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GRANULAR, LIGHT BUILDING SUBSTANCE

Carl Fabritz, Konigsberg, Preussen, Germany;
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My invention relates to a granular, light building substance.

It is an object of my invention to provide a substance of the kind referred to which possesses particularly favorable properties for building purposes, i. e., light weight, heat and sound insulation, adaptability, and low cost.

To this end, I provide grains of water-absorbing material, for instance, saw dust, and coat each grain individually with a binder which sets in the presence of water and is impermeable to water in set condition, for instance, cement.

It has already been proposed to manufacture light building elements by impregnating water-absorbing substances which swell to a greater or lesser extent when moistened, for instance, saw dust, with a very thin liquid binder, for instance, cement grouts, so as to "petrify" the substances.

This old process is complicated and slow since the impregnation requires a rather long time, and the mixture must be agitated repeatedly.

My novel substance, on the other hand, requires agitation of a few minutes' duration only and can be used directly, for instance, for making light-weight and insulating floors, or it can be used, with addition of some more binder, for casting, molding, or otherwise producing light building elements.

In the following description, saw dust will be described as the material for the grains to be coated, and cement, with or without sand, as the binder, but it is understood that I am not limited to this but may use other water-absorbing materials and other binders, provided that they are suitable for coating the grains of water-absorbing material.

The granular substance according to my invention is prepared as follows:

The water-absorbing material, for instance, 4 litres of soft-wood sawdust with a grain size not exceeding five millimeters, and one litre of cement, are mixed in dry condition. To this dry mixture is added a solution of a froth-forming agent, for instance soap, in water. The weight of the soap is 1.5 times the weight of the cement, and the weight of the water in which the soap is dissolved, is 2.5 times the weight of the sawdust. Waterglass at the rate of 10 to 15% of the weight of the water in the solution is added, and the mixture is agitated violently for about five minutes until a thick, frothy paste is produced. By the formation of the froth, so much moisture is withdrawn from the mixture that the walls of the froth globules are not supported by the binder but the binder is deposited on the grains of sawdust as a coat. The water glass supports the walls of the froth globules, holding the grains in suspension until all the moisture has evaporated, and causing rapid setting of the binder in the coats of the grains. As the moisture is evaporated, the froth globules gradually burst. There is no adhesion between the coated grains, and the finished substance has the structure of coarse sand. It is stored in thin layers, and used directly, or for manufacturing light building elements, as will be described.

The amount of water added must obviously so determined that the grains are only coated, and not embedded in the binder. It is determined by the nature of the water-absorbing material, of the binder, and of the froth-forming agent. This agent may be dispensed with, if desired.

The binder may be mixed with a filler. In the case of cement as the binder, the filler is fine, and preferably dust-like, sand which is admixed to the cement preferably in dry condition. I have found that sand may be added at the maximum rate of one part of sand for one part of cement, by weight, and still a satisfactory coat on each grain is obtained which prevents subsequent access of moisture to the grain.

The percentages of the constituents of the granular substance obviously vary with the crude materials used. Thus, a higher percentage of water is required for Portland cement than for iron cement, and the same rule applies to finer sand as compared with coarser one. However, the principal factor which determines the percentage of the water, is the water-absorbing capacity of the grains. Sawdust can absorb about four times its own weight in water, but the amount of water must be under 2.5 times the weight of the sawdust, unless, as in the example recited above, a froth-forming agent is present, and the rate is 2.5 times. Only about one-half of the absorbing capacity of the sawdust is consequently utilized. Similarly, in the case of powdered peat whose water absorbing capacity is about 12 times its own weight, the weight of the water should be about 6 times the weight of the peat.

I have found by experiment that definite limits for the percentage of water can be determined for all crude materials in consideration. Under all conditions, the percentage of water must not be higher than what is required for setting the coats on the grains, without producing adhesion and conglomeration.

As mentioned, light building elements can be formed from the granular substance aforesaid.

This operation may be performed in a single stage, combining the coating of the grains and their binding together, or the two operations are performed in separate stages. In both cases, a certain amount of binder is added beyond that required for making the granular substance. The degree of compactness in the finished elements depends upon the percentage of water present. If such percentage is but slightly in excess of the minimum required for the formation of the granular substance, the element will be porous. It can be cast or molded under pressure but obviously there is a limit to such pressure since the element must not be crushed which would shut up its pores. If the percentage of water is much in excess of the minimum, a compact or non-porous element is produced, and this is preferably cast.

By way of example, the single-stage process may be performed as follows for making porous elements:

26.2 kilogrammes of best cement are intimately mixed with 10.4 kg of dry sand having the fineness of flour. To this dry mixture are added 15.6 kg of dry-soft-wood sawdust, and the sawdust and the dry mixture are again mixed intimately. 24.6 kg of water are added gradually and the mass is agitated to form a paste which can be cast, or molded under moderate pressure.

In the two-stage process, the granular substance is prepared as described, in the first stage, and preferably gypsum-free cement is used, or an accelerating agent, for instance, soda, is added. In the second stage, the additions of cement and a higher percentage of water are made. If the setting period of the cement is shortened by the means described, the two stages can be performed in the same mixer. The compact element thus obtained is preferably cast.

CARL FABRITZ.