

- [54] **ALKALINE PEROXIDE TREATMENT OF AGRICULTURAL BYPRODUCTS**
- [75] **Inventor:** John M. Gould, Brimfield, Ill.
- [73] **Assignee:** The United States of America as represented by the Secretary of Agriculture, Washington, D.C.
- [*] **Notice:** The portion of the term of this patent subsequent to Mar. 10, 2004 has been disclaimed.
- [21] **Appl. No.:** 912,296
- [22] **Filed:** Sep. 29, 1986

Related U.S. Application Data

- [63] Continuation-in-part of Ser. No. 566,380, Dec. 28, 1983, Pat. No. 4,649,113.
- [51] **Int. Cl.⁴** C12P 7/10; C13K 1/02; D21C 3/00; D01C 1/00
- [52] **U.S. Cl.** 435/165; 127/37; 162/78; 162/99
- [58] **Field of Search** 435/165; 127/37; 530/500; 162/78, 99

References Cited

U.S. PATENT DOCUMENTS

2,487,114	11/1949	Dreyfus	162/25
4,314,854	2/1982	Takagi	127/37
4,462,864	7/1984	Carles et al.	162/56
4,649,113	3/1987	Gould	435/165

FOREIGN PATENT DOCUMENTS

1169794 6/1984 Canada .

OTHER PUBLICATIONS

D. Lachenal et al., "Hydrogen Peroxide as a Delignifying Agent," *Tappi* 63(4): 119-122 (Apr. 1980).
 "Peroxide Treatment of Lignocellulose," Northern Regional Research Center Notes from the Director, Issue 1533, pp. 1-2 (Jan. 28, 1983).
 "Mix Straw with Hydrogen Peroxide, Soak Well and Serve-to Farm Animals?" *Des Moines Sunday Register* (Nov. 24, 1985).

"Can This Cellulose Mash Change Corn Grain's Role in Fattening Rations?" *Beef* (Mar. 1986).
 "New Process Spins Crop Residue Into 'Golden' Products," *Farm Industry News*, pp. 12-13 (Apr. 1986).
 J. M. Gould, "Alkaline Peroxide Delignification of Agricultural Residues to Enhance Enzymatic Saccharification," *Biotech. Bioeng.* XXVI: 46-52 (1984); #5350.
 J. M. Gould et al., "High-Efficiency Production from Lignocellulosic Residues Pretreated with Alkaline H₂O₂," *Biotech. Bioeng.* XXVI: 628-631 (1984); #5387.
 J. M. Gould, "Studies on the Mechanism of Alkaline Peroxide Delignification of Agricultural Residues," *Biotech. Bioeng.* XXVII: 225-231 (1985); #5530.
 J. M. Gould, "Enhanced Polysaccharide Recovery from Agricultural Residues and Perennial Grasses Treated with Alkaline Hydrogen Peroxide," *Biotech. Bioeng.* XXVII: 893-896 (1985); #5560.
 M. S. Kerley et al., "Alkaline Hydrogen Peroxide Treatment Unlocks Energy in Agricultural By-Products," *Science* 230: 820-822 (Nov. 15, 1985); #5605.
 "'Peoria Diet' Starts with Corn Stalks," *Peoria Journal Star*, pp. A14 and A2 (Jun. 7, 1986).

Primary Examiner—Esther M. Kepplinger
Assistant Examiner—Janelle Graeter
Attorney, Agent, or Firm—M. Howard Silverstein; David G. McConnell; Curtis P. Ribando

[57] **ABSTRACT**

Nonwoody lignocellulosic portions of plant fruits, roots, and tubers, such as sugar beet pulp, citrus pulp, seed hulls, and cereal bran are treated with hydrogen peroxide under alkaline conditions thereby delignifying the materials and rendering the cellulose and hemicellulose highly available for subsequent use. The products are characterized by enhanced water-binding capacity of the cellulose as indicated by high water swellability. The products are also nontoxic and thereby useful as carbohydrate sources in ruminant feeds, as microbial feedstocks, and as sources of dietary fiber for humans and other monogastrics.

18 Claims, No Drawings