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(54) Herstellungsverfahren von mit Harz beschichteten Trägerteilchen für elektrophotographische Entwickler.

(57) A method for manufacturing a resin-coated carrier for a electrophotographic developer comprising the steps of coating a resin on the surface of a carrier core, which resin and carrier core are a dielectric material, to obtain a resin coated carrier, and then baking the thus obtained resin-coated carrier by means of microwave heating to obtain the resin-coated carrier; and an electrophotographic developer using therein said resin-coated carrier. The resin-coated carriers have excellent durability, excellent resistance to the environment, as well as excellent producibility and economy.

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Background of the Invention

1. Field of the Invention

The present invention relates to a method for manufacturing a resin-coated carrier for an electrophotographic developer for use in a copying machine, a printer or the like, and to an electrophotographic developer using therein the carrier obtained by said method.

2. Prior Art

A two-component type developer used for electrophotography is composed of a toner and a carrier. When the developer is used, the carrier is stirred and mixed with the toner in a development box to give a desired charge to the toner and then carries the thus charged toner onto electrostatic latent images on a photosensitive material to develop the latent images thereby forming toner images. The carrier thus used remains on a magnet roll and is then returned again to the development box when it is again stirred and mixed with a fresh toner for repeated use as a developer.

Accordingly, the carrier is required to always provide the toner with the desired charge during the use of the carrier.

Further, in substitution for many of carriers, there has recently been generally used a resin-coated carrier prepared by coating the surface of a carrier core with various resins to obatin a carrier which is improved in durability and resistance to environmental dependence.

However, conventional developers which have heretofore been used will cause various inconveniences with respect to images developed, due to collision of carrier particles with each other by stirring, or friction between the development box and the carrier particles. One of the inconveniences is that the toner particles are fusion adhered onto the surface of the carrier particles by friction to cause useless consumption of the toner (the useless consumption being hereinafter refered to as "spent"-phenomenon) thereby widening the distiribution of charge amount between the toner and carrier with the result that toner scattering and image fog arise during the use of the developer for testing the service life thereof. Further, in a case where a resin-coated carrier is included instead of the above carrier in the developer, the resin of the outermost layer of the coated resin falls off to expose the internal resin layer thereby varying a charge amount between the toner and carrier with the result that such toner scattering and image fogging as above arise especially under high-temperature and high-humidity conditions, during the use of the developer. When the developer service life test is further conducted, the resin layer is peeled off to expose the carrier core thereby varying the carrier resistance with the result that the developer cannot maintain its performance of making images which are substantially equality to the initially made image and it finally ends its survice life.

In a case where a developer including the resincoated carrier is used, a "spent"-phenomenon with the toner tends to decrease as compared with the use of the uncoated carrier in the developer and, however, so-called granulation of the resin-coated carrier particles arise due to the carrier core particles being adhered to one another with the resin at the time of resin coating. The granulated resin-coated carrier particles are then separated one by one from one another thereby varying the fluidity of the developer during printing or copying, with the result that the toner concentration is varied, the density of images be obtained decreases due to the toner scattering caused by excessive concentration of the toner and to lessening of the toner density, and image deficiencies are very often incurred by adhesion of the carrier particles to the image.

There have heretofore been proposed various resin-coated carriers in order to improve carriers in durability. For example, there have been proposed carriers prepared by coating carrier cores on the surface with a fluorocarbon-based polymer (for example, Japanese Patent Application Laid-Open Gazette No. Sho. 54-126,040). Although the resin-coated carrier so proposed was stable in charging characteristics at its initial, but it allowed a developer containing it to vary in fluidity due to the use of the carrier for a long time thereby to form images having insufficient density, impair a photosensitive material due to adhesion of the carrier thereto and consequently incur defects as to images, thus the resin-coated carrier having been overall estimated to have a short service life.

Further, carriers coated with a silicone resin or the like have been proposed (Japanese Patent Application Laid Open Gazette No. Sho. 57-78,552, etc.). This silicone resin-coated carrier has an advantage that the use thereof makes it difficult to cause a "spent"-phenomenon because of its low-surface energy and, however, it causes fogging and toner scattering due to its gradual decrease in charge level with the result that a developer having the silicone resin-coated carrier has a short service life.

Recently, a carrier has been required to have satisfactory durability and a developer including such a carrier is ultimately required to be maintenance-free for use, as mentioned above. However, the service life of the resin-coated carrier is still short and, therefore, there has remained an outstanding problem as to difficulties in prolonging the service life of a developer containing such a carrier. Further, there has also remained a problem as to a still high cost for coating a carrier core with a resin.

The present invention was made to solve the problems of the above mentioned prior art, and an object of the present invention is to provide a method for manufacturing resin-coated carriers for an electrophotographic developer which are excellent in durability, resistance to environment without changing their electrifiability for the toner, and producibility, as well as in economy, and also to provide an electrographic developer including the carrier obtained by said method.

Summary of the Invention

The present inventors made various intensive studies to make sure what factors constitute a bar to solving the above problems and, as the result of their studies, they found that the occurrence of peeling of the resin of the resin-coated carrier and the granulation thereof are the biggest factors. As the result of their further studies, they also found that a further big factor is a method for heating a resin coated on a carrier core in the process of preparation of the resin-coated carrier. The present invention is based on this finding.

The method for manufacturing a resin-coated carrier for an electrophotographic developer of the present invention is characterized in that it comprises the steps of coating the surface of a carrier core which is a dielectric material, with a resin which is also a dielectric material and then baking the thus obtained resin coated carrier core by means of microwave heating to obtain a resin-coated carrier.

DETAILED EXPLANATION OF THE INVENTION

The present invention will now be explained hereunder in more detail.

The carrier core to be used in the present invention may be a dielectric material. Examples -thereof are ferrite, magnetite and ceramics, among which ferrite is preferred and Cu-Zn ferrite is particularly preferred. Therefore, since metals such as iron and copper are not a dielectric material, they cannot be used in the present invention. The mean particle diameter of the carrier core is in the range of preferably 15 to 200 μm, more preferably 20 to 150 μm. When the mean particle diameter of a carrier used is less than 15 μm, the carrier will exhibit its severe adhesion. On the other hand, when the mean particle diameter of a carrier is larger than 200 μm, the density of solid area of the resulting image will be deficient.

In the present invention, the surface of the carrier core which is a dielectric material is coated with a desired synthetic resin.

The resins to be used in the present invention are not particularly limited, and examples thereof are fluorine-based resins, silicone-based resins, acrylstyrene resins, alkyd resins, polyolefin resins, polyester resins and epoxy resins, and mixtures thereof.

In addition to the above, the typical usable resins include fluorine-based resins such as polyvinylidene fluoride and vinylidene fluoride/ tetrafluoroethylene copolymers; silicone-based resins such as cold-setting and thermosetting silicone resins which are used in the form of silicone varnish, and silane coupling agents of low-degree polymerization; acryl/styrene-based resins such as acryl-based resins alone, styrene-based resins alone, and copolymers of acryl-based monomer and styrene-based monomer, the acryl-based resins used herein refer to acrylic or methacrylic acid homopolymers, copolymers of said acid and other monomer, homopolymers of acrylic or methacrylic acid ester having functional groups, copolymers of said ester with other monomer; and each of these polymers, into which is introduced a thermosetting resin such as a melamine resin, or an isocyanate compound. Among these resins, acryl-based resins are the best from the standpoint of adhesion to the carrier cores.

The amount of such a resin coated is preferably 0.05 to 10.0% by weight, more preferably 0.1 to 7.0% by weight, of the resulting resin-coated carrier. When the amount of the resin used is less than 0.05% by weight, a uniform coating layer cannot be formed on the carrier surface. When the amount of the resin used is more than 10.0% by weight, the resulting coating layer will be too thick and the resulting resin-coated carrier particles will be remarkably granulated even if they are baked by microwave heating.

In order to adjust charges and resistivities, conductive materials such as carbon black may be added to the above resins.

In the present invention, the resin is generally dissolved in a solvent and then coated on the surface of the carrier core. The solvents used herein may be ones which can easily dissolve the resins therein, and examples thereof are toluene, xylene, Celsolve butyl acetate, methyl ethyl ketone, methyl isobutyl ketone and methanol. The resin diluted with the solvent may be applied by any method such as a dipping method, spray method, brushing method or kneading method, and the solvent so applied is then volatalized in the air.

Furthermore, the surface of the carrier core may be coated with the resin by a dry method instead of a wet method using the solvent.

In the present invention, the micro-wave heating is applied to the resin, which is a dielectric material, coated on the surface of a carrier core, thereby baking the resin thereon. In this case, it is necessary to heat the coated resin to a temperature higher than that at which the resin is cured by the use of microwave heating, and, to this end, it is also necessary to adjust a time for irradiating the microwave. The irradiation time is generally from 30 seconds to 10 minutes.

When the irradiation time is shorter than 30 seconds, the adhesion of the resin to the carrier core is poor since the amount of heat applied is insufficient. On the other hand, when the irradiation time is longer than 10 minutes, the durability of the resin-coated carrier is deteriorated since the resin is overheated thereby causing the decomposition thereof.

The microwave used for microwave heating in the present invention is among electromagnetic waves having a frequency ranging from 300 MHz to 30 GHz and has a frequency of 915±25 MHz or 2450±50 GHz with the latter being prefered.

In the above manner, the resin is coated on the surface of the carrier core, baked (or cured) and then cooled to obtain a resin-coated carrier.

Function

Conventional heating used at the time of carrier cores with a resin has been effected by flame and heated air originated from combustion, a burner, an electric heater or vapor or the like. These heating means have been used to heat the external surface of the thus coated resin by their heat irradiation from the outside and then heat the inside, that is the carrier core, by thermal conductivity. In brief, conventional heating is external heating.

In contrast, the present invention adopts an internal heating method using high-frequency heating (radio heating), in which method a material to be heated generates heat from itself (from the carrier core in this case) as a heating medium. This internal heating will enable the adhesion of the resin layer to carrier core to be improved or enhanced since the resin and the carrier core themselves generate heat uniformly from their insides. Further, the microwave heating system will enable resin coatings to be baked in a short time.

Thus, the conventional heating apparatus needs a longer baking time and a higher cost to manufacture resin-coated carriers, while the present invention makes it possible to remarkably shorten a baking time as compared with the conventional one, reduce their production cost and render their producibility excellent.

The present invention will be better understood by the following Examples and Comparative Examples.

<u>Example 1</u>

Cu-Zn ferrite particles (produced under the tradename "F-150" by Powdertech Co., Ltd., Japan; mean particle diameter: 80 μm; saturation magnetization: 65 emu/g) were used as a carrier core. On the other hand, 88 % by weight of an acryl-styrene based resin and 12 % by weight of a melamine based resin were dissolved in a toluene solvent to prepare a coating resin composition. The thus prepared coating composition was coated on the carrier core by using a fluidized-bed so that the resin so coated amounted to 3.0 % by weight based on the total weight of the resulting resin-coated carrier. The thus coated carrier core was then baked for 3 minutes by irradiating microwave having a wavelength of 2450MHz by using a microwave heating apparatus to obtain a resin-coated carrier. The temperature of this stage was 150°C.

These characteristics of the resin-coated carriers obtained and treating conditions used in Examples and Comparative Examples are summarized in Table 1.

The resin-coated carrier obtained in Example 1 and a toner were used to prepare a developer which was then subjected to a developer service life test in which 100,000 sheets were to be copied by a commercially available copying machine to test the resin-coated carrier for its image evaluation. The toner used in this test was a commercially available black toner and a toner concentration used was 4.5 % by weight.

The image evaluation was effected for image density, for on the image, carrier adhesion and toner scattering which were observed at the initial stage of this developer service life test and after the end thereof, as well as for environmental variation of electric charge, resistance variation of the carrier and amount of "spent", after which an overall estimation was carried out. The test results are shown in the following table 2. In Table 2, the symbols, ◎, ○, Δ, and X represent "excellent", "good", "slightly poor" and "poor", respectively. Methods for evaluating these items are indicated hereunder.

[Image evaluation of carrier]

(1) Image density (ID)

The developer was used in copying under a proper exposure condition to obtain copies which were then evaluated for image density. More particularly, the initial and final test copies were evaluated at their solid image portions for image density by using a SAKURA densitometer, and the image densities found were ranged.

(2) Fog on image

As for fogs on the image, test copies were evaluated at their white grounds for toner fog on the image, and the fogs found were ranged.

(3) Carrier adhesion

As in the case of the above toner fog, test copies were evaluated at their white grounds for carrier adhesion level, and the levels found were ranged.

(4) Toner scattering

Test copies were eveluated for degree of toner scattering which stains the copies, soil of an electrification charger and undesirable condition of toner scattering, and these results found were then ranked.

(5) Environmental variation of charge

One portion of the developer was maintained at 10 °C and 15% humidity for 24 hours to find its amount of charge (QLL) at the end of the maintenance, while another portion of the same developer was also maintained at 30 °C and 85% humidity for 24 hours to find its amount of charge (QHH) at the end of said maintenance. The difference (ΔQ) was calculated and ranked for evaluating environmental variation of charge.

$$\Delta Q = QLL - QHH\ (\mu c/g)$$

(6) Carrier resistance variation

The inherent resistance (R1) of the resin-coated carrier at the initial stage and that (R2) thereof after the end of the developer service life test of copying 100,000 sheets were measured respectively, and the difference (ΔR) therebetween was calculated from the said resistances found. The variation of the carrier resistance was evaluated by ranking the difference thus obtained.

$$\Delta R = R_1 - R_2(\Omega \cdot cm)$$

(7) Amount of "spent"

The amount of toner (amount of "spent") adhered to the carrier after the end of the developer service life test of copying 100,000 sheets was measured and ranked for evaluating the amount of "spent".

(8) Overall evaluation

The image evaluations (image density, fog on the image, carrier adhesion, toner scattering, environmental variation of electrification or charge, carrier resistance variation and amount of "spent") obtained in the developer service life test of 100,000 sheets were overall evaluated and ranked.

Example 2

Cu-Zn ferrite particles (produced under the tradename "FL-100" by Powdertech Co., Ltd., Japan; mean particle diameter: 120 μm; saturation magnetization: 55 emu/g) were used as a carrier core. On the other hand, a silicone resin (produced under the tradename "SR-2411" by the Toray-Dow Corning silicone Co., Ltd.,) was coated in the same manner as in Example 1 so that said resin was coated in an amount of 1.0 % by weight based on the total weight of the resulting resin-coated carrier. Furthermore, the thus obtained coated carrier core was baked for 6 minutes by irradiating thereto microwave having a wavelength of 2450MHz by using a microwave heating apparatus to obtain a resin-coated carrier. The temperature of this stage was 200°C.

The characteristics of the carrier core used in this Example and treating conditions are summarized in Table 1.

A developer was prepared from the thus obtained resin-coated carrier and the same toner as used in Example 1 so that the toner concentration was 4.0 % by weight. The thus obtained developer was subjected to a developer service life test under the same conditions as Example 1 by using a commercially available copying machine to conduct image evaluation. The image evaluation in this case is shown in table 2.

Example 3

Cu-Zn Ferrite particles (produced under the tradename "F-1030" by Powdertech Co., Ltd., Japan; mean particle diameter: 100 μm; saturation magnetization: 65emu/g) were used as a carrier core. On the other hand, a fluorine-acryl resin (1:1 mixed resin of polyvinylidene fluoride and acryl-styrene resin) was coated in the same manner as in Example 1 so that said resin was coated in an amount of 0.3 % by weight based on the total weight of the resulting resin-coated carrier. Furthermore, the thus obtained coated carrier core was baked for 4 minutes by irradiating thereto microwave having a wavelength of 2450MHz by using a microwave heating apparatus to obtain a resin-coated carrier. The temperature of this stage was 170°C.

The characteristics of the carrier core used in this Example and treating conditions are summarized in Table 1.

A developer was prepared from the thus obtained resin-coated carrier and the same toner as used in Example 1 so that the developer had a toner concentration of 4.0 % by weight. The thus obtained developer was subjected to a developer service life test under the same conditions as Example 1 by using a commercially available copying machine to carry out image evaluation of the resin-coated carrier. The image evaluation in this case is shown in Table 2.

Example 4

Cu-Zn ferrite particles (produced under the tradename "F-150" by Powdertech Co., Ltd., Japan; mean particle diameter: 80 μm; saturation magnetization: 65 emu/g) were used as a carrier core. On the other hand, 88 % by weight of an acryl-styrene based resin and 12 % by weight of a melamine based resin were dissolved in a toluene solvent to prepare a coating resin composition, and said carrier core was coated with said resin composition in the same manner as in Example 1 so that said resin was coated in an amount of 8.0 % by weight based on the total weight of the resulting resin-coated carrier. Furthermore, the thus obtained coated carrier core was baked for 6 minutes by irradiating thereto microwave having a wavelength of 915MHz by using a microwave heating apparatus to obtain a resin-coated carrier. The temperature of this stage was 150°C.

The characteristics of the carrier core used in this Example and treating conditions are summarized in Table 1.

A developer was prepared from the thus obtained resin-coated carrier and the same toner as used in Example 1 so that the developer had a toner concentration of 4.5 % by weight. The thus obtained developer was subjected to a developer service life test under the same conditions as Example 1 by using a commercially av-ailable copying machine to conduct image evaluation of the resin-coated carrier. The image evaluation in this case was shown in Table 2.

Comparative Example 1

The procedure of Example 1 was followed except that baking of the resin at 150 °C for 60 minutes in an electric furnace was substituted for the microwave heating of 2450MHz for 3 minutes, to obtain a comparative resin-coated carrier.

The characteristics of the carrier core used in this Comparative Example and treating conditions are summarized in Table 1.

A developer was prepared from the thus obtained resin coated carrier and the same toner as used in Example 1 so that the developer had a toner concentration of 4.5 % by weight of a toner concentration. The thus obtained developer was subjected to a developer service life test under the same conditions as Example 1 by using a commercially available copying machine to conduct image evaluation of the resin-coated carrier. The image evaluation in this case is shown in Table 2.

Comparative Example 2

The procedure of Example 2 was followed except that baking of the resin at 200 °C for 120 minutes in a thermostat was substituted for the microwave heating of 2450MHz for 6 minutes, to obtain a comparative resin-coated carrier.

The characteristics of the carrier core used in this Comparative Example and treating conditions are summarized in Table 1.

A developer was prepared from the thus obtained resin-coated carrier and the same toner as used in Example 1 so that the developer had a toner concentration of 4.0 % by weight. The thus obtained developer was subjected to a developer service life test under the same conditions as Example 1 by using a commercially available copying machine to conduct image evaluation of the resin-coated carrier. The image evaluation in this case is shown in Table 2.

Comparative Example 3

The procedure of Example 3 was followed except that baking of the resin at 170 °C for 90 minutes in an the electric furnace was substituted for the microwave heating of 2450MHz for 4 minutes, to obtain a comparative resin-coated carrier.

The characteristics of the carrier core used in this Comparative Example and treating conditions are summarized in Table 1.

A developer was prepared from the thus obtained resin-coated carrier and the same toner as used in Example 1 so that the developer had a toner concentration of 4.0 % by weight. The thus obtained developer was subjected to a developer service life test under the same conditions as Example 1 by using a commercially available copying machine to carry out image evaluation of the comparative resin-coated carrier. The image evaluation in this case was shown in Table 2.

Comparative Example 4

The procedure of Example 4 was followed except that baking of the resin at 150 °C for 60 minutes in an the electric furnace was substituted for the microwave heating of 915MHz for 3 minutes, to obtain a comparative resin-coated carrier.

The characteristics of the carrier core used in this Comparative Example and treating conditions are summarized in Table 1.

A developer was prepared from the thus obtained comparative resin-coated carrier and the same toner as used in Example 1 so that the developer had a toner concentration of 4.5 % by weight. The thus obtained developer was subjected to a developer service life test under the same conditions as Example 1 by using a commercially available copying machine to carry out image evaluation of the comparative resin-coated carrier. The image evaluation in this case is shown in table 2.

Table 1

Examp. · Comp. Ex.	mean particle diameter (um)	saturation magnetization (emu/g)	coated resin	amount of resin coated (wt%)	baking conditions			
					apparatus used	temp. (°C)	time (min.)	wavelength (MHz)
Ex. 1	80	65	acryl-styrene	3.0	microwave	150	3	2450
Ex. 2	120	55	silicone	1.0	microwave	200	6	2450
Ex. 3	100	65	fluorine-acryl	0.3	microwave	170	4	2450
Ex. 4	80	65	acryl-styrene	8.0	microwave	150	6	915
Comp. 1	80	65	acryl-styrene	3.0	electric furnacc	150	60	-
Comp. 2	120	55	silicone	1.0	thermostat	200	120	-
Comp. 3	100	65	fluorine-acryl	0.3	electric furnace	170	90	-
Comp. 4	80	65	acryl-styrene	8.0	electric furnace	150	60	-

Table 2

Examp. · Comp. Ex.	image density		fogging on the image		carrier adhesion		toner scattering		Environmental variation of charge	resistivity fluctuation of carrier	amount of "spent	overall evaluation
	initial stage	after test *	initial stage	after test *	initial stage	after test *	initial stage	after test *				
Ex. 1	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	○	◎
Ex. 2	◎	◎	◎	◎	◎	◎	◎	○	○	○	◎	◎
Ex. 3	◎	◎	◎	◎	◎	◎	◎	○	◎	○	○	◎
Ex. 4	◎	○	◎	○	◎	○	◎	○	○	○	○	○
Comp. 1	◎	○	○	○	◎	○	△	△	△	×	×	×
Comp. 2	◎	○	○	○	◎	○	△	×	×	×	△	×
Comp. 3	○	○	○	○	◎	○	△	×	△	×	×	×
Comp. 4	○	○	○	○	◎	○	△	×	△	×	×	×

*: represents the results after 10,000 sheets are copied.

(Effect of the Invention)

The resin-coated carriers obtained by the method of the present invention have excellent advantages that a "spent"-phenomenon (amount of "spent") of the toner appreciated on hardening or curring the coated resin is very slight since the adhesion between the carrier core and the resin becomes firm and steady due to the internal heating by using microwave heating in the baking step after the carrier core was coated with the resin, and they also have excellent durability since the peeling or falling of the coated resin layer off the carrier surface decreases. Further, the resincoated carrier can maintain stable charging performance even if the environment varies. Accordingly, a developer using therein such a resin-coated carrier as above can remarkably improve itself in service life and image characteristics. In addition to this, the method of the present invention is excellent in economy and productivity since the heating time is short as previously mentioned.

Claims

1. A method for manufacturing a resin-coated carrier for an electrophotographic developer comprising the steps of:
a) coating a resin on the surface of a carrier core, the resin and carrier core being independently formed of dielectric material, to obtain a resin coated carrier, and
b) baking the thus obtained resin-coated carrier by means of microwave heating, to obtain the resin-coated carrier.

2. A method according to claim 1, wherein said microwave heating is carried out for 30 seconds to 10 minutes.

3. An electrophotographic developer including the resin-coated carried obtained by the method of claim 1 or 2.

4. A resin-coated carrier for use as an electrophotographic developer, said resin-coated carrier comprising a carrier core substantially formed of dielectric material and a resin coating substantially formed of dielectric material, wherein the carrier core and the resin coating are bonded together.

5. A resin-coated carrier as claimed in claim 4 wherein the carrier core is formed from ferrite or magnetite.

6. A resin-coated carrier as claimed in claim 5 wherein the ferrite is Cu-Zn ferrite.

7. A resin-coated carrier as claimed in any of claims 4, 5 or 6 wherein the mean particle diameter of the carrier core is from not less than 15 μm to not more than 200 μm.

8. A resin-coated carrier as claimed in any of claims 4 to 7 wherein the resin is selected from one or more of; fluorine-based resins, silicone-based resins, acryl-styrene resins, alkyd resins, polyolefin resins, and polyester resins.

9. A resin-coated carrier as claimed in any of claims 4 to 8 wherein the resin-coated carrier comprises 0.05 to 10.0% by weight of the resin.

10. A resin-coated carrier as claimed in any of claims 4 to 9 in which the resin further includes conductive material.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 93 30 0856

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.5)
X Y	US-A-4 929 528 (M.SHINOKI) * column 3, line 52 - column 4, line 5; examples 1,4 * ---	4,5,7-9 1-3	G03G9/113
X	US-A-4 912 005 (D.J.GOODMAN) * claims 1,28,43 * ---	4-10	
X	US-A-5 068 301 (Y.OKAMURA) * column 5, line 1 - line 17; example 1 * ---	4,5,7-9	
Y	IBM TECHNICAL DISCLOSURE BULLETIN vol. 26, no. 9, 1 February 1984, page 4704 MEYER 'Powder-Coating method for Carrier' ---	1-3	
Y	IBM TECHNICAL DISCLOSURE BULLETIN vol. 24, no. 1A, 1 June 1981, NEW YORK US page 116 SEGARRA 'Film Coating' -----	1-3	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			G03G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	03 JUNE 1993	VANHECKE H.

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
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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
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