UNITED STATES PATENT OFFICE.

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PROCESS FOR BLEACHING AND IMPROVING FLOUR AND MILLING PRODUCTS.


To all whom it may concern:

Be it known that I, HENRI CASPAR JOSEPH HUBERT GELISSEN, doctor of chemistry, residing at Berlin, Germany, have invented certain new and useful Improvements in Processes for Bleaching and Improving Flour and Milling Products, of which the following is a specification.

In the specification and in the appended claims the terms “flour material,” “milling material,” or “milling material” are intended to cover either finished flour or the material from which flour is to be made, as well as all intermediate products such as the successive stages of the material as the same passes through the flour milling operation.

The present invention relates to bleaching and improving flour material by the use of peraldehydes, ozonides, per-oxonides (which are known as ozonides), peroxonides (known as peroxonides) ozonide peroxides, polymers of the ozonides (as well as of the peroxonides, peroxonides, ozonide-peroxides), derivatives of these materials, or mixtures of two or more of the materials or derivatives mentioned above. These derivatives, however, generally must have the same typical molecular structure and character as the peraldehydes, ozonides, peroxonides, ozonide-peroxides or the polymers mentioned above.

The peraldehydes, ozonides, and per-oxonides, peroxonides, ozonide-peroxides or polymers of the ozonides (as well as of the peroxonides, peroxonides, ozonide-peroxides), as well as derivatives of these materials or mixture thereof, are hereinafter generically referred to in the expression “a substance of the herein described peraldehyde-oxonide class.” As examples of these materials I mention the following, which have been found to give good results: peraldehydes of peroxidic character such as 1,5-C₅H₄CHO and in the general the compounds of the formula CH₃(CH₂)₅CHO (vide Harries “Das Ozon,” page 15) and peroxonides such as for instance

\[
\text{CH}_3(\text{CH}_2)_5\text{CH} \cdot (\text{CH}_2)_5\text{CH} \cdot \text{CO} \cdot \text{OH}
\]

(vide Harries “Das Ozon,” page 6). As an example of a peroxozonide

\[
\text{CH}_3(\text{CH}_2)_5\text{CH} \cdot (\text{CH}_2)_5\text{CH} \cdot \text{CO} \cdot \text{OH}
\]

is mentioned, and as an example of an ozonide peroxid the ozonide-peroxid of oleic acid is mentioned:

\[
\text{CH}_3(\text{CH}_2)_5\text{CH} \cdot (\text{CH}_2)_5\text{CH} \cdot \text{CO} \cdot \text{OH}
\]

These substances may be added e.g. to the flour, meal, milling product, the original grain, dried potato meal, or similar materials, or they may be added at an intermediate stage; for example, in the treatment of flour from wheat or other like grains, they may be added after the wheat has passed through the first set of rolls of the roller mill in which the wheat is to be converted into flour.

The amount of such substance which it is necessary to add, in order to produce important improvement in the color, baking quality, and keeping quality of the flour material, is very small. In fact 0.01% of these materials, (relative to the weight of the milling product) is sufficient in many instances.

It is well known that wheat and other materials used in making flour contain numerous enzymes, among which the catalase and peroxidase may be mentioned as typical. Catalase ordinarily acts upon such substances as ozonides with the production of molecular oxygen, whereas peroxidase acts upon these substances with the production of highly active or nascent oxygen. The former of these actions is somewhat detrimental, as it may use up a considerable proportion of the
whole amount of the substance of the herein described peraldehyde-ozonide class without producing any substantial improvement in the flour material. On the other hand, the nascent oxygen produced by the action of peroxidase is the preferred form of producing the oxygen, since the oxygen in this form is more highly active and is accordingly better adapted to improve the flour material. The catalase and similarly acting enzymes may, however, conveniently be destroyed or rendered wholly or largely inactive before the substance of the herein described peraldehyde-ozonide class is added, this effect being produced by treating the milling product with small quantities of chlorin gas, or small quantities of substances producing chlorin. The amount of chlorin need not be large, and particularly the amount of chlorin need not be sufficient to produce any bleaching effect upon the flour material. Without restricting myself to exact amounts, I will state that the treatment of the milling material with an amount of chlorin representing 0.002% of the weight of the milling material, and subsequently adding 0.01% of the substance of the herein described peraldehyde-ozonide class, has been found to give very useful results.

In addition to the substance of the herein described peraldehyde-ozonide class, there may be added to the flour material, a small percentage of peroxids, persalts, peracids, or other suitable percompounds to the flour material, a small percentage of peroxids, persalts, peracids, or other suitable percompounds or equivalent materials, during the stage of making the bread. For this purpose the flour material is successively or simultaneously incorporated with liquid in such proportion as to produce dough, and this operation may be simultaneous with the addition of other ingredients of the dough batch, such as salt, yeast, baking powder, shortening, sugar or other flavoring materials, dried milk, milk, dried eggs, etc.

The substances of the herein described peraldehyde-ozonide class are generally highly unstable in character and will therefore liberate active oxygen, and it appears probable that the bleaching action is produced by the active oxygen so liberated. These substances contain relatively great percentages of active oxygen, so that a very small percentage of said compounds, when added to the milling material, is sufficient to produce the desired amount of bleaching and to improve the baking quality. The fact that the product is rendered sterile and hence that it will keep for a long period of time without undergoing change is also of great advantage.

The addition of the substances of the herein described peraldehyde-ozonide class, during the early part of the milling process is especially effective, perhaps due to the fact that an exceptionally good incorporation thereof with the said materials is produced thereby and perhaps also largely due to the fact that the atmosphere within the milling apparatus is usually much warmer.

Various chemical treatments may also be used with similar effects; for example: the addition of metal oxides which decompose the above mentioned substances, forming very active oxygen.

It is also possible in some cases to produce the desired results by adding the substances of the herein described peraldehyde-ozonide class, with or without the peroxids, persalts, peracids or other suitable percompounds or equivalent materials, during the stage of making the bread. For this purpose the flour material is successively or simultaneously incorporated with liquid in such proportion as to produce dough, and this operation may be simultaneous with the addition of other ingredients of the dough batch, such as salt, yeast, baking powder, shortening, sugar or other flavoring materials, dried milk, milk, dried eggs, etc.

The substances of the herein described peraldehyde-ozonide class are generally highly unstable in character and will therefore liberate active oxygen, and it appears probable that the bleaching action is produced by the active oxygen so liberated. These substances contain relatively great percentages of active oxygen, so that a very small percentage of said compounds, when added to the milling material, is sufficient to produce the desired amount of bleaching and to improve the baking quality. The fact that the product is rendered sterile and hence that it will keep for a long period of time without undergoing change is also of great advantage.

The addition of the substances of the herein described peraldehyde-ozonide class, during the early part of the milling process is especially effective, perhaps due to the fact that an exceptionally good incorporation thereof with the said materials is produced thereby and perhaps also largely due to the fact that the atmosphere within the milling apparatus is usually much warmer.
and more moist than the outside atmosphere. These conditions may be enhanced by the admission of steam or warm air, or both, into the roller mill casing, or elsewhere in the apparatus. The chlorin treatment and the addition of the peraldehyde-ozone compounds may be added, in the early part of the milling process, particularly just after the material has passed through the first pair of rolls in the roller mill.

I claim:

1. A process which comprises adding a substance of the herein described peraldehyde-ozone class to flour material.

2. A process which comprises adding a substance of the herein described peraldehyde-ozone class, together with a true peroxid compound, to flour material.

3. A process which comprises adding a substance of the herein described peraldehyde-ozone class, together with a liquid vehicle, to flour material.

4. A process of treating flour material which comprises subjecting such material to the action of chlorin and treating the same with a substance of the peraldehyde-ozone class.

5. A process of treating flour material which comprises adding a substance of the herein described peraldehyde-ozone class which substance is decomposed while mixed with the said flour material under conditions capable of producing active oxygen in contact therewith.

In testimony whereof I affix my signature.

HENRI CASPAR JOSEPH HUBERT GELISSEN.