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(54) **SIMPLIFIED SWITCHING FOR STATE OF CHARGE BALANCING OF BATTERY STRINGS AND MODULES**

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(57) **ABSTRACT**

A battery system includes: at least two battery modules, where each of the at least two battery modules includes three strings of battery cells; and a switch control module configured to: determine state of charges (SOCs) of the strings of battery cells, respectively; determine, using model predictive control based on the SOCs, periods of phases, respectively; determine, using model predictive control based on the SOCs, periods for the strings, respectively, to be connected to a second positive terminal and a negative terminal during the phases, the determination of the periods for the strings including: setting the period for one of the strings of one of the battery modules to end before the end of a phase; and setting the periods for the other two strings of the one of the battery modules to end at the end of the phase.