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(54) **Title**: MAINTENANCE READY-MIXED PLASTER

(57) **Abstract**: Dry mixture of remedial plaster that comprises silica aggregate, dry hydrate, dispersive admixture, hydrophobization admixture and lightweight granular aggregate, wherein the dry mixture comprises from about 20 to about 85 weight percent silica aggregate with granularity from 0,1 to 2 mm, bulk density from 80 to 400 kg/m3; from about 0,5 to about 45 weight percent cement binder with minimal strength 40 MPa/28 days; from about- 1 to about 25 weight percent calcium hydrate; from about 1 to about 20 weight percent lightweight granular aggregate with bulk density lower than 100 kg/m3; from about 0,1 to about 0,5 weight percent modified methyl cellulose; from about 1,5 to about 12 weight percent dispersive admixture; from about 0,1 to about 3 weight percent pores forming admixture and eventually up to 2 weight percent hydrophobization admixture; up to 15 weight per¬ cent pozzolana admixture and/or 1 to 7 weight percent water reducer/superplasticizer.

Maintenance ready-mixed plaster

FIELD OF THE INVENTION

The present invention relates to composition of dry mixture of remedial plaster for preserving damp and salted walling. The composition is set up to significant increase of thermal resistance of building structures.

DESCRIPTION OF THE PRIOR ART

The presence of moisture in building structures is a natural phenomenon. However, amount of moisture content plays a crucial role. Porous space of building materials may be filled with various substances. In an ideal case is the porous space filled with dry air, whose influence on material characteristics can be neglected. Unfortunately, it is not only the air, which is the pore system filled with. There are also other substances transported together with the air into the pores. In real conditions, the air contains water vapor that may condense inside the porous body. Thus, the moisture content of material is increased. Other (and much faster) way of receiving moisture is a direct contact of the material with water, where capillary forces and suction mechanisms are activated.

Generally, the increased moisture content negatively affects material characteristics. Due to high thermal conductivity of water, thermal properties of moist materials/structures are worsened. Phase changes of water into ice reduce durability of building materials as well as its mechanical properties, which are deteriorating with increasing moisture content anyway. The high level of moisture content negatively affects acoustic parameters of building materials as well and increases risk of biological degradation, which may lead to infraction of sanitary regulations. Finally, the increased moisture content may result in esthetic failures.

Water penetrates into building structures in many different forms as atmospheric water, capillary water, condensed water or hygroscopic water. Hygroscopicity of building materials may be increased by presence of hygroscopic salts in their pores. These salts are able to absorb humidity from air and thus several time increase state of moisture equilibrium of the material. The main source of salts is hard water rising from subsoil, acid rains or splashed water from pavements and roadbeds.

The biggest part of salts contained in the building structures is represented by sulfates. In addition to sulfates, there are other main groups of salts; chlorides and nitrates. The nitrates are present especially in masonry of agricultural buildings, whereas sulfates and chlorides are present in almost all kind of masonries. All harmful salts are characteristic by its solubility.

Desalinization of the masonry is desirable, but usually very expansive. In the past, chemical treatment based on transformation of soluble salts into insoluble derivatives was used. Such transformation led to a breach of salts transport. Sodium hexafluorosilicate (Na_2SiF_6) was used as an active substance for the transformation, but due to its harmful impact on the environment, this treatment is no longer used anymore. In these days, the negative effects of salts contained in the masonry are eliminated by use of remedial plasters. The remedial plasters are typical for its high porosity and water vapor permeability with low capillary suction. These properties allow the moisture evaporation zone to move from the surface layer more to the inside of the plaster, where the salt crystallization occurs. Thus, the surface of remedial plaster stays dry without salt efflorescence, suitable for final surfacing. Due to proper pore geometry of the remedial plasters, the durability is much longer comparing to common plasters applied on salted walling. Because of decelerating of salt intake, the hygroscopic moisture content is reduced and so optically dry surface layer is created, although certain moisture content is present inside the masonry.

Traditional remedial plasters are based on cement compounds, lime hydrate, silica sand, light weighting admixture and some other admixtures. Even though high quality remedial plasters are prepared according to national standards and rules, some of their properties are not optimal. For example bulk density of matured plaster ranges from 800 to 1200 kg/m^3, but its thermal conductivity ranges from 0,30 to 0,40 W/mK. This makes such plaster unsuitable for use in basements or ground floors, because of their insufficient thermal insulation properties. Other disadvantage of common plasters is technological process of their application, which must be done in few steps; sanitary spraying, rendering layer, remedial plaster and fine plaster if appropriate. The final surface can be applied after maturing of whole plaster system, which for ordinary thickness of 30 mm presents technological break approximately one month. This fact reduces working productivity and raises the construction costs.

Available thermal insulating and remedial plasters, described for instance in documents CZ 7580 U1 or DE-PS 1 803 381 are based on plastic materials such as crushed polystyrene, polyurethane etc., which are not fire resistant and more to that, when the mixture is being prepared, the plastic particles may be segregated. So far used hydrophobization admixtures, such as calcium stearate described in document CZ 10765 U1, or metallic soap described in DD-PS 123 187 or sodium oleate described in FR-PS 396 694 and 446 375, do not allow optimal hydrophobization of green plaster and so the control of capillary adsorption of matured plaster is practically impossible. Also some aerating admixtures used for creation of pores in the plaster, for instance according to CZ 285113, surfactants and peroxo-compounds, are able to reach the level of pores slightly over 25 %. Unfortunately they are not able to increase this number, which is followed by reduction of bulk density together with increasing of water vapor permeability, thermal insulation properties and salt resistance.

There are many products marketed as high range water reducers for concrete. Such products may be used for remedial plasters as well. The original composition of high range water reducers is protected by numbers of International patents (for instance

US Pat. 5584920; 5494516; 4704415; 4460720 or 4441929) and it is well-known that essentially they are lignosulphonates-, melamine-, naphthalene- and polyacrylate-based compounds.

The presented technical invention introduces a dry mixture of remedial plaster of new composition, allowing to achieve new level of properties with wide range of product qualities.

DETAILED DESCRIPTION OF THE INVENTION

The present invention is to a great extent achieved by technical solution based on dry mixture of remedial plaster that comprises silica aggregate, calcium hydrate, dispersive admixture, hydrophobization admixture and lightweight granular aggregate. The dry mixture comprises from about 20 to about 85 weight percent silica aggregate with granularity from 0,1 to 2 mm, bulk density from 80 to 400 kg/m^3; from about 0,5 to about 45 weight percent cement binder with minimal strength 40 MPa/28 days; from about 1 to about 25 weight percent calcium hydrate; from about 1 to about 20 weight percent lightweight granular aggregate with bulk density lower than 100 kg/m^3; from about 0,1 to about 0,5 weight percent modified methyl cellulose; from about 1,5 to about 12 weight percent dispersive admixture; from about 0,1 to about 3 weight percent pores forming admixture and eventually up to 2 weight percent hydrophobization admixture; up to 15 weight percent pozzolana admixture and/or 1 to 7 weight percent water reducer/superplasticizer.

Replacing of silica aggregate by expanded materials on natural basis, such as volcanic rocks or silica sands may by profitable. Same profit may be achieved by replacing silica aggregates by recycled waste materials on glass basis or plastic materials and/or their mixtures.

It is also profitable, if the granular aggregate comprises expanded perlite or expanded vermiculite; dispersive admixture comprises material on vinyl acetate-ethylene basis or acrylate-styrene basis or acetate-vinyl-versatate-vinyl-acrylate basis; hydrofobization admixture is on silica or stearate basis; pores forming admixture is chosen from materials on surfactant basis; pozzolana admixture is chosen from materials on kaolin basis and/or from kaolin clay; water reducer/superplasticizer is chosen from materials on melamine or naphthalene basis or is produced from mineral plasticizers on micronized limestone or marble or bentonite.

The dry mixtures of remedial plasters prepared according to formulas described above are characteristic for its low bulk density of matured plaster, which is 2 to 3 times lower than bulk density of ordinary plasters, whereas the unique composition of the mixture, rates of each component allow to achieve more than 70 % porosity of matured plaster. Thus are perfect thermal insulation properties guaranteed, as well as drying ability. Thermal conductivity of the plaster ranges between 0,06 and 0,08 W/mK.

EXAMPLES

Example 1 – Dry mixture of remedial plaster comprising from:

- silica aggregate 65,0 Wt. %
- cement 15,0 Wt. %
- dry hydrate 10,0 Wt. %
- expanded perlite 5,0 Wt. %
- pores forming admixture 0,5 Wt. %
- modified methylcellulose 0,1 Wt. %
- pulverized dispersion 2,5 Wt. %
- hydrophobization admixture on stearate basis 0,9 Wt. %
- plasticizer 1,0 Wt. %

Example 2 – Dry mixture of remedial plaster with additional thermal insulating properties comprising from:

- silica aggregate 79,0 Wt. %
- cement 1,0 Wt. %
- dry hydrate 8,0 Wt. %
- pozzolano admixture 7,0 Wt. %
- pulverized dispersion 3,0 Wt. %
- pores forming admixture 0,2 Wt. %
- modified methylcellulose 0,2 Wt. %
- hydrophobization admixture on silicon basis 0,5 Wt. %
- plasticizer 1,1 Wt. %

Example 3:

- silica aggregate 60,0 Wt. %
- cement 26,7 Wt. %
- dry hydrate 2,0 Wt. %
- pozzolano admixture 5,0 Wt. %
- pulverized dispersion 2,2 Wt. %
- modified methylcellulose 0,3 Wt. %
- vermiculite 1,5 Wt. %
- hydrophobization admixture on stearate basis 0,5 Wt. %
- plasticizer on melamine basis 1,5 Wt. %
- pores forming admixture 0,3 Wt. %

Example 4:

- cement 18,0 Wt. %
- silica aggregate 62 Wt. %
- dry hydrate 8,7 Wt. %
- pozzolano admixture 3,0 Wt. %
- pulverized dispersion 1,5 Wt. %

- modified methylcellulose 0,5 Wt. %
- expanded perlite 5,0 Wt. %
- plasticizer on micronized limestone basis 1,0 Wt. %
- pores forming admixture 0,3 Wt. %

Producing of dry mixture of remedial plaster in mixing room is done according to technological process. In mixer is placed quantified amount of silica aggregate, cement, dry hydrate and granular aggregate. To these components is added exact amount of prepared concentrate of modification admixtures and the mixer is launched for certain time, which depends on the weight of mixed components and mixer type. The time usually ranges between 5 and 12 minutes. After finishing of mixing process a newly formed homogenous mixture filled into the bags by bag-filling machine. The size of the bag depends on expected area of plastered surface. Optimally, the bags are designed for 7 kg of the mixture, which is required amount for 1 m2 of plastered area with the thickness of 23 to 25 millimeters.

On construction site is the bag content put into bucket, which is one third full of mixing water, and the mixture is being mixed by hand mixer with adjustable rotating speed. Next some other mixing water is added and thorough mixing is followed by 5 minutes technological break. Then is the mixture again mixed thoroughly, which is the final step. The mixture is now ready for the application. The maximal thickness of applied plaster is 30 millimeters. If higher thickness is needed, the plaster must be applied step by step in layers with maximal thickness of 30 millimeters. The plaster can be machine-mixed as well, but only by mixer with forced mixing and not by free-fall mixer.

INDUSTRIAL APPLICABILITY

Dry mixture of remedial plaster prepared according to technical invention may be profitable used in field of sanitation of damp and salted masonry both in exterior and interior. The remedial plaster may be used to increase of thermal resistance of building construction in case where application of other thermal insulation systems is impossible, for instance renovation of historical and listed buildings, thermal insulation of residential buildings with high moisture content.

CLAIMS

What is claimed is:

1. Dry mixture of remedial plaster that comprises silica aggregate, dry hydrate, dispersive admixture, hydrophobization admixture and lightweight granular aggregate, wherein the dry mixture comprises from about 20 to about 85 weight percent silica aggregate with granularity from 0,1 to 2 mm, bulk density from 80 to 400 kg/m^3; from about 0,5 to about 45 weight percent cement binder with minimal strength 40 MPa/28 days; from about 1 to about 25 weight percent calcium hydrate; from about 1 to about 20 weight percent lightweight granular aggregate with bulk density lower than 100 kg/m^3; from about 0,1 to about 0,5 weight percent modified methyl cellulose; from about 1,5 to about 12 weight percent dispersive admixture; from about 0,1 to about 3 weight percent pores forming admixture and eventually up to 2 weight percent hydrophobization admixture; up to 15 weight percent pozzolana admixture and/or 1 to 7 weight percent water reducer/superplasticizer.

2. Dry mixture of remedial plaster according to Claim 1, wherein the silica aggregate is formed by expanded materials on natural basis, such as volcanic rocks or silica sands.

3. Dry mixture of remedial plaster according to Claim 1, wherein the silica aggregate is formed by recycled waste materials on glass basis or plastic materials and/or their mixtures.

4. Dry mixture of remedial plaster according to some of Claims 1 – 3, wherein the granular aggregate comprises perlite or vermiculite.

5. Dry mixture of remedial plaster according to some of Claims 1 – 4, wherein the dispersive admixture is formed on vinyl acetate-ethylene basis or acrylate-styrene basis or vinyl acetate-vinyl versatate-ethylene basis or vinyl acetate-vinyl versatate-acrylate basis.

6. Dry mixture of remedial plaster according to some of Claims 1 – 5, wherein the hydrophobization admixture is formed on stearate or silicone basis.

7. Dry mixture of remedial plaster according to some of Claims 1 – 6, wherein the pores forming admixture is chosen from materials on surfactant basis.

8. Dry mixture of remedial plaster according to some of Claims 1 – 7, wherein the pozzolano admixture is formed on kaolin basis and/or kaolin clay.

9. Dry mixture of remedial plaster according to some of Claims 1 – 9, wherein the plasticizer is chosen from materials on melamine or naphthalene or polymer basis or is produced from mineral plasticizers on micronized limestone or marble or bentonite.

INTERNATIONAL SEARCH REPORT

International application No
PCT/CZ2011/000053

A. CLASSIFICATION OF SUBJECT MATTER
INV. C04B28/02
ADD.

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)
C04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

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

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Date of the actual completion of the international search	Date of mailing of the international search report
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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Information on patent family members

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