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(54) **Means and process for automatic coloring of concrete.**

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PATENT ABSTRACTS OF JAPAN, vol. 9, no. 74 (C-273)[1797], 3rd April 1985; & JP-A-59 209 632 (SHINNIHON GIJUTSU CONSULTANTK.K.) 28-11-1984

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Description

The invention concerns a process for the automatic coloring of concrete.

In a known method, the coloring of the concrete is obtained through the use of inorganic synthetic pigments, like iron oxides, chrome oxides and the like.

The first of these pigments, which are used to obtain the colors red, yellow, black, brown and their shades, and the second, which are used to obtain green, and at any rate inorganic synthetic pigments in general, are substantially added to the cement and aggregates directly in the concrete mixers.

According to a known process, the dry oxides in powder are added by hand on the basis of volumetric evaluations and measurements. This method of proceeding is, however, very empiric and the chromatic result depends exclusively on the experience of the operator who prepares the mix.

For these reasons, it is difficult to achieve production batches which are homogeneous or identical, as the dry oxides in powder are added in volume ratios, and these volumes necessarily vary also with the type of oxide, its state of preservation, temperature conditions, humidity etc.

A weighing system for dispensing concrete in measured amounts of material required to complete a load is disclosed in US-A-3.994.404. This document discloses a mixing plant for dry concrete ingredients comprising a plurality of mixing and measuring units mounted on a single truck, a collecting belt conveyor and a truck loading and distributing device arranged to supply the dry concrete ingredients to ready-mix trucks. Each unit may carry a particular material or concrete ingredient and includes a belt conveyor, a weighing system arranged for weighing of material on the conveyor and a hopper mounted above the latter and having a coarse dispensing outlet and a fine dispensing outlet overlying the conveyor and longitudinally spaced along the latter.

The mixing and weighing of the concrete ingredients in the dry state has, however, many drawbacks. In fact, the yield of these mixes is much lower than the real potential, due to the high volatility of the oxides and to their easy dispersion in air during the additions.

Another drawback consists in the fact that, in the dry mixes, it is impossible to completely and optimally exploit the oxides as the particles, besides dispersing easily in air, are not homogeneously mixed with those of the cement.

According to another coloring method previously used, the oxides are prediluted in water by the producing companies; this system, although it permits a better yield and homogeneity of the mixes, also presents some particular drawbacks, first of all the fact that the prediluted products are packed in drums, or at any rate very bulky containers, for which storage is necessary, with consequent increased costs of packing, transport, storage and of any recycling or disposal of the throw-away containers.

Another drawback consists in the fact that the prediluted oxides create particular pollution problems, as, once a change of color is required, it is necessary to wash all the pipes, pumps and plants in general, with subsequent drainage of the water in sewer due to the fact that it is difficult to work in the presence of purification systems.

Another drawback consists in the high costs of the products as fluidizing and deflocculating additives are present in them to prevent the sedimentation of the oxide particles and keep them suspended.

To all this is added the fact that indispensable for such needs are special liquid batching plants, comprising sophisticated components like probes, displacement pumps, etc.

This method, finally, lends itself to incorrect speculations since, at equal volume yield, it is possible to dilute in water smaller quantities of dry oxide powder than those declared and considered to establish the prices of the prediluted products.

A process according to the preamble of claim 1 is known from DE-A-3.436.813.

According to the disclosure of said DE-A-3.436.813, one of the concrete additives is diluted into a predetermined portion of the water required for the preparation of the concrete in a container and is fed to the concrete mixer containing the concrete ingredients; while the remaining water portion is fed directly to the concrete mixer. This apparatus does not completely solve the above-listed drawbacks since the coloring oxides are not soluble in water and their feeding means and the container are not completely washed clean at the end of the feeding cycle.

The object of the present invention is to provide a process for automatic coloring concrete which overcomes the drawbacks stated above.

According to the present invention this object is achieved by the features in the characterizing part of claim 1. Preferred features of the process of the present invention are set forth in dependent claims 2 to 7.

The process of the present invention allows the following results to be achieved : the oxide mixes are produced automatically, with precise, repetitive batches; the predilution of the oxides is carried out inside a container with a mixer in which the water has also the subsequent function of washing all the parts that have come into contact with the products; the prediluted oxides are sent automatically to the concrete mixers in which the cement and aggregates are already being mixed; subsequently, after the mixing of the cement-aggregates with the prediluted oxides, a further batch of water is sent into the container with a mixer, necessary to complete the total, final mixing, which operates a washing action of all parts.

The advantages of the present invention mainly

consist in the fact that, besides the homogeneity and uniformity of the mixes, it is possible to vary automatically the quantity of coloring oxides and mix them together to obtain any special effect, e.g. streaks and imitation of colour which are obtained in the baking of brick products, and to obtain constant, optimal chromatic yields of colour.

Another advantage consists in the fact that the quantities of coloring oxides are accurately controllable by the programmed weighing systems.

Further advantages consist in the fact that the washing water of the plants is no longer present, as this operation is carried out in the last phase of mixing, all the operations take place automatically and according to pre-established programs, and the storage of the raw materials, i.e. of the oxides, is carried out in traditional manner, with limited dimensions and costs.

The invention is described in more detail below according to a preferred and unbinding construction, with reference to the enclosed drawing, in which:

fig. 1 shows a predilution plant of the coloring oxides, in schematic lateral view, and

fig. 2 shows the same plant, viewed schematically in plan. The figures illustrate means and process for automatic coloring of concrete, for the production of building material, like self-locking blocks, tiles and bent tiles in cement, sheets, blocks or hollow bricks in cement etc., comprising a batching unit (1) composed of various microbatchers (2), preferably with Archimedean screw and with loading hopper (2′), positioned above a conveyor belt (3), with sides (4), supported by a weighing system (5) preferably of electronic type.

In the hoppers (2′), separated from each other, are loaded the different basic products, for example: iron oxide, chrome oxide etc.

With the use of a normal computer, not illustrated, the microbatchers (2) can be programmed in opening and closure on the basis of the pre-established mixes.

At their opening, the microbatchers (2) discharge in the underlying conveyor belt (3) the desired quantity of product contained in the corresponding loading hoppers (2′). According to the color programmed, on the conveyor belt (3) can be discharged oxides from one or more microbatchers (2), whose opening and closure is governed by the quantity of product discharged, weighed directly by the underlying system (5).

Once the required batches of oxide powders have been prepared, the conveyor belt (3) discharges everything into a container (6), preferably constructed in stainless steel, in which is positioned a mechanical mixer (7) with motor (8).

The mixer (7) is equipped with a plurality of rotating blades positioned at different heights, preferably but unbindingly constructed in PVC or similar materials.

Inside the container (6), the oxide powder/powders are mixed and prediluted in a pre-established batch of water and regulated automatically according to the program established previously and inserted in the operator's control computer. The water is inserted in the same container (6) through the duct (9). The opening and closing of the feed valve (10) of the water is regulated automatically by means of the programmed computer.

While the above predilution phase of the dry oxides in powder, in water, is taking place in the container (6), in a standard concrete mixer, positioned downstream from the drain pipe (11) and not illustrated as of known type, a required quantity of cement and aggregates is inserted, and their established mixing phase starts.

At the end of said cement-aggregates mixing phase, whose time is also programmed, the concrete mixer needs water and it reaches it through the drain pipe (11) of the container (6). In substance, the first water that reaches the concrete mixer is that in which the coloring oxides have'already been prediluted.

Subsequently, to the cement-aggregates-prediluted oxides mix, generated in the concrete mixer, is added a second batch of water, pre-established, necessary to complete the preparation of the colored concrete.

Also this second batch of water is discharged from the duct (9) through the valve (10); before reaching the concrete mixer to complete preparation of the colored concrete, it is discharged in the container (6) exercising a washing action, which continues during discharge through the valve (12), the pump (13) and the drain pipe (11).

The feed valves (10) and drain valves (12) are preferably of pneumatic type, while the circulating pump (13) is preferably of pneumatic type with diaphragm.

Finally, when all the second batch of water has been discharged into the concrete mixer, the entire predilution plant of the oxides positioned upstream is perfectly washed and ready to be used for other mixes, with possible different ratios of the components and even with different components, while the same washing liquid is not drained in sewer but used to advantage to complete the colored concrete being prepared in the concrete mixer.

At this point, the colored concrete is ready to be discharged from the concrete mixer on the belts, towards vibrating forms and to the presses for the formation of the finished products, while the mixing and predilution plant of the colored oxides is ready to be re-used according to any other formula and/or color or shade.

Claims

1. A process for the automatic coloring of concrete for the production of building material, comprising the following steps:
   - feeding weighed batches of inorganic synthetic pigments to a container (6);
   - prediluting the batches of the inorganic synthetic pigments with a predetermined portion of water in the container (6);
   - mixing in a concrete mixer a quantity of cement and aggregates required for producing the concrete;
   - feeding the water prediluted batches of the inorganic synthetic pigments to the concrete mixer; and
   - feeding to the concrete mixer a further quantity of water required for obtaining a complete and homogeneous mixing of the colored concrete components,

   characterized in that the batches of the inorganic synthetic pigments are premixed with the predetermined portion of water in the container (6) and the further quantity of water is fed to the concrete mixer through the same container (6).

2. The process according to claim 1, characterized in that the premixed batches of the inorganic synthetic pigments and the further quantity of water are fed to the concrete mixer by a same circulating pump (13).

3. The process according to claim 2, characterized in that the circulating pump (13) is of pneumatic type with diaphragm.

4. The process according to anyone of the preceding claims, characterized in that the batches of the inorganic synthetic pigments are prepared by a programmed opening of microbatchers (2) provided with Archimedean screw and with a loading hopper (2′), each microbatcher (2) containing a single basic inorganic synthetic pigment.

5. The process according to claim 4, characterized in that the batches of the inorganic synthetic pigments are weighed by a weighing system (5) of electronic type positioned downstream from the microbatchers (2).

6. The process according to anyone of the preceding claims, characterized in that the container (6) is provided with a mixer (7) equipped with a plurality of rotating blades positioned at different heights and moved by a motor (8).

7. The process according to anyone of the preceding claims, characterized in that the water is fed to the container (6) through a duct (9) provided with a feed valve (10) automatically regulated by means of a programmed computer.

Patentansprüche

1. Verfahren zum automatischen Färben von Beton für die Produktion von Baumaterial mit folgenden Arbeitsschritten:
   - Fördern abgewogener Chargen anorganischer synthetischer Pigmente zu einem Behälter (6);
   - Vorverdünnen der Chargen anorganischer synthetischer Pigmente mit einer bestimmten Portion Wasser in dem Behälter (6);
   - Mischen einer für die Herstellung von Beton erforderlichen Menge von Zement und Zuschlagstoffen in einem Betonmischer;
   - Fördern der mit Wasser vorverdünnten Chargen anorganischer synthetischer Pigmente zum Betonmischer; und
   - Fördern einer weiteren Menge Wasser zum Betonmischer, die erforderlich ist, um eine vollständige und gleichmäßige Vermischung der gefärbten Betonbestandteile zu erhalten,**dadurch gekennzeichnet,** daß die Chargen der anorganischen synthetischen Pigmente mit der bestimmten Portion Wasser in dem Behälter (6) vorgemischt werden und die weitere Wassermenge durch denselben Behälter (6) dem Betonmischer zugeführt wird.

2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet,** daß die vorgemischten Chargen der anorganischen synthetischen Pigmente und die weitere Wassermenge durch dieselbe Förderpumpe (13) dem Betonmischer zugeführt werden.

3. Verfahren nach Anspruch 2, **dadurch gekennzeichnet,** daß die Förderpumpe (13) von der pneumatischen Art mit Membran ist.

4. Verfahren nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet,** daß die Chargen der anorganischen synthetischen Pigmente durch programmiertes Öffnen von mit einer archimedischen Schraube und mit einem Speisetrichter (2′) versehenen Mikrodosierern (2) hergestellt werden, wobei jeder Mikrodosierer (2) ein einziges anorganisches synthetisches Basis-pigment enthält.

5. Verfahren nach Anspruch 4, **dadurch gekennzeichnet,** daß die Chargen der anorganischen synthetischen Pigmente durch eine elektronische Waage (5) gewogen werden, die sich in Förder-

richtung hinter den Mikrodosierern (2) befindet.

6. Verfahren nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet,** daß der Behälter (6) mit einem Mischer (7) versehen ist, welcher mit einer Vielzahl auf verschiedenen Höhen angeordneter, rotierender Flügel ausgestattet und durch einen Motor (8) angetrieben ist.

7. Verfahren nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet,** daß das Wasser durch eine mit einem Zulaufventil (10), welches durch einen programmierten Computer automatisch gesteuert ist, versehene Leitung (9) dem Behälter (6) zugeführt wird.

Revendications

1. Procédé de coloration automatique du béton pour la production d'un matériau de construction, comprenant les étapes consistant à:
   - mettre des doses pesées de pigments synthétiques inorganiques dans un bac (6),
   - prédiluer, dans le bac (6), les doses de pigments synthétiques inorganiques avec une quantité d'eau prédéterminée,
   - mélanger, dans un mélangeur à béton, une quantité de ciment et d'agrégats requise pour la production du béton,
   - mettre, dans le mélangeur à béton, les doses prédiluées de pigments synthétiques inorganiques,
   - mettre, dans le mélangeur à béton, une quantité d'eau supplémentaire requise pour obtenir un mélange complet et homogène des composants de béton colorés,

   caractérisé en ce que les doses de pigments synthétiques inorganiques sont prémélangées, dans le bac (6), avec la quantité d'eau prédéterminée, et la quantité d'eau supplémentaire est fournie au mélangeur à béton par le même bac (6).

2. Procédé suivant la revendication 1 caractérisé en ce que les doses prémélangées de pigments synthétiques inorganiques et la quantité d'eau supplémentaire sont fournies au mélangeur à béton par une même pompe de circulation (13).

3. Procédé suivant la revendication 2 caractérisé en ce que la pompe de circulation (13) est une pompe pneumatique du type à diaphragme.

4. Procédé suivant l'une quelconque des revendications précédentes caractérisé en ce que les doses de pigments synthétiques inorganiques sont préparées par une ouverture programmée de microdoseurs (2) alimentés par une vis d'Archimède et une trémie de chargement (2') de chaque microdoseur (2) contenant un simple pigment synthétique de base inorganique.

5. Procédé suivant la revendication 4 caractérisé en ce que les doses de pigments synthétiques inorganiques sont pesées par un système de pesée (5), de type électronique, positionné en aval des microdoseurs (2).

6. Procédé suivant l'une quelconque des revendications précédentes caractérisé en ce que le bac (6) comporte un mélangeur (7) pourvu d'une pluralité d'ailettes rotatives, disposées à différentes hauteurs, et mises en mouvement par un moteur (8).

7. Procédé suivant l'une quelconque des revendications précédentes caractérisé en ce que l'eau est fournie au bac (6) par une canalisation (9) comportant une vanne d'alimentation (10) réglée automatiquement par un calculateur programmé.

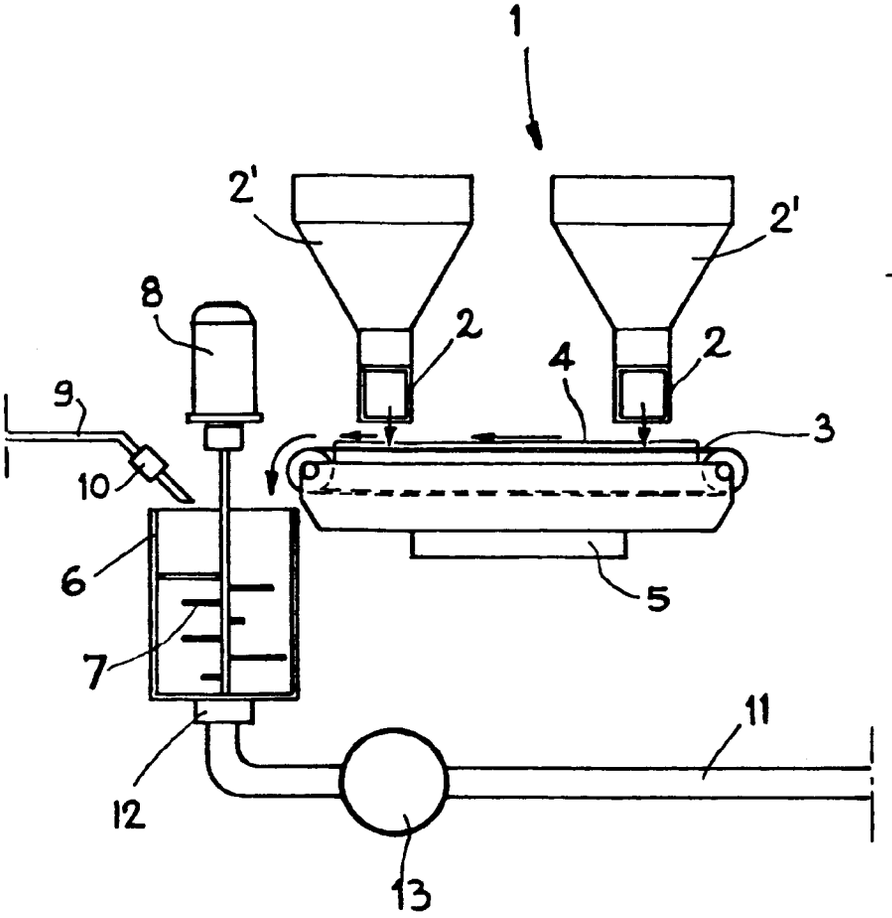

Fig.1

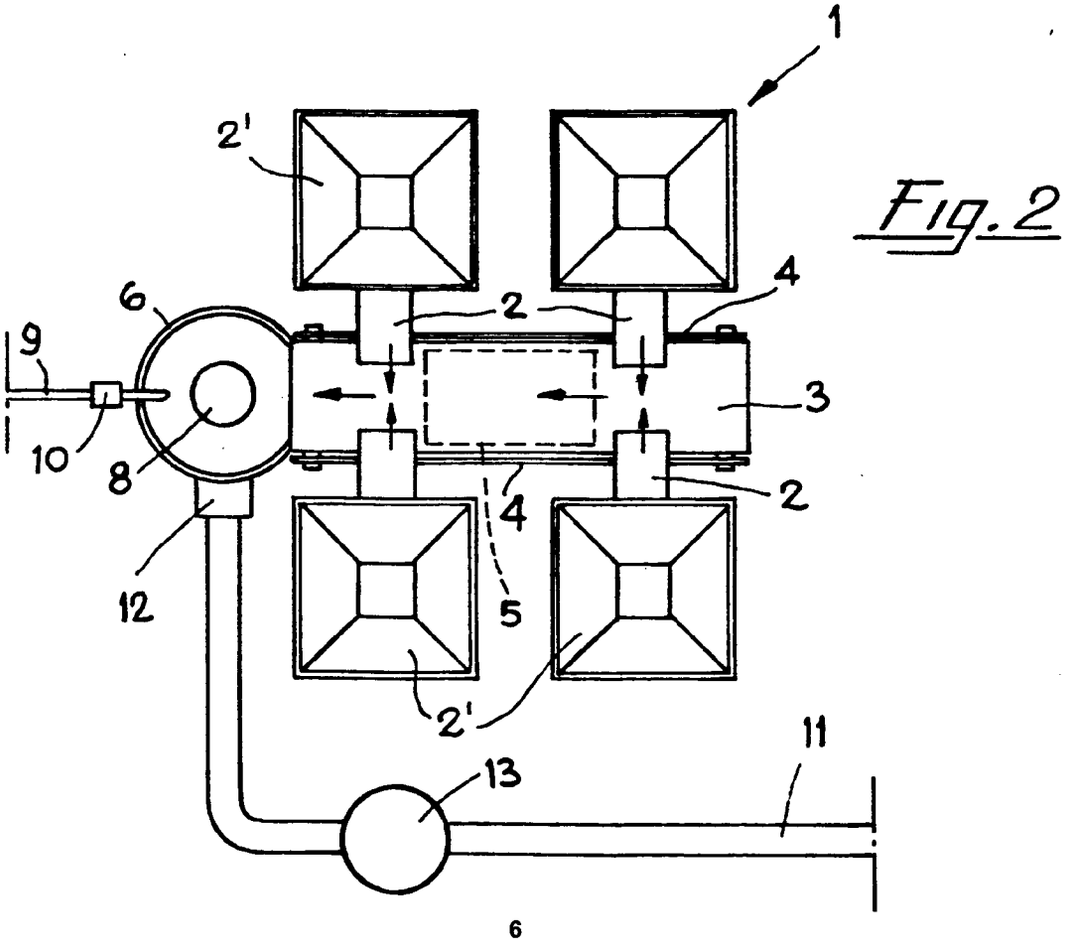

Fig.2