumerated, but in which the amount of aluminum stearate and stearic acid was successively reduced in quantity until they were entirely absent from the formula, still satisfactory promotion of leafing or mirroring characteristics was obtained.

I have described herein what I believe to be typical examples and preferred embodiments of my invention. I do not wish, however, to be confined to the embodiments described, or the quantities of components stated, but what I desire to cover by Letters Patent is set forth in the appended claims.

I claim:

1. A metallic pigment paste formed by mixing a metallic powder with a colloidal sol with camphor which causes the paste to have a greater leafing power than the same weight of dry powder.

2. A metallic pigment paste formed by mixing a metallic powder with a colloidal sol with a camphor body which causes the paste to have a greater leafing power than the same weight of dry powder.

3. A metallic pigment paste formed by mixing metallic aluminum particles in leaf form with a petroleum fraction of hydrocarbons of high purity having a boiling point range of 160° to 200° C. containing dissolved therein a readily sublimable solid, neutral, volatile aromatic ketone, in proportion to promote leafing of the pigment portion.

4. Method for promoting the leafing of a pigment consisting of a plurality of aluminum particles in flake form, comprising incorporating said pigment into a high flash point naphtha, in which has been dissolved a proportion of naphthalene.

5. An improved method for augmenting the leafing characteristics of a pigment mixture comprising particles of aluminum in flake form, consisting of dissolving a neutral, readily sublimable organic solid of the group consisting of aromatic ketones, naphthalene and substituted naphthalenes in a highly purified mixture of aliphatic hydrocarbons of suitable boiling range, and incorporating the same with the metallic particle proportion to the consistency and metal content required, substantially as herein set forth.

6. An improved method for augmenting the leafing characteristics of a pigment mixture comprising particles of aluminum in flake form, consisting of dissolving a neutral, readily sublimable organic solid of the group consisting of neutral hydrocarbon bodies and aromatic ketones in a highly purified mixture of aromatic hydrocarbons of suitable boiling range, and incorporating the same with the metallic particles in proportion to the consistency and metal content required, substantially as herein set forth.

7. A metallic pigment paste formed by mixing a metallic powder with a stable colloidal sol containing in addition a neutral hydrocarbon body solid at ordinary temperature but which readily sublimes at such temperature and causes an increase in the leafing power of the paste.

8. A metallic pigment paste which promotes leafing of a pigment composed of finely divided aluminum particles in flake form intimately mixed with a stable colloidal sol containing in addition a readily sublimable solid, volatile aromatic hydrocarbon dissolved in a paraffin hydrocarbon fraction of relatively high purity.

9. A metallic pigment paste composed of finely divided particles of aluminum particles in flake form intimately mixed with a stable colloidal sol containing a proportion of camphor, aluminum stearate and stearic acid dissolved in a petroleum fraction having a boiling point range of 160° to 200° C. in such amount and under such conditions as to promote the leafing of the pigment.

10. A metallic pigment paste formed by mixing a metallic powder with a stable colloidal sol and formed of a metallic soap dispersed in a liquid phase of the paste and containing in addition an organic compound solid at ordinary temperature but which sublimes at such temperature and which causes an increase in the leafing power of the paste, said organic compound comprising camphor.

11. A metallic pigment paste composed of metallic particles in leaf form mixed with a petroleum fraction of hydrocarbon of high purity having dissolved therein a readily sublimable, solid, neutral, volatile hydrocarbon body in amount sufficient to promote the leafing of the metal particles.

12. A metallic pigment paste composed of finely divided metallic particles mixed with a solution containing a colloidal sol consisting of high flash point naphtha, a metallic stearate and naphthalene in amount sufficient to promote the leafing power of the metal particles.

13. A metal pigment composition of improved leafing characteristics comprising an intimate mixture of metallic powder, a volatile hydrocarbon liquid, a higher fatty acid as leafing agent, and a normally solid readily sublimable aromatic stabilizing agent selected from the group consisting of camphor, naphthalene, and camphoraceous and naphthalenic bodies.

14. A stabilized metal pigment paste having improved leafing power comprising metal flakes, stearic acid, a substituted naphthalene, and a thinner.

15. A stabilized metal pigment paste having improved leafing power comprising metal flakes, stearic acid, a substituted naphthalene, and a petroleum oil thinner.

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