PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 4 :		(11) International Publication Number:
B01F 3/00	A1	WO 85/ 04344
		(43) International Publication Date: 10 October 1985 (10.10.85)

(21) International Application Number: PCT/FI85/00030

(22) International Filing Date: 28 March 1985 (28.03.85)

(31) Priority Application Number: 841298

(32) Priority Date: 30 March 1984 (30.03.84)

(33) Priority Country: FI

(71) Applicant *(for all designated States except US):* MYLLYKOSKI OY [FI/FI]; SF-73670 Luikonlahti (FI).

(72) Inventors; and
(75) Inventors/Applicants *(for US only) :* KAILA, Mikko [FI/FI]; Merenneidontie 28, SF-02320 Espoo (FI). ESKELINEN, Eelis [FI/FI]; TYNI, Matti [FI/FI]; SF-73670 Luikonlahti (FI).

(74) Agent: FORSSÉN & SALOMAA OY; Uudenmaankatu 40 A, SF-00120 Helsinki (FI).

(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent), DK, FR (European patent), GB (European patent), JP, NL (European patent), NO, SE (European patent), US.

Published
With international search report.

(54) Title: PROCEDURE FOR DISPERSING TALC

(57) Abstract

The talc is dispersed in the presence of at least one hydrophilic mineral substance. For hydrophilic mineral substance is used kaolin, calcium carbonate, gypsum or a mixture of these. For talc is used finely divided, powdery talc or granulated talc having average grain size 5 μm at maximum. The quantity of talc is between 10-95% by weight of the suspension quantity.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	**GA**	Gabon	**MR**	Mauritania
AU	Australia	**GB**	United Kingdom	**MW**	Malawi
BB	Barbados	**HU**	Hungary	**NL**	Netherlands
BE	Belgium	**IT**	Italy	**NO**	Norway
BG	Bulgaria	**JP**	Japan	**RO**	Romania
BR	Brazil	**KP**	Democratic People's Republic of Korea	**SD**	Sudan
CF	Central African Republic			**SE**	Sweden
CG	Congo	**KR**	Republic of Korea	**SN**	Senegal
CH	Switzerland	**LI**	Liechtenstein	**SU**	Soviet Union
CM	Cameroon	**LK**	Sri Lanka	**TD**	Chad
DE	Germany, Federal Republic of	**LU**	Luxembourg	**TG**	Togo
DK	Denmark	**MC**	Monaco	**US**	United States of America
FI	Finland	**MG**	Madagascar		
FR	France	**ML**	Mali		

Procedure for dispersing talc

The present invention concerns a procedure for dispersing talc. In particular, the present invention concerns a procedure with which granulated, finely divided talc can be advantageously dispersed to become a suspension which fulfills the requirements of paper coating paste, at the same time retaining the advantages of granulated talc regarding its handling, and in which standard blunging apparatus can be used.

Granulating finely ground talc is a method commonly used in order to improve the processability of a bulk-type talc product. In the granulation process, the moistened talc is compressed with fairly great force into small non-dusting briquettes. However, the talc particles which have been pressed too close to each other and are mutually suitably oriented become combined by action of a van der Waals force like those in the original talc crystal. The energy threshold of talc is 4.1 kcal/mol (17.2 kJ/mol) and the critical distance, 3 Å (R.F. GIESE, JR: Interlayer Bonding in Talc and Pyrophyllite, 1974). In conventional granulation, and in storage silos, these values are often exceeded, with the consequence that upon granulation the particle size distribution of the suspended talc is coarser than before granulation.

In paper coating paste, the pigment must be completely dispersed. Success in this respect implies that the aggregated particles are separated. It is in fact necessary, in suspending finely divided talc, to use especially powerful dispersing agents. The energy requirements in the coating talc suspending process are twice those in suspending coating kaolin (J-E, TEIRFOLK, INSKO p. 82-80 VI).

The viscosity and rheological properties of the suspension to be used in paper coating paste must be stable. No agglomeration or sedimentation must take place, not even during prolonged storage.

The object of the invention is to provide a procedure in which the use of expensive, high-power special mixers can be avoided.

The aim of the invention is achieved by a method which is mainly characterized in that the talc is suspended in the presence of at least one hydrophilic mineral substance.

The other characteristic features of the procedure of the invention are stated in claims 2-9.

In the procedure of the invention, the talc may be either finely divided powdery talc or granulated talc. The original grain size of the granulated finely divided talc is 1-5 µm on the average. To the granulating water have been added 0.5-1.5% by weight, of the talc dry weight, e.g. of pH-regulating hydrophilizing and defoaming auxiliary substances, such as e.g. NaOH, polyalkylene glycol and/or its derivatives, and appropriate tensides. To the aqueous suspension prepared of hydrophilic mineral material(s) or of mixtures of such, the above-mentioned auxiliary substances are added at 0.1-0.5% by weight, referred to the total quantity of pigments. In view of maintaining the effectivity of the additives, the temperature must not rise above 50°C in the suspending operation.

The hydrophilicity of a mineral is caused by the difference between the surface energy of said mineral and that of the water surface: the smaller this difference, the higher the hydrophilicity of the mineral.

The surface energy of				normal water is	72	mJ/m^2
"	"	"	"	kaolin is	65	"
"	"	"	"	calcium carbonate is	70	"
"	"	"	"	gypsum is	abt. 70	"
"	"	"	"	talc is	45	"

The differences between the surface energies of the minerals are due to different crystal structures and chemical composition. Talc is by nature strongly hydrophobic. The other minerals mentioned are easily wettable. A talc/water suspension prepared without auxiliary substances

is thixotropic, but it becomes dilatant later as the air escapes from the suspension. The stability of viscosity is poor, and the rheological properties change with the slow wetting of the talc. The viscosity of a suspension with more than 60% dry matter content produced without additives is far too high in view of its use.

For hydrophilic mineral substance, the contents of which in the suspension should be 5-90% of the weight of the ultimate suspension, one may use for instance kaolin, calcium carbonate or gypsum suited for paper coating. The effect of the mineral substance in dispersing finely divided, granulated talc is based on the following:

- the refining effect with which the particles in the suspension scatter the talc agglomerates;

- different surface energy: by interposing themselves in the interstices of talc particles, they decrease the hydrophobicity of the pigment and inhibit the reagglomeration of talc particles under pressure.

In a suspension prepared as described, one obtains the original particle size distribution and a high dry matter content: 60-70%, advantageously 65-68%. Complete wetting of the pigments is achieved, and the handling properties of the suspension are good. The auxiliary substances that are used are suited for making a coating paste, and the suspension is stable also in prolonged storage. Dispersing as taught by the invention can be carried out in standard blungers, and the processability advantages afforded by the talc granulation can be preserved.

Example 1

Finely divided, granulated talc, with average grain size 2.2 µm, and to the granulating water of which was added polyalkylene glycol (Pluriol^{R} PE 6400) at 0.8% of the dry weight of talc, was dispersed in a suspension made of SPS kaolin to the suspension water of which had been added 0.3 parts by weight of a dispersing agent (Polysalz^{R} S),

0.02 parts by weight of sodium hydroxide and 0.02 parts by weight of defoaming agent (Nopco^{R} 8034), (all percentages referring to the total pigment weight). The ultimate dry matter content of the suspension was 65%, thereof 50% talc and 50% kaolin. The suspension process took place in a Kady Mill apparatus. On dilution to 63% by weight, the suspension had a viscosity of 100 mPas/50 r/min. The viscosity and rheological properties did not change during storage for 24 hours. The suspension was used to coat LWC paper, with good results.

Example 2

Finely divided, granulated talc with average grain size 2.2 µm, and to the granulating water of which was added polyalkylene glycol (Pluriol^{R} PE 6400) at 1.2% of the dry weight of talc, was dispersed in a suspension prepared of SPS kaolin and to the suspension water of which had been added 0.3 parts by weight of a dispersing agent (Polysalz^{R} S), 0.02 parts by weight of sodium hydroxide (all these referred to the total pigment weight). The ultimate dry matter content of the suspension was 60.0%, thereof 50% talc and 50% kaolin. The suspension process took place in the laboratory with a Diaf apparatus. The viscosity of the suspension was 75 mPas/20 r/min. The viscosity and rheological properties did not change in 24-hr storage.

When merely finely divided talc was suspended to 60% suspension density, the required suspending time was doubled. The suspension had viscosity 80 mPas/20 r/min. The viscosity and the rheological properties changed substantially during storage for 24 hrs. The suspension was unstable.

Example 3

Fine-grained granulated talc with 2.5 µm average grain size was dispersed in a suspension prepared of calcium carbonate with 1.7 µm average grain size, to the suspension water of which had been added, among others, 1.2 % polyalkylene glycol (Pluriol ^{R} PE 6400) at 1.2% by weight, and sodium hydroxide at 0.02% by weight of the talc dry

weight. Dispersion was carried out in the laboratory with a Diaf apparatus. The ultimate dry matter content of the suspension was 60%.

The grain size of the dry matter of the suspension with different carbonate/talc proportions was as follows:

Talc	Carbonate	Average grain size		
		Calculated	Measured	Difference
95%	5%	2.47	2.30	7,4%
90%	10%	2.42	2.20	10%
70%	30%	2.26	2.10	7,6%
50%	50%	2.10	1.90	10,5%

The grain sizes were measured with a Sedigraph apparatus. In the experiments, nearly 10% smaller grain sizes were achieved than might be expected, calculating from the original grain size of the pigments. This is believed to be due to the scattering of the talc agglomerates.

Example 4

Fine-grained granulated talc with average grain size 2.2 µm was dispersed with a Diaf apparatus in a suspension prepared of gypsum (CoCoat^{R}) meant for paper coating, to the suspension water of which was added polyethylene glycol (Pluriol^{R} 6400) 0.8% by weight and sodium hydroxide 0.02% by weight, of the weight of talc. The ultimate solid matter content of the suspension was about 60%. With mixing proportions 5-30% gypsum 95-70% talc, it was easy to obtain a well dispersed stable suspension in which no sedimentation took place, nor any substantial change of viscosity, during storage for two days.

Example 5

Finely divided granulated talc with average grain size 2.2 µm and to the granulating water of which was added polyalkylene glycol (Pluriol^{R} Pe 6400) at 0.8% of the talc dry weight, was dispersed in a suspension prepared of SPS kaolin, to the suspension water of which had been added 0.3 parts by weight of dispersing agent (Polysalz^{R} S), 0.02 parts by

weight of sodium hydroxide (all referred to the total pigment weight). The ultimate dry matter content of the suspension was about 64% and it contained 70-95% talc and 30-5% kaolin. Suspension was carried out in the laboratory with a Diaf apparatus. The viscosity and rheological properties did not change at storage for 24 hrs. The viscosity at different mixing proportions was:

Talc	Kaolin	Dry matter, %	Viscosity, mPas/20 r/min
95	5	63.9	450
90	10	64.1	550
70	30	63.9	420

When only finely divided talc was suspended to 64% dry matter content, the viscosity of the suspension was about double the above-mentioned values.

Claims

1. A procedure for dispersing talc, characterized in that the talc is suspended in the presence of at least one hydrophilic mineral substance.

2. Procedure according to claim 1, characterized in that for hydrophilic mineral substance is used kaolin.

3. Procedure according to claim 1, characterized in that for hydrophilic mineral substance is used calcium carbonate.

4. Procedure according to claim 1, characterized in that for hydrophilic mineral substance is used gypsum.

5. Procedure according to any one of claims 1-4, characterized in that for talc is used finely divided, powdery talc.

6. Procedure according to any one of claims 1-4, characterized in that for talc is used granulated talc.

7. Procedure according to any one of claims 1-6, characterized in that the average grain size of the talc is 5 µm at maximum.

8. Procedure according to any one of claims 1-7, characterized in that the quantity of talc is between 10-95% by weight, advantageously 10-60% by weight, of the quantity of suspension.

9. Procedure according to any one of claims 1-8, characterized in that to the suspension and/or to the granulating water have been added pH-regulating, hydrophilizing and defoaming auxiliary substances such as e.g. NaOH, polyalkylene glycol and/or its derivatives and tensides.

INTERNATIONAL SEARCH REPORT

International Application No PCT/FI85/00030

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC 4

B 01 F 3/00

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC 4	B 01 F 3/00,12, 17/00
US Cl	252:302, 313R, 351, 363.5

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

SE, NO, DK, FI classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
A	US, A, 4 187 192 (LANKRO CHEMICALS LTD) 5 February 1980	1
A	GB, A, 1 449 129 (LAPORTE INDUSTRIES LIMITED) 15 September 1976	1
A	FI, B, 64 674 (OY KOLSTER AB) 31 August 1983	1
A	US, A, 4 430 249 (ENGLISH CLAYS LOVERING POCHIN & CO LTD) 7 February 1984	9

* Special categories of cited documents: [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
1985-06-12	1985 -06- 13
International Searching Authority	**Signature of Authorized Officer**
Swedish Patent Office	Wiva Asplund

MJ