



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 1 388 365 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
11.02.2004 Bulletin 2004/07

(51) Int Cl.7: **B01F 3/12**, G06F 17/00,
B44D 3/06, C08K 3/00,
B65B 57/14

(21) Application number: **03017589.7**

(22) Date of filing: **08.08.2003**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PT RO SE SI SK TR**
Designated Extension States:
AL LT LV MK

• **Kagamiyama, Masayuki**
Hiratsuka-shi, Kanagawa-ken (JP)
• **Ino, Satoshi**
Hiratsuka-shi, Kanagawa-ken (JP)

(30) Priority: **08.08.2002 JP 2002230676**

(71) Applicant: **KANSAI PAINT CO., LTD.**
Amagasaki-shi, Hyogo-ken 661-8555 (JP)

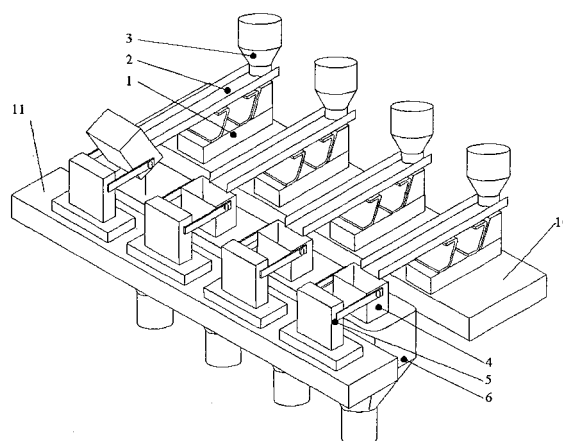
(74) Representative:
Banzer, Hans-Jörg, Dipl.-Ing. et al
Kraus & Weisert
Patent- und Rechtsanwälte
Thomas-Wimmer-Ring 15
80539 München (DE)

(72) Inventors:
• **Suzuki, Yasuyuki**
Hiratsuka-shi, Kanagawa-ken (JP)

(54) **Method and apparatus for mixing toned paint**

(57) A method for supplying a toned paint by weighing and blending one or more types of granular color materials and a base paint and agitating and mixing them, characterized in that selection of a granular color material and the blending quantity of the granular color material are automatically decided from a prepared toning database by inputting a desired color or a color measurement result of an existing color and the weight of the base paint to a computer and supply of the granular color material is controlled. A weighing-toning system used for the toned-paint supplying method includes control means for deciding selection of a granular color material and the blending quantity of the material for a prepared toning database in accordance with a desired color or color measurement result of an existing color and the weight of a base paint, means for selecting and weighing (5) a granular color material in accordance with a command supplied from the control means, and means for supplying (4) the weighed granular color material to a vessel in which a base paint is stored and uniformly agitating and mixing the base paint and granular color material in the vessel.

Fig. 1



Description

[0001] The present invention relates to a method for supplying a toned paint using a granular color material for paint or ink.

Related Background Art and Its Problems

[0002] It is conventionally publicly known to blend one or more types of primary-color paints or primary-color pastes with a white or transparent base paint packed in a vessel such as a can in order to obtain a toned product from paints.

[0003] However, because it has been necessary to use these primary-color paints or primary-color pastes by dispersing the pigment of each color with a resin dispersion or dispersing agent for several hours and forming the pigment into a paste or a primary-color paint (enamel), a lot of effort has been required. It is possible to reduce the number of steps if the pigment powder of each color can be directly blended with a base paint. However, it takes a lot of time to disperse each pigment powder up to primary particles and moreover, it is difficult to perform stable toning.

[0004] It is an object of the present invention to provide a method and a system for supplying a toned paint by excluding steps of preparing a liquid primary-color paint or primary-color paste and directly blending a granular color material with a base paint.

[0005] This object is achieved by a method for supplying a toned paint as defined in claim 1 and a weighing-toning system as defined in claim 6. Additionally a toned paint as defined in claim 5 is provided. The dependent claims define preferred and advantageous embodiments of the invention.

Effect of the Invention

[0006] According to the present invention, by using a granular color material, directly blending the granular color material with a base paint, and preparing a toned paint, it is possible to exclude conventional steps of preparing a liquid primary-color paint or primary-color paste and thereby greatly reduce the number of steps.

[0007] A method of the present invention for supplying a toned paint is able to correspond to a large-quantity supply of paint every oil can at a color center in a paint maker and a small-quantity supply of paint at a paint delivery agent, do-it-yourself center, or home center.

Brief Description of the Drawing

[0008]

FIG. 1 is a perspective view showing a weighing and supplying apparatus used for a method of the present invention.

Working Embodiments of the Invention

[0009] The present invention provides a method for supplying a toned paint by directly blending one or more types of weighed granular color materials with a base paint and agitating and mixing them.

[0010] A base paint is a liquid paint and it is allowed that the paint is the water-diluted type or organic-solvent-diluted type and the type and color of the base paint are not restricted. However, a white paint or transparent paint can be normally preferably used and particularly, the white paint is preferable. In the case of the present invention, a base paint is basically directly used except that it is not toned and it can be used as a paint by adjusting its viscosity with water or solvent and contains a paint binder and pigment component. It is allowed that a base paint contains a paint additive such as a curing catalyst, antifoaming agent, flowage adjuster, painted-surface adjuster, film-forming assistant, plasticizer, freeze stabilizer, ultraviolet absorbent, or ultraviolet stabilizer according to necessity.

[0011] The base paint is prepared while it is stored as a product in a vessel such as a can.

[0012] It is preferable that the quantity of a base paint to be stored in a vessel is kept in a range of 70 to 99 wt% of a predetermined canned paint quantity from the viewpoint of the paint film performance of a finally obtained toned paint and of obtaining a toned paint of wide-range paints. Moreover, it is preferable to set the quantity of a base paint to be stored in a vessel to a value at which the quantity of a granular color material to be blended in the vessel is kept in the range of an allowable rate from the viewpoint of paint film performance and painting property. Thus, it is possible to exclude causes of deterioration of paint-film performance and deterioration of painting property.

[0013] The above granular color material is not restricted as long as it is a conventionally-publicly-known non-dusting uniform pigment adjusting material, which can use one of color materials of white, red, blue, green, yellow, and black, whose most particles are spherical, whose average particle diameter ranges between 5 and 3,000 μm or preferably

ranges between 20 and 2,000 μm , and whose specific gravity ranges between 0.2 and 0.6 g/ml. As the above granular color material, it is preferable to use a material having a hollow structure from the viewpoint of its high dispersibility into a base paint.

[0014] Particles of the above granular color material are spherically formed by adding 5 to 30 wt% of an additive such as a nonion-based interfacial active agent to, for example, a synthesized pigment and suspending the mixture and then, freeze-drying or spray-drying it.

[0015] In the case of the present invention, by inputting a desired color or a color-measurement result of an existing color and a base-paint weight to a computer, the granular color material is selected and the quantity of the material to be blended is automatically decided in accordance with a prepared toning database and supply of the granular color material is controlled.

[0016] To perform the above computer toning, a base paint and the optical data for each granular color material are previously obtained as basic data. As the basic data for each granular color material, it is preferable to obtain optical data by using the enamel paint of each color obtained by dissolving a proper quantity of each of the granular color materials in a transparent base paint and thereby preparing a color card. The optical data can be the absorption coefficient and dispersion coefficient of a primary-color enamel paint prepared by dissolving a base paint and each granular color material in a transparent base paint and mixing them. For example, the optical data can be obtained by using the optical density formula of Kubelka Munk and the color mixing theory of Duncan in accordance with a spectral reflectance obtained by using a primary-color enamel paint prepared by dissolving and mixing a base paint and each granular color material in and with a transparent base paint. Thereby, the standard toning database is formed.

[0017] Specifically, the spectral reflectance of a desired sample is measured by using a color sample book for the existing colors and a spectrophotometer. A toning-blending quantity is calculated by using a computer color-toning system and a base paint and a granular color material in accordance with the measured spectral reflectance to obtain the blending quantity of the granular color material to the weight of the base paint.

It is also possible to correct a toning database corresponding to a lot difference between granular color materials and weight change or volume change of the color materials to humidity according to necessity.

[0018] Thereby, it is possible to prepare a toned paint obtained by simultaneously blending granular color materials and confirm a color by measuring the spectral reflectance of a color card by a prepared final toned paint according to necessity.

[0019] Moreover, it is allowed to perform fine toning for obtaining the blended remaining quantity of granular color materials to be toned to a target color by blending granular color materials up to a quantity equal to or less than a predetermined quantity, preparing a toned color card for color confirmation, measuring the paint color, and using a computer toning system in accordance with the color measured value. The fine adjustment is preferable also from the viewpoint of correspondence to weight change and volume change to the lot difference between granular color materials and the humidity of the materials.

[0020] Moreover, in the case of the present invention, it is allowed to perform toning by not only using toning according to weighing and blending of only granular color materials but also using weighing and blending according to one or more types of liquid primary color paints or primary pastes for weighing and blending of the granular color materials when necessary.

[0021] A weighing-toning system used for the present invention comprises control means for selecting a granular color material and deciding the blending quantity of the color material from a previously formed toning database in accordance with a color measurement result of a desired color or existing color and a base-paint weight, means for selecting and weighing a granular color material in accordance with a command sent from the control means, and means for supplying the weighed granular color material to a vessel in which a base paint is stored and uniformly agitating and mixing the base paint and granular color material in the vessel. It is allowed that these means are set in separate apparatuses or the same apparatus.

[0022] The control means for selecting a granular color material and deciding its blending weight can use a conventionally-publicly-known computer toning system. In general, the system is constituted by a computer and a spectrophotometer. By measuring the color of a desired-color or existing-color color card by a spectrophotometer, it is possible to select a granular color material for a predetermined weight of a base paint and obtain the data for the blending quantity of the color material from a standard toning database built in the computer.

[0023] Means for weighing a granular color material in accordance with a command sent from the control means is not restricted as long as it can be accurately weighed in accordance with a weight standard or volume standard. Therefore, it is possible to use a conventionally-publicly-known weighing device. Though it is possible that an operator weighs the granular color material of the above decided quantity and blend it in a vessel in which a base paint is stored, it is allowed to weigh a granular color material discharged into a tray of the weighing device through a supply route from a vessel such as a hopper in which the granular color material is stored and dropped, measure the weight of the hopper in which the granular color material is stored and that of the supply route by subtracting a discharged weight, or perform volume measurement by using a flow meter in the middle of the supply route. Particularly, it is preferable that discharge

and weighing of a necessary granular color material and supply of it to a vessel in which a base paint is stored are automatically controlled by a computer in accordance with the above weighing command.

[0024] FIG. 1 shows an apparatus for automatically weighing and supplying a granular color material. In FIG. 1, symbol 1 denotes an electromagnetic-feeder driving section, 2 denotes a carrying trough, 3 denotes a hopper filled with each granular color material, 4 denotes a packet, 5 denotes a weighing unit, and 6 denotes a discharge chute. The carrying trough 2 is a carrying route for carrying a granular color material discharged from the hopper 3 and carrying of a granular color material is controlled by the electromagnetic-feeder driving section 1. The weighing unit 5 is provided with the packet 4 for receiving a granular color material falling from the carrying trough 2, which measures the total weight of the packet 4 including the received granular color material. The weighed granular color material is supplied from the discharge chute 6 to a vessel (not illustrated) in which a base paint is stored.

[0025] Because a granular color material is easily influenced by humidity or the like, it is preferable to protect a hopper in which the granular color material is stored and a supply route by covering the whole system with a glass plate or acrylic plate, providing a lid for the hopper, circulating dry air or inert gas, and always using a desiccant.

[0026] To carry a granular color material, it is possible to use various types of feeders. However, it is particularly preferable to use an electromagnetic-vibration feeder because the granular color material is smoothly carried. The electromagnetic-vibration feeder controls the supply rate of a granular color material in a carrying route by providing vibration to the carrying route.

[0027] As means for uniformly agitating the base paint and granular color material in the vessel, it is possible to use a conventionally publicly-known agitating-mixing apparatus. In general, it is preferable to uniformly agitate and mix a base paint and a granular color material which are contents by, for example, a gyromixer. Thereby, it is possible to obtain a paint which can be shipped or used as a product. When a base paint has a high viscosity, it is also allowed to lower the apparent viscosity of the paint by heating it so that the paint is easily mixed.

Examples

[0028] The present invention is further specifically described, referring to the following Examples. However, the present invention is not restricted by those Examples.

[0029] In these Examples, computer toning was performed by using ALES MATCH™ made by Kansai Paint Co., Ltd. as a computer toning system. This system is constituted by a computer and a spectrophotometer. The paint uses a water-based normally-dry acrylic emulsion paint (AQUA GLOSS WHITE™ made by Kansai Paint Co., Ltd.) as a white base paint. As granular color materials, black, ocher, and red rusts are used which are hollow structure particles having an average particle diameter of 100 μm and superior in water solubility. The vessel used was a can having a capacity of 20.0 kg., in which 16.0 kg of a white base paint was filled. Example 1 is an embodiment in which confirmation toning was not performed during operation and Examples 2 and 3 are embodiments in which confirmation toning was performed. Moreover, Example 4, ocher and red rusts respectively used a granular color material but black rust used a normal liquid-paste-type color material.

Example 1

(Toning preparation or primary-color optical data obtainment)

[0030] First, basic data used for a computer toning system is obtained. Then, the following are obtained:

the absorption coefficient and dissipation coefficient (these are generally referred to as optical data) of a primary-color enamel paint (hereafter referred to as primary-color enamel paint) obtained by mixing and agitating a white base paint and each granular color material with a transparent base paint (clear paint of AQUA GLOSS WHITE™ made by Kansai Paint Co., Ltd.) by using the optical density formula of Kubelka Munk and the color mixing theory of Duncan widely known for the toning and blending quantity calculation using a computer toning system.

[0031] The following is a method for obtaining optical data in this example.

1. Color cards are prepared which are painted so as to be sufficiently covered with paint obtained by mixing a white base paint, each granular color material, and primary-color enamel paint at the following blending ratios. To prepare optical data for white base paint:

100% of white base paint, 99.5% of white base paint + 0.5% of black granular color material

To prepare optical data for black primary-color enamel paint:

EP 1 388 365 A1

99.5% of white base paint + 0.5% of black granular color material,
100% of black primary-color enamel paint (66.6% of transparent base paint + 33.4% of black granular color material)

To prepare optical data for ocher primary-color enamel paint:

95% of white base paint + 5% of ocher granular color material,
100% of ocher primary-color enamel paint (66.6% of transparent base paint + 33.4% of ocher granular color material)

To prepare optical data for red-rust primary-color enamel paint:

95% of white base paint + 5% of red-rust granular color material,
100% of red-rust primary-color enamel paint (66.6% of transparent base paint + 33.4% of red-rust granular color material)

2. Colors of the above prepared color cards are measured to obtain spectral reflectances.

3. Optical data is obtained from spectral reflectances by using the optical density formula of Kubelka Munk and the color mixing theory of Duncan.

(Blending quantity calculation)

[0032] The spectral reflectance of a sample having a color for toning is obtained by applying the 2001-edition sample book A22-75D (beige color) of Japan Paint Industry Association to the sample and using a spectrophotometer. When showing the chromaticity of the sample by using the CIELAB color-specification system under the condition of 10-degree visual field of the D65 light source, L^* is 76.53, a^* is 1.76, and b^* is 15.20. As a result of calculating a toning blending quantity with a white base paint and each granular color material by using a computer toning system in accordance with the above data, the following blending ratio (A) is obtained.

Blending ratio (A)	
White base paint	92.138%
Black granular color material	1.430%
Red-rust granular color material	0.441%
Ocher granular color material	5.991%

[0033] By performing proportional distribution in accordance with the designated quantities obtained from the blending ratio (A), the following blending quantity (1) is obtained because the quantity of the white base paint previously put in a can is 16.0 kg.

Blending quantity (1)	
White base paint	(16.000 Kg)
Black granular color material	0.249 Kg
Red-rust granular color material	0.077 Kg
Ocher granular color material	1.040 Kg
(Total: 17.366 Kg)	

[0034] A color card is prepared by mixing a granular color material with a paint in the can and waving the can with a gyromixer (made by Corob S.p.A.) to uniform the paint in the can, sampling the paint to confirm the color, and painting the card with the paint up to a dry film thickness of approx. 30 μm which is sufficient to cover the card, and then drying the card at ordinary temperature. The spectral reflectance of the obtained color card is obtained by using a spectrophotometer. When showing the chromaticity of the color card by using the CIE Lab color-specification system under the condition of 10-degree visual field of the light source D65, L^* is 77.20, a^* is 1.80, and b^* is 15.22. When showing the color difference between the color card and the sample in terms of ΔE_{ab}^* , it is 0.73 by assuming that the color-specification conditions are the same.

Example 2

[0035] Optical data and blending quantity are calculated the same as Example 1.

[0036] The spectral reflectance of a sample having a color for toning is obtained by also applying the 2001-edition sample book A25-75D of Japan Paint Industry Association same as Example 1 to the sample and using a spectrophotometer. As a result of calculating the toning and blending quantity with a white base paint and a granular color material and using a computer toning system in accordance with the above spectral reflectance, the blending ratio (A) in Example 1 is obtained.

(Toning and evaluation of prepared color card)

[0037] As a result of performing proportional distribution in accordance with the designated quantities obtained from the blending ratio (A), the following blending quantity (1) is obtained because the white base paint previously put in a can is 16 kg. Granular color materials in the can are mixed in accordance with the blending quantity (1) to wave the can so that they become uniform.

Blending quantity (1)	
White base paint	(16.000 Kg)
Black granular color material	0.249 Kg
Red rust granular color material	0.077 Kg
Ocher granular color material	1.040 Kg
(Total: 17.366 Kg)	

[0038] Then, a necessary minimum quantity of paint is sampled from the can to prepare a color card painted so as to be sufficiently covered with the paint. The spectral reflectance of the obtained color card is obtained by a spectrophotometer. When showing the chromaticity of the color card by using the CIE Lab colorimetric system under the condition of the 10-degree visual field of the light source D65, L^* is 77.02, a^* is 1.83, and b^* is 15.23. When showing the chromaticity in terms of ΔE_{ab}^* , it is 0.49 by assuming that the color-specification conditions are the same. As a result of calculating a corrected blending quantity by using a computer toning system in accordance with the spectral reflectance of the obtained color card and that of the sample, the following blending ratio (B) is obtained. Moreover, an additional granular-color-material blending quantity (2) is obtained from the blending ratio (B). The blending ratio (B) and additional granular-color-material blending quantity (2) denote a blending ratio and an additional blending quantity to the paint quantity (17.36 kg) in the can at this point of time.

Blending ratio (B)	
Black granular color material	0.109%
Red-rust granular color material	0.004%
Ocher granular color material	0.249%
Additional granular-color-material blending quantity (2)	
Black granular color material	0.019 Kg
Red-rust granular color material	0.001 Kg
Ocher granular color material	0.043 Kg
(Total: 0.063 Kg)	

[0039] Granular color materials shown by the blending quantity (2) are mixed with the paint in the can and the can is waved to uniform the paint in the can. Then, a color card is prepared by sampling the paint in order to confirm the chromaticity, painting the color card with the paint so as to have a dry film thickness of approx. 30 μm which is sufficient to cover the card, and drying the card at ordinary temperature. The spectral reflectance of the obtained color card is obtained by a spectrophotometer. When showing the chromaticity by using the CIELAB color-specification system under the condition of 10-degree visual field of the light source D65, L^* is 76.87, a^* is 1.74, and b^* is 15.17. When showing the color difference between the color card and the sample in terms of ΔE_{ab}^* , it is 0.34 by assuming the color-specification conditions are the same.

Example 3

[0040] Optical data and blending quantity are calculated the same as Example 1.

[0041] The spectral reflectance of a sample having a color for toning is obtained by also applying the 2001-edition sample book A25-75D of Japan Paint Industry Association used for Example 1 to the sample and using a spectrophotometer. The toning blending quantity is calculated with a white base paint and a granular color material by using a computer toning system in accordance with the obtained spectral reflectance. As a result, the blending ratio A in Example 1 is obtained. By calculating the blending quantity of each granular color material to 16 kg of the white base paint in accordance with the blending ratio A, the blending quantity (1) in Example 1 is obtained. As a result of performing calculation so that blending quantities of the granular color materials in the blending quantity (1) decrease by 10%, a blending quantity (3) is obtained.

Blending quantity (3)	
White base paint	(16.000 Kg)
Black granular color material	0.222 Kg
Red-rust granular color material	0.069 Kg
Ocher granular color material	0.935 Kg
(Total: 17.226 Kg)	

[0042] The granular color materials shown in the blending quantity (3) are mixed with the paint in a can and the can is waved to uniform the paint in the can. Then, a color card is prepared by sampling the paint in order to confirm the chromaticity, painting the card with the paint so as to have a dry film thickness of approx. 30 μm which is sufficient to cover the card, and drying the card at ordinary temperature. The spectral reflectance of the obtained color card is obtained by a spectrophotometer. When showing the chromaticity under the condition of 10-degree visual field of the light source D65 by using the CIELAB color specification system, L^* is 77.63, a^* is 1.73, and b^* is 15.23. When showing the chromaticity in terms of ΔE_{ab}^* by assuming that the color-specification conditions are the same, it is 1.10. As a result of calculating a corrected blending quantity in accordance with the spectral reflectance of the obtained color card and that of the sample by using a computer toning system, the following blending ratio (C) is obtained. Moreover, an additional granular-color-material blending quantity (4) is obtained from the blending ratio (C). The blending ratio (C) and additional granular-color-material blending quantity (4) denote a blending ratio and additional blending quantity to the paint quantity (17.226 kg) in the cat at this point of time.

Blending ratio (C)	
Black granular color material	0.268%
Red-rust granular color material	0.052%
Ocher granular color material	0.249%
Additional granular-color-material blending quantity (4)	
Black granular color material	0.046 Kg
Red-rust granular color material	0.009 Kg
Ocher granular color material	0.155 Kg
(Total: 0.210 Kg)	

[0043] The granular color material shown in the above blending quantity (4) is mixed with the paint in the can and the can is shaken to homogenize the paint in the can. Then, a color card is prepared in order to confirm the chromaticity, by sampling the paint, painting the card with the paint to a dry film thickness of approx. 30 μm which is sufficient to cover the card, and drying the card at ambient temperature. The spectral reflectance of the obtained color card is measured with a spectrophotometer. When the chromaticity is expressed under the condition of 10-degree visual field of the light source D65 by using the CIELAB color specification system, L^* is 76.88, a^* is 1.77, and b^* is 15.13. The color difference from the sample is, when expressed in terms of ΔE_{ab}^* under an assumption that the color-specification conditions are the same, it is 0.36.

Example 4

(Toning preparation or primary-color optical data obtainment)

[0044] First, basic data used for a computer toning system is obtained. Obtainment of red rust and ocher conforms to the toning preparation or primary-color optical data obtainment of Example 1.

[0045] An optical-data obtaining method of this example is described below.

1. A color card is prepared by mixing a white base paint, granular color materials, primary-color enamel paint, and liquid black paste at the following blending ratio and painting the card with the obtained paint up to a thickness which is sufficient to cover the card.

To prepare optical data for white base paint:

100% of white base paint, 99.5% of white base paint + 0.5% of black paste

To prepare optical data for black paste:

99.5% of white base paint + 0.5% of black paste, 100% of black paste

To prepare optical data for ocher primary-color enamel paint:

95% of white base paint + 5% of ocher granular color material,
100% of ocher primary-color enamel paint (66.6% of transparent base paint + 33.4% of ocher granular color material)

To prepare optical data for red-rust primary-color enamel paint:

95% of white base paint + 5% of red-rust granular color material,
100% of red-rust primary-color enamel paint (66.6% of transparent base paint + 33.4% of red-rust granular color material)

2. The color of the above prepared color card is measured to obtain the spectral reflectance.

3. Optical data is obtained from the spectral reflectance by using the optical density formula of Kubelka Munk and the color mixing theory of Duncan.

(Blending quantity calculation)

[0046] The spectral reflectance of a sample having a color for toning is obtained by applying the 2001-edition sample book A22-75D (beige color) of Japan Paint Industry Association to the sample and using a spectrophotometer. When showing the chromaticity of the sample by using the CIELAB color-specification system under the condition of 10-degree visual field of the D65 light source, L^* is 76.53, a^* is 1.76, and b^* is 15.20. As a result of calculating a toning blending quantity with a white base paint and each granular color material by using a computer toning system in accordance with the above data, the following blending ratio (A) is obtained.

Blending ratio (A)	
White base paint	92.111%
Black paste	1.517%
Red-rust granular color material	0.436%
Ocher granular color material	5.936%

[0047] By performing proportional distribution in accordance with the designated quantities obtained from the blending ratio (A), the following blending quantity (1) is obtained because the quantity of the white base paint previously put in a can is 16.0 kg.

Blending quantity (1)	
White base paint	(16.000 Kg)
Black paste	0.264 Kg
Red-rust granular color material	0.076 Kg
Ocher granular color material	1.031 Kg
(Total: 17.371 Kg)	

[0048] A color card is prepared by mixing granular color materials with a paint in the can and waving the can to uniform the paint in the can, sampling the paint to confirm the color, and painting the card with the paint up to a dry film thickness of approx. 30 μm which is sufficient to cover the card, and then drying the card at ordinary temperature. The spectral reflectance of the obtained color card is obtained by using a spectrophotometer. When showing the chromaticity of the color card by using the CIE Lab color-specification system under the condition of 10-degree visual field of the light source D65, L^* is 76.79, a^* is 1.74, and b^* is 15.16. When showing the color difference between the color card and the sample in terms of ΔE_{ab}^* , it is 0.26 by assuming that the color-specification conditions are the same.

Example 5

[0049] Basic stability tests (color stability, mixed-color stability, and storage stability) are applied to paints relating to the present invention. For samples, a water-based normally-dry acrylic emulsion paint (AQUA GLOSS WHITE™ made by Kansai Paint Co., Ltd.) is used as a white base paint and a blue color material constituted by hollow-structure particles having an average particle diameter of 100 μm and superior in water solubility is used as a granular color material. Moreover, blue, black, ocher, and red-rust liquid primary-color pastes respectively containing 20% of a pigment component conventionally used are used as comparative examples. In this case, for comparison, tests are performed by adjusting blending quantities so that the quantity of the pigment component of the granular color material becomes equal to the quantity of each of the liquid primary-color pastes.

[0050] Sample <1>: A quantity of 1.25 g of the blue granular color material is added to 100 g of the white base paint and agitated by a homodisper at 1,500 rpm for 5 min until they are sufficiently mixed.

[0051] Sample <2>: A quantity of 0.25 g of the blue granular color material is added to 100 g of the white base paint and moreover, 1 g of the black liquid primary-color paste, 1 g of ocher, and 1 g of red rust are added to it and agitated by a homodisper at 1,500 rpm for 5 min until they are sufficiently mixed.

[0052] Sample <3>: A quantity of 5 g of the blue liquid primary-color paste to 100 g of the white base paint and agitated by a homodisper at 1,500 rpm for 5 min until they are sufficiently mixed.

[0053] Sample <4>: Quantities of 2 g of the blue liquid primary-color paste, 1 g of black, 1 g of ocher, and 1g of red rust are added to 100 g of the white base paint and agitated by a homodisper at 1,500 rpm for 5 min until they are sufficiently mixed.

Preparation and performance test of test color cards

[0054] Each test color card is prepared by painting the card with the above each sample until its dry film thickness reaches approx. 30 μm which is sufficient to cover the card and drying the card at ordinary temperature (normal portion). In the drying process, a part of the color card is rubbed by a finger before dry-to-touch of the card to prepare the normally-dried portion (rubbed portion). Moreover, by newly dripping the same sample on a part of the normal portion dried at ordinary temperature to paint the part thicker than the normal state and then drying it at ordinary temperature, the portion (drip-painted portion) dried at ordinary temperature is prepared.

[0055] The color stability is evaluated by checking the color difference between a normal portion and a rubbed portion or drip-painted portion in accordance with visual observation and a color difference ΔE obtained through color measurement. Moreover, a paint state is visually evaluated.

[0056] Criteria of visual evaluation are described below. Moreover, the same evaluation is performed after storing the samples for 10 days at 40°C. Table 1 shows the evaluation results.

Evaluation criteria of color stability

[0057]

○: Color difference from normal portion cannot be confirmed.

Δ: Color difference from normal portion can be confirmed.

Evaluation criteria of paint state

[0058]

○: Trouble such as color separation or color float is not confirmed.

Δ: Trough such as color separation or color float is confirmed.

Table 1

		Sample <1>	Sample <2>	Sample <3>	Sample <4>
Before storing paint	Visual observation of rubbed portion	○	○	Δ	○
	Rubbed portion ΔE	0.7	0.2	2.0	0.3
	Visual observation of drip-painted portion	○	○	○	○
	Drip-painted portion ΔE	0.2	0.4	0.4	0.5
	Paint state	○	○	○	○
After storing paint at 40°C for ten days	Visual observation of rubbed portion	○	○	Δ	○
	Rubbed portion ΔE	1.1	0.5	1.7	0.7
	Visual observation of drip-painted portion	○	○	○	○
	Drip-painted portion ΔE	0.1	0.6	0.3	0.3
	Paint state	○	○	Δ	○

[0059] From the above results, it can be confirmed from the basic performance tests of toned paints using granular color materials that each of the toned paints using a granular color material has the basic performance equal to or higher than the case of using a conventional liquid primary-color paste.

Claims

1. A method for supplying a toned paint by weighing and blending one or more types of granular color materials and a base paint and agitating and mixing them, **characterized in that** a desired color or a color weighing result of an existing color is input to and the weight of the base paint is input to a computer and thereby, selection of a granular color material and the blending quantity of the granular color material are automatically decided in accordance with a prepared toning database and supply of the granular color material is controlled.
2. The method for supplying a toned paint according to the above claim 1, **characterized in that** a base paint is a white or transparent paint and it is stored in a vessel as a product.
3. The method for supplying a toned paint according to claim 1 or 2, **characterized in that** the granular color material has a hollow structure.
4. The method for supplying a tone paint according to any one of claims 1-3, **characterized in that** weighing and blending of one or more types of primary-color paints or primary-color pastes is used together with weighing and blending of granular color materials.
5. A toned paint supplied in accordance with the supply method according to any one of the above claims 1 to 4.
6. A weighing-toning system used for the method for supplying a toned paint according to any one of the above claims

EP 1 388 365 A1

1 to 4, which comprises control means for deciding selection of a granular color material and the blending quantity of the granular color material from a prepared toning database in accordance with the color weighing result of a desired color or existing color and a base-paint weight, means for selecting and weighing (5) a granular color material in accordance with a command supplied from the control means, and means for supplying (4) the weighed granular color material to a vessel in which a base paint is stored and uniformly agitating and mixing the base paint and granular color material in the vessel.

5

10

15

20

25

30

35

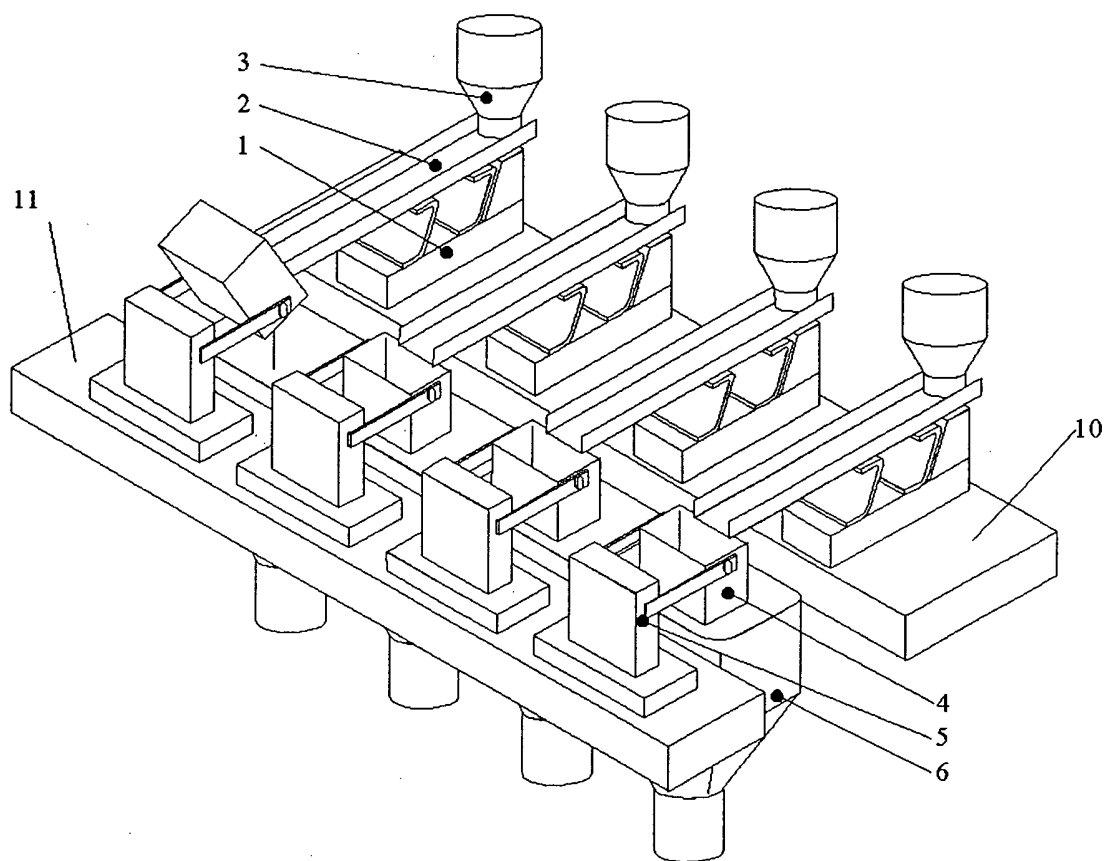
40

45

50

55

Fig. 1





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 01 7589

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
Y	PATENT ABSTRACTS OF JAPAN vol. 0062, no. 23 (C-133), 9 November 1982 (1982-11-09) & JP 57 126867 A (KIKUSUI KAGAKU KOGYO KK), 6 August 1982 (1982-08-06) * abstract *	1,2,4-6	B01F3/12 G06F17/00 B44D3/06 C08K3/00 B65B57/14
Y	----- US 5 153 825 A (YAUK ROBERT H ET AL) 6 October 1992 (1992-10-06) * the whole document *	1,2,4-6	
P,A	----- WO 02 073142 A (METTLER TOLEDO GMBH ; SCHMID JOHANNES (CH)) 19 September 2002 (2002-09-19) * the whole document *	1,2,4-6	
A	----- PATENT ABSTRACTS OF JAPAN vol. 0040, no. 30 (C-002), 15 March 1980 (1980-03-15) & JP 55 005965 A (KOWA KAGAKU KOGYO KK), 17 January 1980 (1980-01-17) * abstract *	1,2	
A	----- PATENT ABSTRACTS OF JAPAN vol. 0090, no. 59 (C-270), 15 March 1985 (1985-03-15) & JP 59 193967 A (NIPPON PAINT KK), 2 November 1984 (1984-11-02) * abstract *	1	
A	----- PATENT ABSTRACTS OF JAPAN vol. 0132, no. 55 (C-606), 13 June 1989 (1989-06-13) & JP 1 056782 A (NIPPON CEMENT CO LTD), 3 March 1989 (1989-03-03) * abstract *	1,2	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			C09D G06F B01F B44D C08K G05D B65B G01G
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 18 November 2003	Examiner Philpott, G
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document	

EPO FORM 1503 03.82 (P04C01)



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 01 7589

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 5 718 268 A (MUSCARA DOMINIC) 17 February 1998 (1998-02-17) * column 2, line 51 - column 4, line 64 *	1	
A	EP 0 484 564 A (KANSAI PAINT CO LTD) 13 May 1992 (1992-05-13) * the whole document *	1	
A	EP 0 971 007 A (GROS HANS PETER DKFM) 12 January 2000 (2000-01-12) * abstract *	1,3	
A	US 5 795 507 A (SHEN JI ET AL) 18 August 1998 (1998-08-18) * column 1, line 60, paragraph 65 *	1,3	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 18 November 2003	Examiner Philpott, G
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 03 01 7589

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

18-11-2003

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
JP 57126867	A	06-08-1982	JP 1446011 C	30-06-1988
			JP 62055557 B	20-11-1987
US 5153825	A	06-10-1992	NONE	
WO 02073142	A	19-09-2002	DE 10111730 A1	02-10-2002
			WO 02073142 A1	19-09-2002
JP 55005965	A	17-01-1980	AU 522495 B2	10-06-1982
			AU 4156578 A	03-01-1980
JP 59193967	A	02-11-1984	JP 1781464 C	13-08-1993
			JP 4069194 B	05-11-1992
JP 1056782	A	03-03-1989	NONE	
US 5718268	A	17-02-1998	US 5570731 A	05-11-1996
			US 5464047 A	07-11-1995
			US 5686236 A	11-11-1997
			US 5623976 A	29-04-1997
EP 0484564	A	13-05-1992	EP 0484564 A1	13-05-1992
EP 0971007	A	12-01-2000	AT 205237 T	15-09-2001
			DE 59900235 D1	11-10-2001
			EP 0971007 A1	12-01-2000
			ES 2163928 T3	01-02-2002
US 5795507	A	18-08-1998	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82