

UNITED STATES PATENT OFFICE

2,632,711

METHOD FOR PRODUCING IRON CEMENT
IN POWDER FORM

Victor Trief, Deux-Acren Lez Lessines, Belgium

No Drawing. Application August 30, 1949, Serial
No. 113,249. In Belgium September 3, 1948

2 Claims. (Cl. 106-117)

1

It is known to grind blast-furnace slag, after it has been previously dried, in order to obtain a commercial hydraulic binder in powder form, the catalyser thereof being added during or after the grinding. The catalyser generally used is Portland cement in clinker or in powder form, according to whether it is being added during or after the grinding of the slag.

It is also known to grind by a wet method granulated blast-furnace slag in order to obtain, under the form of a paste, a hydraulic binder of very fine grain size, and one that has latent hydraulic-binding properties, which thus appear only after the binder will be put in the presence of a catalyser such as Portland cement for example.

Such grinding by the wet method is known to show very great advantages over the dry grinding, since it enables to obtain a fineness of the ground particles as is impossible to achieve by the dry grinding into powder. Moreover, it enables a large saving in the required motive power. Finally, it obviates the serious drawbacks encountered with the simultaneous dry grinding of the slag and its catalyser, which dry grinding yields respective grain sizes of the slag and its catalyser, which are insufficient and in reverse relationship with respect to what is necessary in order to obtain a hydraulic binder of high quality. Indeed, by the simultaneous dry grinding, the slag, which is the least active component, while being at the same time the hardest to be ground, will be ground to the largest grain size.

However, the paste obtained by the wet grinding method includes about 25% of water. For this reason it has the disadvantage that it must be constantly kept in movement in order to avoid sedimentation. As a result, the said paste must practically be prepared on the spot of use and, moreover, must virtually be used as its production proceeds, considering the need of agitation.

Preparing the paste in situ and keeping it constantly in movement requires the mounting of a suitable grinding and tritulating plant on the yard. It has been found that the binder would lose its qualities if it is stocked in the state of a paste without permanent precautions as to temperature and agitation; consequently, a very important progress is achieved if the slag which has been ground by the wet method may, after grinding, be brought into a state that will enable it to be stored, with all the qualities inherent to the said paste, and under the form mostly convenient for its stockage and for its subsequent use at any time with the proportion of catalyser corresponding to the quality of the types of concrete to be produced.

2

The present invention brings into effect the possibility of storing, under a suitable form, the above specified hydraulic binder and enables to convert the paste obtained by wet grinding, into a powder that retains all the initial qualities of the paste, it is to say that the original paste may be reconstituted by simply mixing the powder with water.

To this end, and according to the invention, the binder in powder form is obtained by drying the paste resulting from the wet grinding of the granulated slag, immediately after grinding, such drying being preferably carried out at a relatively low temperature, as rapidly as possible, in thin, segregating layers.

To this end the water is in the first place partially removed from the paste. This step may be carried out without the action of calorific energy and without direct man-power, in any suitable apparatus such as for decanting, filtering or centrifugal drying, or with the help of any other means enabling to remove a large proportion of the water contained in the paste. The thus treated material is subsequently advantageously subjected to a drying action, which may, if desired, be completed by a dispersing action in suitable apparatus which eliminates the remainder of the water; thermal energy, vacuum, infra-red rays, radio-frequency, or any other agent may be used to this end. Such apparatus may be constituted e. g. by rotary bullet or blade dryer. At the end of the latter step the treated product appears under the form of an extremely fine powder having completely dispersed particles.

It should be noted that the steps of dehydration and dispersion above described are conveniently carried out in such conditions that the temperature of the mass remains relatively low, advantageously lower than 50° C., so as to eliminate any danger of altering the treated product. Putting the particles into a state of complete dispersion results in securing such a pulverization that the grain size obtained is still smaller than that of the initial paste.

It will be understood that owing to the fact that the paste is thus transformed into a powder retaining all the hydraulic properties of the slag, it becomes possible to use such hydraulic binder, with all its advantages, in any place, at any time and without limitation of stocking time.

The said powder may be supplied in sacks, undergo transportation or be kept in a store, without the risk of alteration, provided the catalyser is not added unless at the moment of use. Contrary to this, conventional cements containing the catalyser are very vulnerable to storage and

3

transport and get the quicker "blown away" and altered the greater the fineness to which they have been ground.

One of the essential features of the new process consists, moreover, in obtaining a powder of much greater fineness than can be achieved with the conventional dry grinding methods. The great fineness of particles obviates the well known drawbacks due to the fact that less finely ground iron cements do not retain water. Moreover, the speed of hydration of a hydraulic binder and, therefore, its hydraulic efficiency, is a direct function of the fineness of its particles.

Finally, it is worth to mention the considerable economic advantage that results from the possibility of preparing and treating the above described binder in a central factory, where it can be stored, and whence it can be despatched in sacks to the place of use.

Since the production of cement according to the invention does not require any burning of the mass, it may be effected in very simple installations, this being a great economical advantage. The powder cement according to the invention is also very advantageous for the preparation of very dry concrete, the use of which becomes more and more frequent. Indeed, if use is made of the paste obtained by wet grinding slag, which paste still contains a rather great proportion of water, it is necessary to add a relatively great quantity of Portland cement in order to obtain the desired water/cement ratio. On the contrary, when use is made of the cement according to the invention, such a convenient ratio may even be obtained without the addition of Portland cement, by simply using any catalyser, for instance a soluble base, such as soda, it being sufficient to conveniently determine the quantity of mixing water.

I claim:

1. The method for the preparation of a hy-

4

draulic cement consisting of the steps of grinding blast furnace slag while wet to finely divided form, rapidly drying the ground product substantially immediately after grinding at a temperature below about 50° C. to reduce the slag powder to dryness whereby the slag powder is capable of storage indefinitely without substantial loss of reactivity for cement formation, and mixing the powder with water and catalyst immediately in advance of use as a hydraulic cement.

2. The method for the preparation of a hydraulic cement consisting of the steps of grinding blast furnace slag while wet to finely divided form, removing the major portion of the water from the wet ground slag by mechanical means, rapidly drying the remainder at a temperature below about 50° C. to reduce the slag powder to dryness whereby the slag powder is capable of storage indefinitely without substantial loss of reactivity for cement formation, and mixing the powder with water and catalyst immediately in advance of use as a hydraulic cement.

VICTOR TRIEF.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
579,820	Elbers	Mar. 30, 1897
1,462,991	Taylor	July 24, 1923

FOREIGN PATENTS

Number	Country	Date
114,794	Great Britain	1918
347,357	Great Britain	1931