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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁵ : C04B 16/06	A1	(11) International Publication Number: WO 94/20428 (43) International Publication Date: 15 September 1994 (15.09.94)
(21) International Application Number: PCT/US94/02861 (22) International Filing Date: 11 March 1994 (11.03.94) (30) Priority Data: 931379 12 March 1993 (12.03.93) MX (71) Applicant: FERNANDEZ GARCIA, Juan, Antonio [MX/US]; 1312 1/4 North Serrano Avenue, Los Angeles, CA 90027 (US). (71)(72) Applicant and Inventor: FERNANDEZ GARCIA, Carlos, Javier [MX/MX]; Sor Juana Inez de la Cruz #25, Barrio Santa Cruz, Tepoztlan, Morelos (MX). (74) Agents: HYMAN, Eric, S. et al.; Blakely, Sokoloff, Taylor & Zafman, 12400 Wilshire Boulevard, 7th floor, Los Angeles, CA 90025 (US).		(81) Designated States: AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, ES, FI, GB, GE, HU, JP, KG, KP, KR, KZ, LK, LU, LV, MD, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SI, SK, TJ, TT, UA, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>
(54) Title: CEMENT COMPOSITION FOR MODELLING (57) Abstract The invention relates to a cement composition with synthetic or natural fibers and/or microfibers having a diameter smaller than 0.0508 mm (2 mils) in a proportion from 0.2 to 1.5 % by weight of the dry composition. The fibers along with other additives serve to achieve proper thixotropy, plasticity and preserve the dimensional structure and integral mechanical bonds of the obtained cement. The cement composition is excellent for modelling and is useful for constructing, machining, restoring or creating various forms with or without structural reinforcement and do so in the absence of fissures or cracks upon solidifying.		

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CEMENT COMPOSITION FOR MODELLING

FIELD OF THE INVENTION

The purpose of this invention is to provide a novel, practical, economic, non-toxic and durable material, both for the construction industry and for craftsmen and artists and for the industry in general, which allows to model, machining, restore or create forms with the easiness of modeling clay and the resistance of a concrete.

As regards the construction field, it may be used without the need of arch centering and in other fields without molds or ovens due to its principal characteristics which are: extraordinary plasticity, conservation of dimensional structure, both when dry and upon curing, without slumping and with integral mechanical bond.

BACKGROUND

The so desired historical dream of modeling the stone obligues as an sculptor to search for a material suitable for modeling and with high resistances. In the present specification a difference is made between the concepts of modeling and molding, whereby modeling relates to the provision of a form to a material without a mold or arch centering, while in order to mold, a mold or arch centering are required. The multiple tests that I had to carry out in order to achieve it were based at first on the sensibility acquired when working with masses; knowing the material through touch allowed me the development of a novel exposition of plasticity, out of which the merit of this invention is deducted.

After seven years of research, I observed the characteristics of cements, cementants, mortars and concretes and, mainly, the search was based in the obtainment of a material for modeling with the resistances of concretes. I began searching plasticity through known means, that is, the use of plasticizers, superplasticizers, gypsums and additives with loads of fine powders, known by the state of the art

which, although same improve the plastic characteristics of mortars, they do not suppress the slumping, increase contractions and diminish resistances.

Faced with failures to achieve my objective with the traditional techniques and, even though there is no desire to be linked to any theory, the present invention is based on the structural mechanic of masses; I had to invent a new system for obtaining plasticity, which contrary to that what might be expected by a person skilled in the art includes for the first time the use of fibers with a caliper smaller than .0508 mm (2 mils) and of microfibers smaller than .0254 mm (1 mil), which calipers had not been included in mortars, cements, cementants, and concretes with the purpose of modeling.

It has been known in the state of the art for thousands of years the use of fibers in cementants, always with the sole purpose of reinforcing but never for modeling. Due to this very reason, I made modifications also in the sense of the granulometric organization based on the present invention, which provided me with a novel combination of grading in the aggregates, which produces an extraordinary lasticity and an increase in resistances and preservation of dimensional structure. In order to improve this composition I also included tixotropics (specifically microsilica, amorphous silicon dioxide or colloidal silica). This type of additives had never been used by the state of the art in the design of established mortars with the purpose of taking advantage of their tixotropic benefit.

The encounter with this three novel and fundamental principles, which, even though each one of them renders very good results on a separate basis, provided the perfection of the composition of this invention, which comprises:

- 1) Fibertation and specially microfibertation, both through synthetic and natural fibers.
- 2) Granulometric control of the aggregates with new specifications for modeling.
- 3) Inclusion of tixotropics and/or other additives.

1. FIBERTATION AND MICROFIBERTATION

For thousands of years natural fibers such as straw, jute, horse's hair, coconut and bamboo fibers were used with the purpose of reinforcing cementants.

In the last decades begins the inclusion of synthetic fibers in order to reinforce mortars and concretes and, therefore, since they are exclusively for reinforcing, same required of calipers greater than .0508 mm (2 mils) or expensive or toxic filaments. However, the literature has not foreseen that fibers or microfibers may improve for modified in any manner whatsoever the properties of the composition in the curing process.

Microfibers generate important changes at the level of the structure of the composition, integrating internally to obtain a mechanical bond, which provides the mass with consistency and at the same time with plasticity, thus presenting new physical characteristics in the mass departing from to primordial qualities: plasticity and mechanical bond.

2. GRANULOMETRIC CONTROL

Departs from an analysis of the components that are used for regulating designs of several materials, including cements, mortars and concretes.

The current state of the art uses it principally with the purpose of regulating the aggregates being more complex the granulometric the specifications of concretes, since mortars basically used the specifications of the ASTM (C144, C33), which only require that the thickest aggregate is not greater than the screen (4) and the thinness (lower than screen 200), do not exceed 5% for concrete or a 10% for mortar of the total weight of the aggregate, since the thickest prevent workability and the thinness are, in general, contaminated with clays and organic materials and will also require a greater amount of water in the mixture.

In all cases, the required specifications are with the purpose of maintaining the resistances, diminishing the contractions by greater

requirement of water and to have a product with the also known specifications of workability for mortars and concretes.

My new granulometric combination has the purpose of obtaining a mechanically integrated material to acquire plasticity. This is obtained for the first time with the present invention which handles the gauges or calipers of the aggregates as if it were a multiple combination of gears, but is, to stop being aggregates in order to turn, as the fibers and microfibers in bonds which interact mechanically in the behavior of masses, that is mechanic additives. This is improved through the inclusion of tixotropic additives. We do not exclude in our designs and formulations some dosages of plasticizers, curing accelerators, air includers, adhesives, resins, water retainers, superplasticizers and other additives known and utilized by the current state of the art.

3. INCLUSION OF TIXOTROPICS

The inclusion of additives such as microsilica, amorphous silicon dioxid, synthetic silica or colloidal silica improved tixotropy in the material.

The tyxotrhopics are used in some paints, inks, food industry and others but have never been used to provide mortar's consistency.

These three concepts create a structural change in the mass, changing the physical characteristics of the matter, therefore presenting clearly integrated these qualities of plasticity and resistance is a concept that had not been explored in cements. The relationship between the masses with this new qualities presents a new angle. In my investigation there are multiple variations upon applying the three fundamental principals in cements, cementants, mortars and concretes. This is because each one of the three principles provides good results by separate, as well as there are countless variations as regard their combination and mixture as will be seen in the examples, the principle of fibertation and microfibertation renders different benefits on a plastic and structural level than the principal of grading or that of the inclusion of tixotropics, therefore, the combination of the three principles will allow the improvement that

different formulations in accordance with the needs of each application.

Thanks to my sculptor carrier and to my theory of structural mechanic of masses, I was able to invent a new way to provide plasticity for cements, mortars, microconcretes and concretes.

Upon obtaining in fresh a material that preserves its dimensional structure acquired by integral mechanic bonds, it is obvious upon hardening will improve these qualities. That is, we achieve a physical change in the cements of a semiliquid known material to a new semi-solid material with great workability. This was achieved thanks to the following novel characteristics.

With the composition of the present invention one obtains putties with 0 slumping, without the need of compression efforts and with enough amount of water allowing to work with them; their integral mechanic bonds and additives provide it modelability, plasticity, cohesion and firmness characteristics and which preserves its dimension of struction, unique until this date on a petrified material, therefore, in order to achieve this objective I have developed this invention.

One of the progresses that holds this invention is that upon diminishing the caliper of the fibers until arriving to microfibers, the dosage of same may be increased improving at the same time its plastic behavior, mechanical bond and resistances.

The same happens upon dosing the grading in order to obtain plasticity as of greater volumes of thick and intermediate calipers combined to produce and effect of engagement.

And the inclusion of the specified microsilica in order to obtain tixotropy and plasticity and when applicable other additives.

Due to the above, the best mode to obtain this objective is the adequate combination of these three principles which lead to the novel composition of cement for modeling.

EXAMPLES

With the purpose of submitting an analysis rheologic behavior of fibrated (with controlled grading), microfibrated and tiksothropized mortars and microconcretes, the following tests were carried out:

MODELS

650 gr. of screened sand at screen 16

350 gr. of pozzolanic cement

275 ml. of water

1. 640 gr. of sand
 350 gr. of pozzolanic cement
 10 gr. of microfiber +
 275 ml. of water
2. 647 gr. of sand
 350 gr. of pozzolanic cement
 3 gr. of microfiber of .0127 mm
 (.5 thousands of")
 275 ml. of water
3. 645 gr. of sand
 350 gr. of pozzolanic cement
 5 gr. of typical fever of
 polypropilene of .0635 mm.
 (2.5 thousands of")
 275 ml. of water

4. 650 gr. of screened sand at screen
16 with controlled grading
350 gr. of pozzolanic cement
275 ml. of water
5. 600 gr. of sand
350 gr. of pozzolanic cement
50 gr. of amorphous silicon
dioxid
275 ml. of water
6. The very composition of the
invention
added-water-cement relation
200 ml. of water

REMARKS:

Once wetted and mixed masses, tests 3 and 1 and had high difficulties to homogenize.

And as regards plasticities:

- Test 1 showed considerable increase in its cohesion and viscosity with the inconvenient of excess fibers.
- Test 2 has a slight increase in its cohesion viscosity and plasticity.
- Test 3 showed a very slight increase in its viscosity with the inconvenient of excess of fiber, not appropriate due to its caliper greater than .0508 mm. (2 thousands of an inch) with a slight detriment of plasticity.
- Test 4 has a slight increase in viscosity and plasticity.
- Test 5 showed a noticeable requirement of water, therefore, we added 200 mililiters more than in the other test, obtaining a considerable increase in viscosity, lasticity and tixothropy.

- Test 6 has extraordinary increase in plasticity, viscosity, 0 slumping, elasticity, integral mechanic bonds, tixothropy, preservation of dimensional structure and workability.

The above description and the following claims describe the preferred embodiment of the present invention. Particularly with regard to the claims it must be understood that changes can be carried out without departing from the essential spirit and scope of the present invention. In this regard, it is intended that these changes fall within the scope of the present invention. It is simply not practical to describe and claim all of the possible reviews that may be achieved with the present invention. The various changes and combinations to the submitted claims and of other aspects submitted in the specification are intended to be included within the claims and shall be understood as supported by the existing specification.

Furthermore, within the extension that any reviews whatsoever utilize the essence of the invention, each one of them would naturally fall within the scope of protection of this patent. This is particularly true for the present invention due to the fact that its basic concepts and interpretations are fundamental in nature and may be broadly applied. The foregoing description of the specific modes so reveals completely the general nature of the invention that others may, upon applying this knowledge, easily modified or adapt for various applications adjusting to specific applications. This modalities will not depart from the general concept and therefore will be considered that fall within the meaning and range of equivalents of the described and claimed modalities. It shall also be understood that the wording and technology are submitted with the purpose of describing and not of limiting.

NOVELTY OF THE INVENTION

Having described the invention as above it is hereby claimed as property the contents of the following:

CLAIMS

1. Cement composition for modeling, characterized because to the mortar or cementant are added synthetic or natural fibers with calipers smaller than .0508 mm. (2 thousands of an inch) in the proportion of .2 to 1.5% of total weight when drive, with the purpose of obtaining a mortar, cementant, microconcrete or cement appropriate for modeling, which preserves its dimensional structure in fresh and does not have contractions, fissures or cracks upon curing.

2. Cement composition for modeling, in accordance with claim 1 characterized by the organization of the aggregates and the inclusion of tixotropic additives according to the following dosages: (cementing material) cement or cementant from 5. to 99.8% in weight; (charge) calipered and dosaged sands for modeling from 20 to 99.8% in weight; screen 16, 50%; screen 30, 30%; screen 50, 8%; screen 80, 7%; screen 120, 3%; screen 200, 2%; (fibers) of polypropilene or nylon with calipers smaller than .0381 mm (1.5 mils) in multifiliment of the same thickness .0381 mm (1.5 mils) and length; from .2 to 1.5% in weight (tixotropic additive), amorphous silicon dioxid from .001 to 5% in weight.

3. Cement composition for modeling, in accordance with claim 1 characterized because it includes in weight cements or cementants from 10 to 70% in weight; sands or charges from 30 to 90% in weight; polypropilene microfibers smaller than .0254 mm (1 mil) from .2 to 8% in weight; amorphous silicon dioxide from .02 to 25 in weight plasticizers or superplasticizers additives, air includers, water reducers and curing accelerators.

4. Cement without contractions, fissures or cracks upon curing, characterized because comprises the composition of claim 1.

5. Mortar without contractions, fissures or cracks upon curing, characterized because comprises the composition of claim 1.

6. Concrete without contractions, fissures or cracks upon curing, characterized because comprises the composition of claim 1.

7. The new industrial application of synthetic or natural fibers and microfibers as agents for supplying workability with zero slumping in cement compositions.

8. The new industrial application of synthetic or natural fibers and microfibers as agents for supplying workability with zero slumping in mortar compositions.

9. The new industrial application of synthetic or natural fibers and microfibers as agents for supplying workability with zero slumping in concrete compositions.

10. Process for the preparation of cement compositions for modeling, characterized because it consists in adding synthetic or natural fibers and microfibers with caliper smaller than .0518 mm (2 mils) in a proportion of .2 to 1.5% of total weight when dry.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US94/02861

A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) : C04B 16/06

US CL : 106/634, 644, 653, 711, 731, 823

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 106/634, 644, 653, 711, 731, 823

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONEElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
NONE**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A, 3,965,020 (Noll et al) 22 June 1976 (see claims 1-12).	1-10
Y	US,A, 4,306,911 (Gordon et al.) 22 December 1981 (see claims 1-8).	1-10
Y	US,A, 4,101,335 (Barrable) 18 July 1978 (see claims 1-20)	1-10
E	US,A, 5,298,071 (Vondran) 29 March 1994 (see claims 1-16).	1-10

☐ Further documents are listed in the continuation of Box C.
 ☐ See patent family annex.

* Special categories of cited documents:	*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
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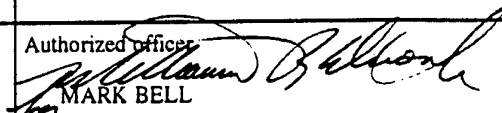
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