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**(54) Title**: ION EXCHANGE DEIONIZATION APPARATUS WITH ELECTRICAL REGENERATION

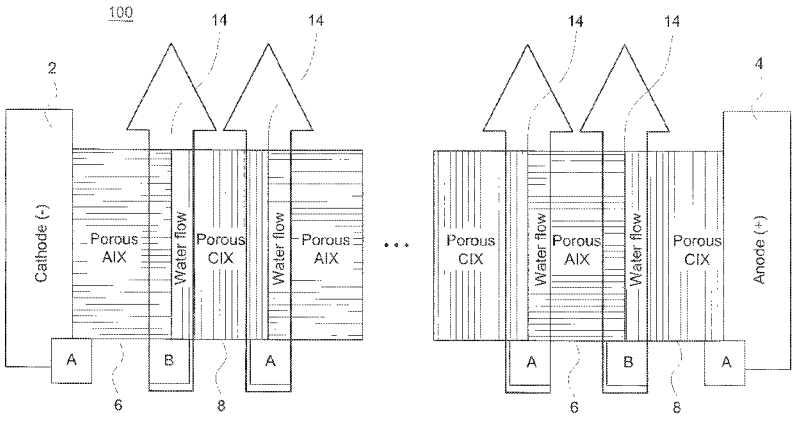



FIG. 1

**(57) Abstract**: Electrodeionization methods and apparatus wherein ion exchange membranes are not utilized. Instead, ion exchange materials such as beads, fibers, etc., are disposed in alternating layers of anion exchange (AIX) materials and cation exchange (CIX) materials between opposite polarity electrodes. In a regeneration stage, a current is applied across the electrodes with water splitting occurring along at least one of the interfacial areas between neighboring AIX and CIX materials. The H+ and OH ions formed via water splitting migrate in response to the electrical current and displace the salt ions in the respective AIX and CIX. The stack is flushed during the regeneration stage to remove the concentrated salt solution. During a deionization phase, the electrical current is terminated with influent fed to the stack for deionization. The salt ions in the influent are depleted via ion exchange as the influent contacts the AIX and CIX.