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(54) **ENERGY EFFICIENT PROCESS FOR PREPARING NANOCELLULOSE FIBERS**

(71) Applicant: **University of Maine System Board of Trustees**, Orono, ME (US)

(72) Inventors: **Michael A. Bilodeau**, Brewer, ME (US); **Mark A. Paradis**, Old Town, ME (US)

(73) Assignee: **University of Maine System Board of Trustees**, Orono, ME (US)

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CPC ***D21C 9/007*** (2013.01); ***D21C 9/002*** (2013.01); ***D21C 9/004*** (2013.01); ***D21H 11/18*** (2013.01); ***D21H 17/005*** (2013.01); ***D21H 17/63*** (2013.01)

(58) **Field of Classification Search**
CPC D21C 9/001; D21C 9/002; D21C 9/004; D21C 9/005; D21C 9/007
See application file for complete search history.

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Primary Examiner — Anthony Calandra
(74) *Attorney, Agent, or Firm* — MacMillan, Sobanski & Todd, LLC

(57) **ABSTRACT**

A scalable, energy efficient process for preparing cellulose nanofibers is disclosed. The process employs a depolymerizing treatment with one or both of: (a) a relatively high charge of ozone under conditions that promote the formation of free radicals to chemically depolymerize the cellulose fiber cell wall and interfiber bonds; or (b) a cellulase enzyme. Depolymerization may be estimated by pulp viscosity changes. The depolymerizing treatment is followed by or concurrent with mechanical comminution of the treated fibers, the comminution being done in any of several mechanical comminuting devices, the amount of energy savings varying depending on the type of comminuting system and the treatment conditions. Comminution may be carried out to any of several endpoint measures such as fiber length, % fines or slurry viscosity.

18 Claims, 7 Drawing Sheets