

Oct. 13, 1936.

K. ENDELL

2,057,232

PROCESS OF ACTIVATING BLEACHING CLAYS

Filed Sept. 9, 1933

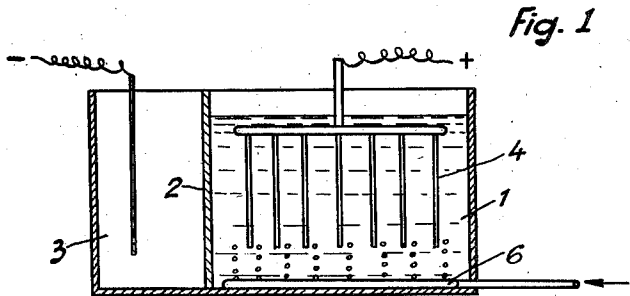


Fig. 1

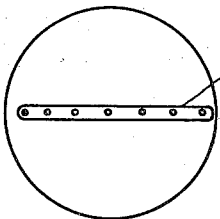


Fig. 2

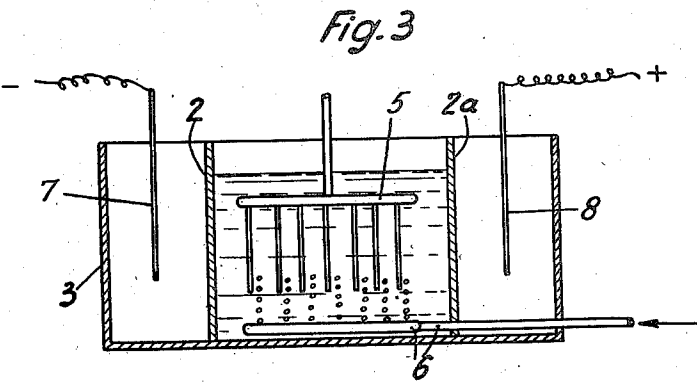


Fig. 3

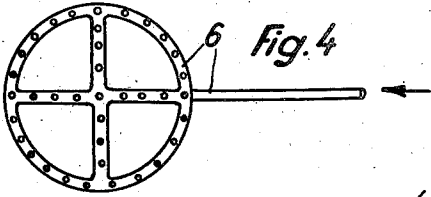


Fig. 4

Kurt Endell
Inventor
by *H. H. Perkins*
Attorney

UNITED STATES PATENT OFFICE

2,057,232

PROCESS OF ACTIVATING BLEACHING
CLAYS

Kurt Endell, Berlin-Steglitz, Germany, assignor
to firm Posschl's Apparatebau- und Export-
Gesellschaft m. b. H., Lubeck, Germany

Application September 9, 1933, Serial No. 688,812
In Germany September 19, 1932

3 Claims. (Cl. 204-1)

The invention relates to a process for activating clays and other natural and artificial sorptive raw materials for the manufacture of bleaching materials, especially bleaching earths.

5 The processes hitherto customary in practice for the manufacture of bleaching materials and especially of bleaching earths from clays or other sorptive materials, as far as they are effective, depend upon a clay or other starting material being treated with an acid in different
10 manners according to the various patents in existence. The acid excess and the substances dissolved by the acid treatment are removed by washing and the purified product is then dried
15 and ground as final product, if necessary.

Ernst Maag and Theodor Blakkolb (German Patent 394,500) render the acid treatment particularly effective by adding to the natural earths and clays such substances from which
20 by subsequent hydrolysis, electrolysis or chemical treatment acids are set free which in statu nascendi are said to influence the raw materials most favorably.

The result of the acid treatment of the starting materials in the manufacture of bleaching
25 earths is explained by the various authors in various ways. Loeb thinks that the success of the acid treatment lies in the formation of hydrosilicates. Eckhard, Weldes and others attribute the effect of the acid treatment to the
30 clearance of efficacious surfaces of the initial starting materials. This latter conception corresponds with the view on the character of bleaching processes carried on through bleaching earths as a pure physical procedure, i. e.
35 through the sorption of coloring matters by means of surface action of the bleaching substances.

The investigation of bleaching earths as to the structure of their sorptive complexes has
40 shown, contrary to the generally current conception shown that the bleaching effect runs parallel to the content of hydrogen combined with ionogen in the complex silicates contained
45 in the bleaching earth, that is, hydrogen which is capable of forming H-ions upon suspending the earth in water. Such colloid particles—as are formed by the complex silicates of the bleaching earth upon suspension in water—
50 which are saturated superficially with hydrogen combined with ionogen, are designated in colloid chemistry as "acidoids". Due to the attachment of hydrogen to their surfaces, the colloid particles possess acid character. The
55 bleaching action, therefore, runs parallel to the

content of acidoids in the earth. Consequently, the bleaching process is not to be regarded as a physical process, but as the chemical saturation of the acidoids by means of coloring bases or basic coloring matters. The acid treatment
5 of the raw materials hitherto used in the manufacture of bleaching materials, especially of bleaching earths, is actually not effective through the clearance of surfaces but through the exchange of bases of the raw material
10 against the H of the acids which is synonymous with the nascence of acidoids.

The acid treatment of the raw materials can now be designated as a very primitive process for the manufacture of acidoids and that for the
15 following reasons:

(1) The exchange of the hydrogen-ions into the complexes proceeds according to the absorption equation in hyperbolic form. To attain a satisfactory formation of acidoids very
20 considerable excesses of acid must thus be employed without it being possible at all ever to attain a complete conversion of all absorptive complexes into acidoids by means of acid treatment, because destruction of the complexes
25 through the acid starts before such complete conversion is produced.

(2) The excess of acid must be removed from the substance by washing just as the products of the exchange dissolved thereby are removed
30 from the raw materials. Thereby great costs are incurred, increasing the price of the final product.

(3) A complete washing-out of the excess of acid is practically almost impossible so that the final products are frequently very acid which
35 considerably affects their efficacy.

The nature of the present invention is that the removal of the bases through hydrogen ion, and thus the activating of the raw materials for the manufacture of bleaching agents is not
40 effected by treating them with acids but directly with hydrogen ions in an electric current by electrolysing the suspended initial materials by means of well-known apparatus at optional current density, voltage and amperage
45 until all bases have been replaced by hydrogen.

The separation of the bases from sorption complexes through hydrogen ions in the electrolysis is known in itself and is being analytically utilized to which also the recent processes of the electro-ultra filtration have to be
50 counted. Heretofore it has not been known to attain a complete activation for bleaching purposes through electrolysis or through elec-
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tro-ultrafiltration of watery suspensions of the raw materials serving for the manufacture of bleaching materials without employing any acids and by means of well known apparatus, which is the object of the present invention.

In carrying out the process of this invention it is possible to proceed as follows:

Example 1.—Into the anode space of a cell separated into two parts by a diaphragm an aqueous suspension of clays containing 40 grams of dry substance in 100 c. c. of slime is introduced. Electrodialysis is carried out by continuously adding water to the cathode space until the constant final value has been attained.

Example 2.—Into the middle space of a three-part cell, the middle space of which is separated from anode and cathode by two diaphragms, a clay slime is introduced according to Example 1. Electrodialysis is carried out by continuously adding water to the cathode and anode spaces until the constant final values have been attained.

For the purpose of improving the initial conductivity both processes may be combined by adding any electrolytes in small quantities to the clay slime or to the water employed.

Small quantities of hydrochloric acid, for instance, $\frac{1}{45}$ of the amount of hydrochloric acid which has been employed with the hitherto usual acid decompositions, and corresponding quantities of acid salts, etc., are required, to serve as electrolytes.

A very good effect may also be attained if carbon dioxide is employed as electrolyte.

The carbon dioxide can be introduced into the suspension in the gaseous state, in the requisite small quantities. The effects in employing carbonic acid, thus produced, as an electrolyte are the following.

1. A physical effect, through homogenization of the slime and uniform activation of the bleaching clay. It is to be observed that through the introduction of carbonic acid, until the activation is completed, the consumption of current should be extremely economical due to avoiding the falling off of the amperage, i. e. it is supplied at a proportionally low voltage.

2. Chemical effects of manifold kinds. The carbon dioxide is a reagent which, when in excess may easily be removed, by simple heating. Furthermore, residues as they appear in the form of chlorides or sulfates respectively when hydrochloric acid or sulfuric acid is being employed. The consequence is a considerable decrease in the acid content of the final product in addition to which the bleaching effect increases.

The activation can also be effected with carbon dioxide under pressure, returning into the cycle the carbon dioxide that leaves the slime. It is also possible to employ, for the activating process, carbon dioxide containing waste gases of practically any kind.

According to experience, for the purpose of converting one ton of a certain clay into bleaching earth by the formerly usual activating process, an amount of 360 kilos of anhydrous hydrogen chloride is required to attain the optimum. The large excess of acid must subsequently be washed out carefully, causing a great loss of substance.

In the present process only 40 kilowatt hours of electrical energy are required per ton of the final product at a loss of substance of only 1%.

For the manufacture of cheap qualities of bleaching materials the electrolysis need not be

carried through to the final resistance, but can be interrupted whenever required.

In carrying the invention into effect equipments such as are given on the schematic drawing attached hereto may be used.

In said drawing,

Fig. 1 shows a two-part cell,

Fig. 2 the anode thereof (view from below) and

Fig. 3 a three-part cell for carrying the process into effect.

Fig. 4 shows the nozzle arrangement for the inlet of carbonic acid gas under supervision.

In the two-part cell (as per Fig. 1) the clay slime can be electrolyzed in the anode space without electrolytes being added.

The arrangement in Fig. 3 serves for receiving and treating the clay slime with an addition of small amounts of electrolytes.

With the arrangement according to Fig. 1 the clay slime is in the anode space 1 which is separated from the cathode space 3 by a diaphragm 2. The anode 4 is in the form of a movable rake, being also the stirring device. It may be replaced by a stationary trellised anode and a special stirring device which effects that the clay particles are kept in constant touch with the acid produced by electrolysis at the anode.

With the arrangement according to Fig. 3 the clay slime is between the diaphragm partitions 2, 2a. Both cathode 7 and anode 8 are separated from the clay slime by the diaphragms. The clay slime in the middle space is stirred by a stirring device 5 of passive material.

Through a gas inlet pipe 6 gaseous carbon dioxide intended to be employed as electrolyte is introduced.

The activation of raw materials for bleaching purposes according to this invention, in using electric current, does not mean merely a substitute for the acid processes but a decidedly important technical progress.

1. Whereas through acid treatment it has not been possible even by using very great excess of acid to convert all colloid salts of the raw materials into acidoids and, by doing so, to attain the theoretical maximum of the activation, with the activation by the electric current this maximum of yield automatically appears, i. e., the conversion of the colloidal electrolytes into acidoids is complete as soon as the resistance of the system falls to a constant final value. The technical aim of the activation is therefore attained through the electric current with greater completeness and security than has been possible with the acid process.

2. The very high costs of the acid treatment and the subsequent washing are eliminated, thus reducing, at a very low consumption of current, the manufacturing costs of the bleaching materials to a fraction of those hitherto incurred. This may be illustrated by the following example:

To convert a ton of a certain clay into bleaching earth by the activation process according to experience an amount of 300 kilogrammes of anhydrous hydrochloric acid is required to obtain the optimum activation. The large excess of acid must subsequently be washed out carefully at a loss of substance of about 6%.

In using the same clay according to the present invention, even for a better activation than previously attained by means of 360 kilos of hydrochloric acid, about 18 kilowatt hours of

electrical energy are sufficient, a final product entirely free from acid ensuing at only about 1% loss in substance and which it is not necessary to purify. There is a great saving in the manufacturing costs through the simplification of the process.

I claim:

1. The process of activating bleaching clays for the manufacture of bleaching earths, which comprises forming a suspension of the respective material and water and subjecting the mixture to electro dialysis to replace the exchangeable bases of the natural bleaching clays by hydrogen and to activate the material.

2. The process of activating bleaching clays for the manufacture of bleaching earths, which

comprises forming a suspension of the respective material and water, adding a small quantity of an electrolyte thereto and subjecting the resulting mixture to electro dialysis to replace the exchangeable bases of the natural bleaching clays by hydrogen and to activate the material.

3. The process of activating bleaching clays for the manufacture of bleaching earths, which comprises forming a suspension of the respective material and water, introducing gaseous carbon dioxide into the suspension and subjecting the resulting mixture to electro dialysis to replace the exchangeable bases of the natural bleaching clays by hydrogen and to activate the material.

KURT ENDELL.

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