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(54) **Pasty fibrous compositions**

(57) A method of manufacturing a pasty fibrous composition includes mixing 100 parts by weight ceramic fibres with 100 to 180 parts by weight water and then whilst continuing the mixing adding 4 to 15 parts by weight clay. An organic bonding agent is then mixed in an amount of 2 to 8 parts by weight, calculated as solid material.

The composition is suitable for the manufacture of fibre plates used as expansion joint filling.

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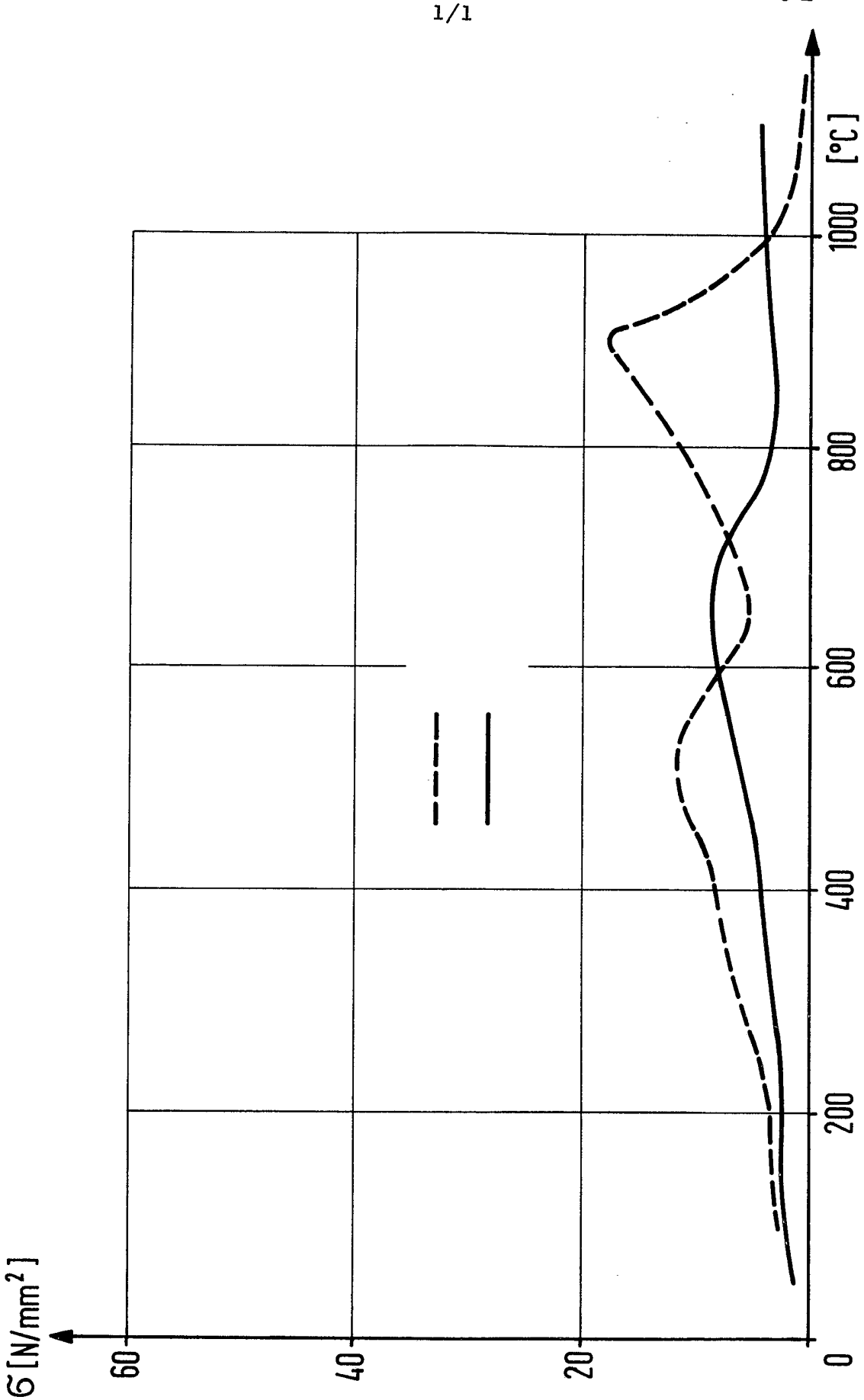

SPECIFICATION

Pasty fibrous compositions

The invention relates to a method of manufacturing pasty fibrous compositions and to the compositions made by the method and their use.

In an earlier application of the present applicants, now published under No. 2093011, a method of manufacturing plastic compositions is described in which a predominant proportion of ceramic fibres is mechanically loosened, an organic bonding agent is mixed into them dry, then relatively small quantities of water are added to this mixture, subsequently clay is added to the dampened mixture and finally a solution of an organic bonding agent is mixed in. These compositions can be used to manufacture heat-resistant or refractory moulded articles and also to manufacture moulded articles by extrusion. In this method a maximum of 50 parts by weight water are added to 100 parts by weight ceramic fibres.

It is an object of the present invention to provide a method of manufacturing improved pasty fibrous compositions from ceramic fibres, clay, organic bonding agent, water and optionally conventional additives, which compositions are suitable, in particular, for the manufacture of fibre plates by simple calendering between rollers, drying and optionally heat treating of the plates. It is also desired that the compositions manufactured in accordance with the invention should be suitable for spreading, e.g. as expansion joint filling material.

According to the present invention there is provided a method of manufacturing a pasty fibrous composition in which 100 parts by weight ceramic fibres are mixed with 100 to 180 parts by weight water, without ceasing mixing 4 to 15 parts by weight bonding clay are mixed in and in which subsequently an organic bonding agent is mixed in an amount of 2 to 8 parts by weight, calculated as solid material.

The invention further embraces compositions made by the method, which are found to have a pot time of four weeks or more and the use of the compositions to manufacture plates by simply calendering, drying and optionally heat-treating the plates. Such plates can be used advantageously as a filling for expansion joints, e.g. between the bricks of revolving tubular furnaces, and it is found that they accommodate stresses as well as the asbestos plates frequently used hitherto but are not associated with health risks like these asbestos plates. The avoidance of such health risks is achieved also when using the compositions according to the present invention, particularly as an expansion joint filling material between the bricks of, in particular, revolving tubular furnaces.

The heat-resistant or refractory ceramic fibres used in the method in accordance with the invention may be known per se and in particular may be based on aluminium silicates with a particularly high Al_2O_3 content in the range of 45 to 95% by weight. Depending on the intended use of the pasty or plastic composition, i.e. the desired degree of refractoriness or heat-resistance, rock wool fibres can, however, also be used, and it is also possible to use mixtures of such ceramic fibres. The ceramic fibres are advantageously used in chopped form, i.e. with a length of 1 to 5 mm, but it is also possible to use so called ground fibres which have a length in the range of 10 to 500 μm. The diameter of the ceramic fibres is in general of the order of 1 to 25 μm and in particular in the range of 2 to 8 μm. It is of course, however, also possible to use ceramic fibres with other dimensions.

The bonding clay used in the method in accordance with the invention may be known per se, but bentonite has been found to be particularly suitable. Prior to the mixing of the bonding clay finely divided Al_2O_3 and/or colloidal silica may be mixed in in an amount of 2 to 8 parts by weight. In addition other finely divided refractory materials, namely aluminium hydroxides, such as bauxite, and/or titanium dioxide and/or chromium oxide and/or magnesia, which are additives known per se in the art may be mixed in in an amount of 2 to 15 parts by weight. The finely divided materials may also include colloidal materials, in particular colloidal silica which is commonly used in the form of a sol. The quantities given refer in all cases to solid materials.

The commonly used organic bonding agents, e.g. sulphite waste in solid or liquid form and starch can be used as organic bonding agents in the method in accordance with the invention. In a preferred embodiment of the invention, carboxymethylcellulose is also added in at the end of the method. The carboxymethylcellulose can advantageously be half in the form of a viscose solution and half in solid form.

In the method in accordance with the invention the sequence of the mixing is critical since in this way a homogeneous mass can be obtained. The total mixing time is commonly 10 to 40 minutes.

Conventional mixers can be used as mixing devices in the method in accordance with the invention, but the use of so called forced mixers, such as Eirich mixers, has proved to be particularly advantageous.

The invention will be illustrated with reference to certain examples in which commercial grade ceramic fibres of the following compositions were used:

Fibres A with 47% Al_2O_3 and 43% SiO_2;
Fibres B with 95% Al_2O_3 and 5% SiO_2.

Example 1

100 parts by weight ceramic fibres A were put into a mixer, in this case a Drais mixer, together with 150 parts by weight water and mixed for 5 minutes. Whilst continuing the mixing 10 parts by weight bentonite as bonding clay were added and mixed in for a further 6 minutes. Subsequently 5 parts by weight solid starch were added as the organic bonding agent and also an anti-fermentation agent, in sufficient quantity to avoid a fermentation or mouldering of the plastic composition when stored, were mixed in for 10 minutes.

The composition produced had a storage life at usual ambient temperatures of more than six weeks. It could be formed advantageously by application onto refractory bricks by means of a trowel into an elastic flexible layer. When making a refractory composite unit from such bricks coated with the plastic mass the hardened and dried plastic composition acts as an expansion joint filler.

Examples 2 to 10

The method of Example 1 was repeated using the compositions given in the following table:

Table

Example	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Fibres A	—	100	50	75	100	25	50	100	—
Fibres B	100	—	50	25	—	75	50	—	100
Bonding Clay	10	8	5	8	4	15	8	10	10
Chromium oxide <44 μm	12	—	2	—	3	—	—	—	2
Titanium dioxide <44 μm	—	5	2	—	—	10	—	—	—
Magnesia <90 μm	—	—	—	—	2	4	—	—	—
Bauxite <63 μm	—	—	—	5	—	—	15	—	—
Water	160	140	150	170	100	120	140	150	110
Carboxymethylcellulose*	—	1	2	—	4	—	—	—	—
Al_2O_3<63 μm	2	2	2	—	8	—	—	10	—
Colloidal SiO_2	—	—	2	8	—	2	4	—	6

*50% added as a 5% solution in water and 50% in solid form—the water content of the solution is ignored when calculating the weight added.

Example 11

The plastic compositions manufactured in Examples 1, 3 to 5 and 8 were put on a three roll calender and formed into plates with a thickness of 5 mm. These plates were dried at a temperature of 110°C and those made from the compositions of Examples 1, 3 and 8 were subjected to a heat treatment at 180 to 200°C for 2 hours.

In all cases an excellent fibre plate material was obtained that can be used instead of asbestos plates as an expansion joint filling between refractory bricks, in particular in revolving tubular furnaces.

The drawing is a comparative graph of the properties of plates made from the composition of Example 5 and of plates made from asbestos. This graph shows the stress σ caused by the thermal expansion of the bricks and reduced by the plate material in the joint against temperature. In each case the plates and thus the expansion joints which they filled were 2 mm thick.

It may be seen from the graph that the plates manufactured using the composition in accordance with the invention have the same or a slightly improved performance compared to those made from asbestos.

Claims

1. A method of manufacturing a pasty fibrous composition in which 100 parts by weight ceramic fibres are mixed with 100 to 180 parts by weight water, without ceasing mixing 4 to 15 parts by weight bonding clay are mixed in and in which subsequently an organic bonding agent is mixed in in an amount of 2 to 8 parts by weight calculated as solid material.

2. A method as claimed in Claim 1 in which prior to the mixing in of the bonding clay 2 to 8 parts by weight finely divided Al_2O_3 and/or colloidal silica are mixed in.

3. A method as claimed in Claim 1 or 2 in which 2 to 15 parts by weight finely divided chromium oxide and/or titanium dioxide and/or magnesia and/or aluminium hydroxides are mixed in together with the bonding clay.

4. A method as claimed in any one of the preceding claims in which the bonding clay is bentonite.

5. A method as claimed in any one of the preceding claims in which the organic bonding agent is starch.

6. A method as claimed in any one of the preceding claims in which 1 to 4 parts by weight carboxymethylcellulose are also mixed in after the mixing in of the organic bonding agent.

7. A method as claimed in any one of the preceding claims, in which an anti-fermentation agent is also added to the mixture.

8. A method of manufacturing a pasty fibrous composition substantially as specifically herein described with reference to any of Examples 1 to 10.

9. A pasty fibrous composition manufactured by a method as claimed in any one of Claims 1 to 8.

10. The use of a composition as claimed in Claim 9 to manufacture plates by calendering, drying and optionally heat treating.

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