

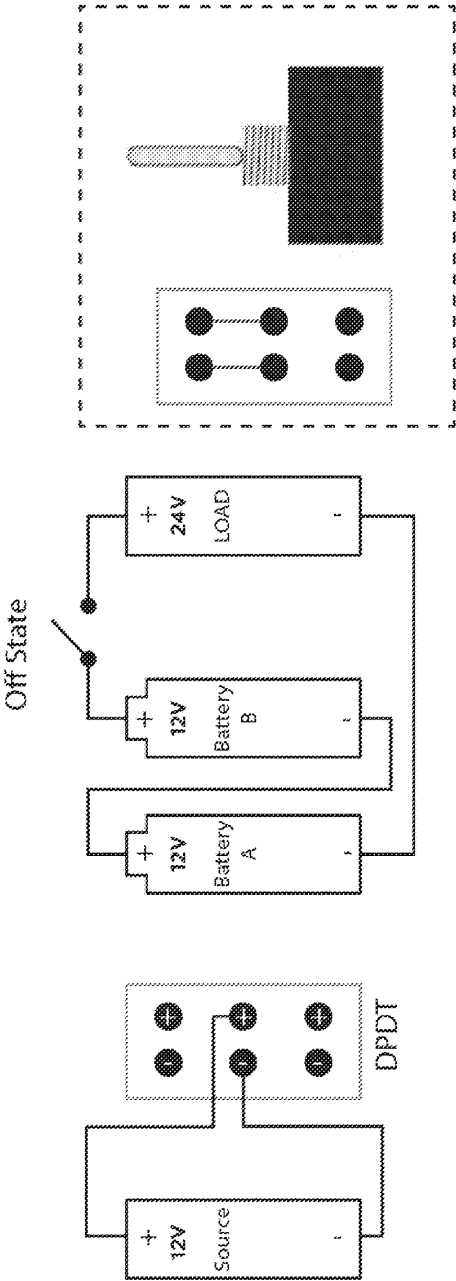


FIG. 1A is an exemplary embodiment of a DPDT switch (Off State) used to charge a series-stacked battery system to power 24V load using a 12V power source.

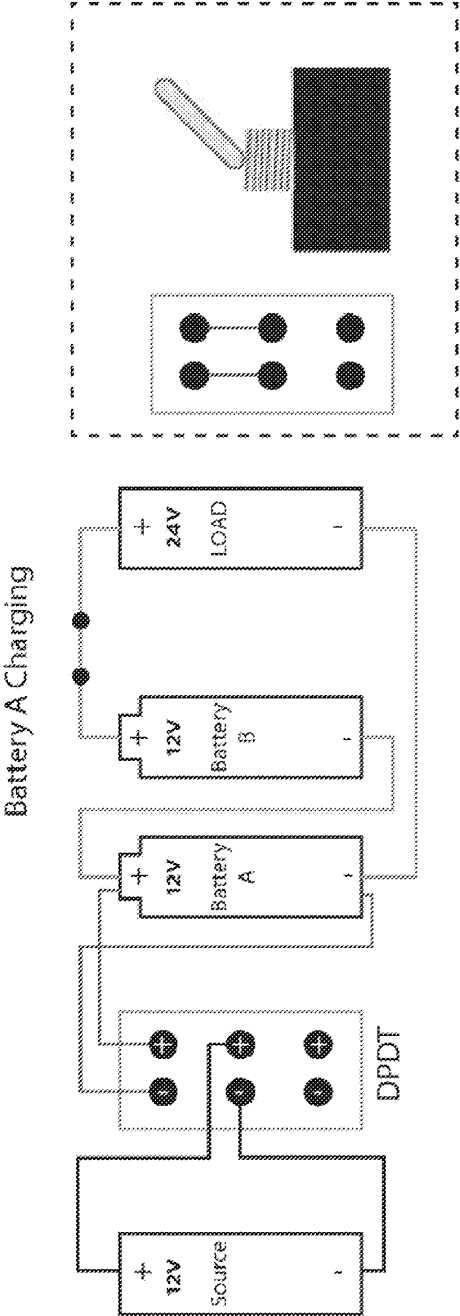


FIG. 1B is an exemplary embodiment of a DPDT switch (First Position) used to charge a series-stacked battery system to power 24V load using a 12V power source.

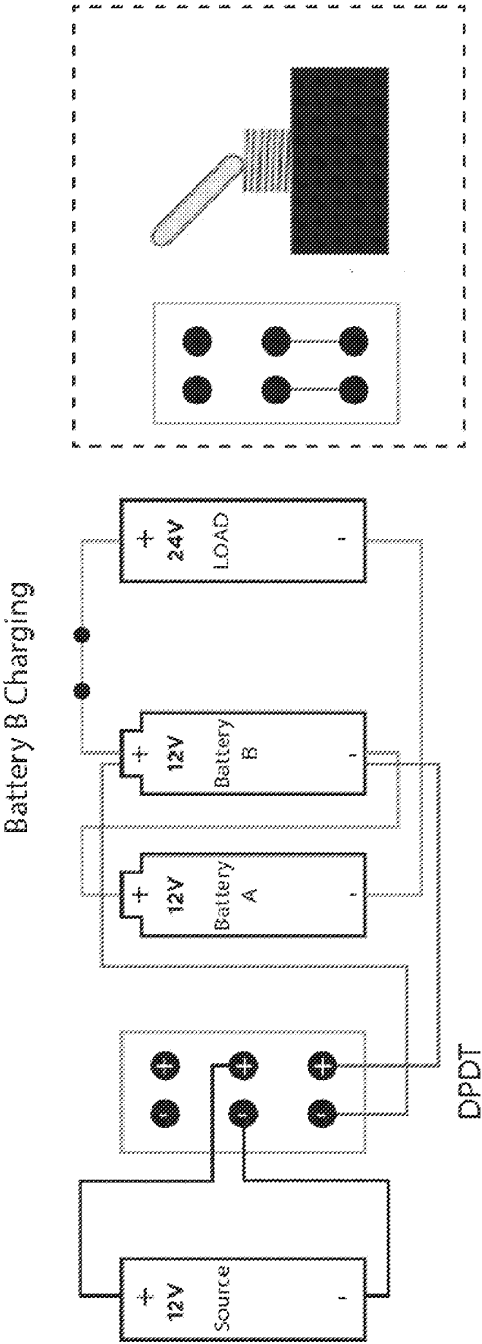


FIG. 1C is an exemplary embodiment of a DPDT switch (Second Position) used to charge a series-stacked battery system to power 24V load using a 12V power source.

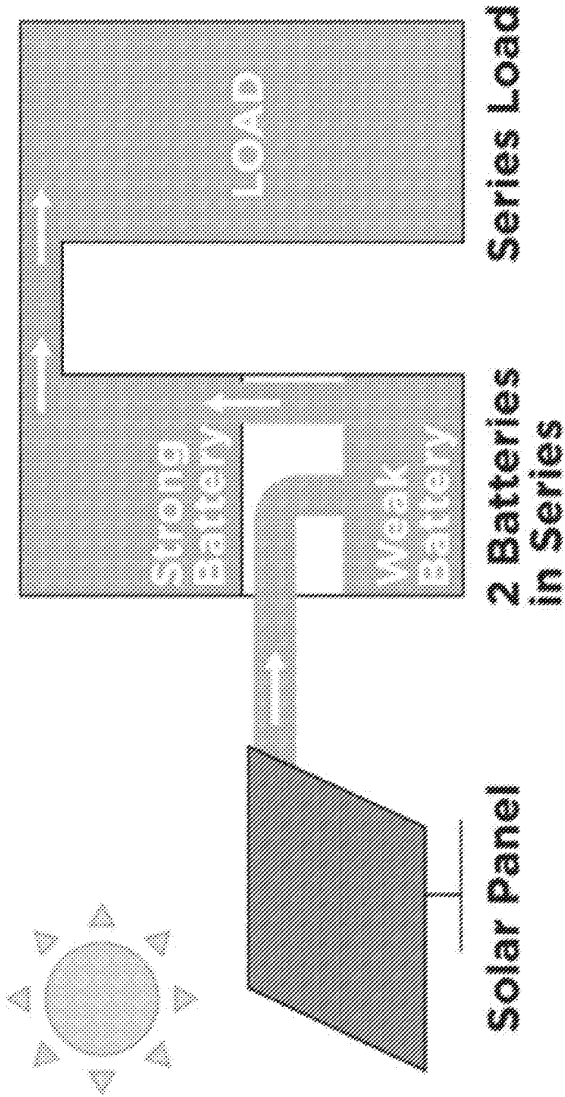


FIG. 2 is a water tank analogy to illustrate the integrated charging and balancing.

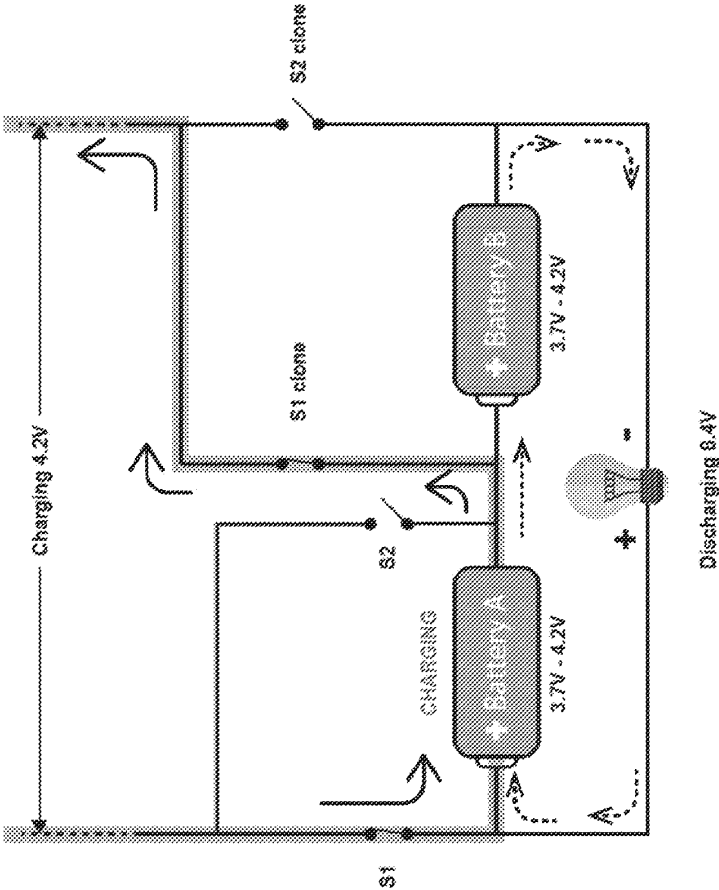


FIG. 3A is an exemplary embodiment where Battery A is charging

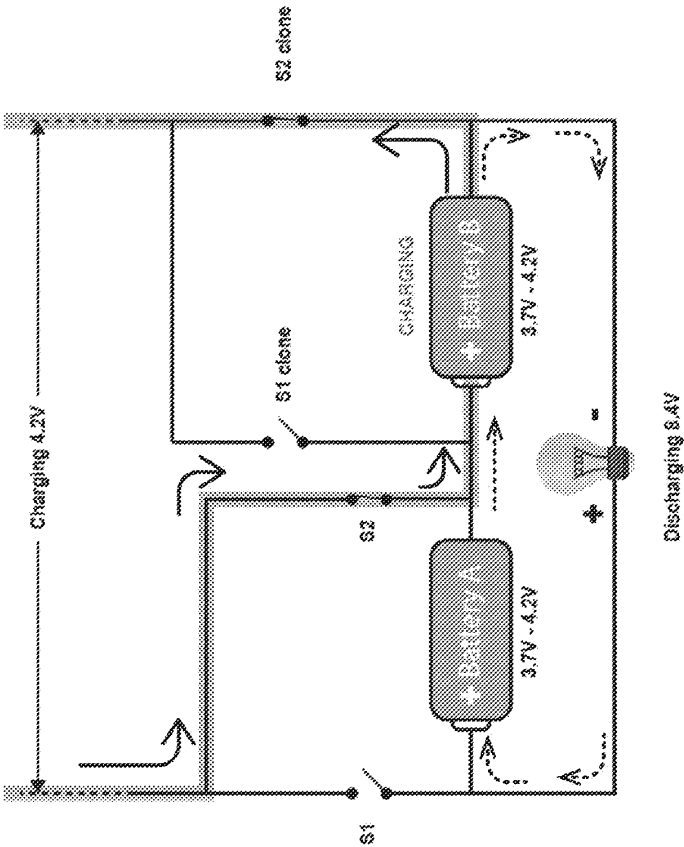


FIG. 3B is an exemplary embodiment where Battery B is charging

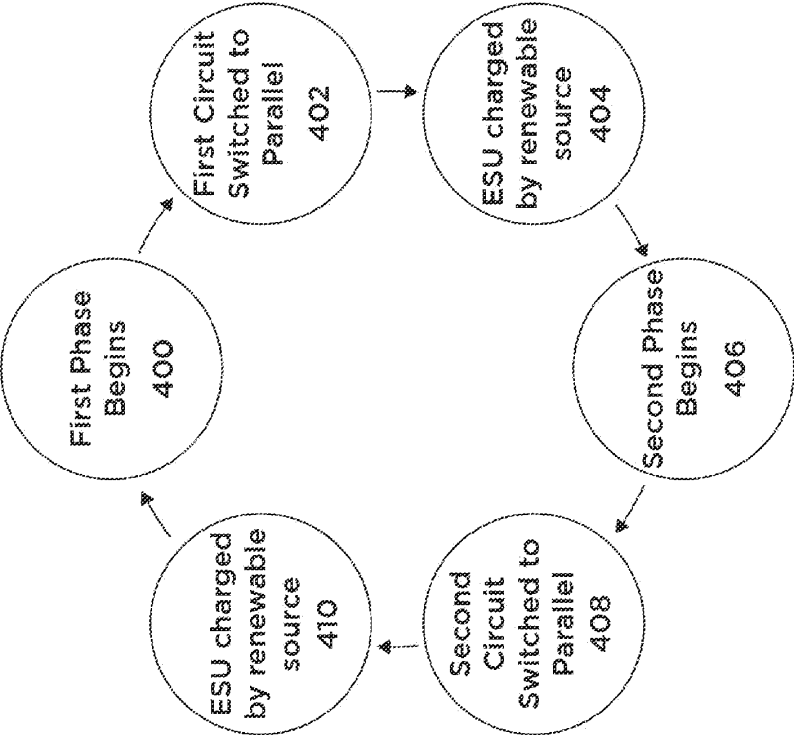


FIG. 4 is an exemplary embodiment of implementing a parallel input switching circuit.

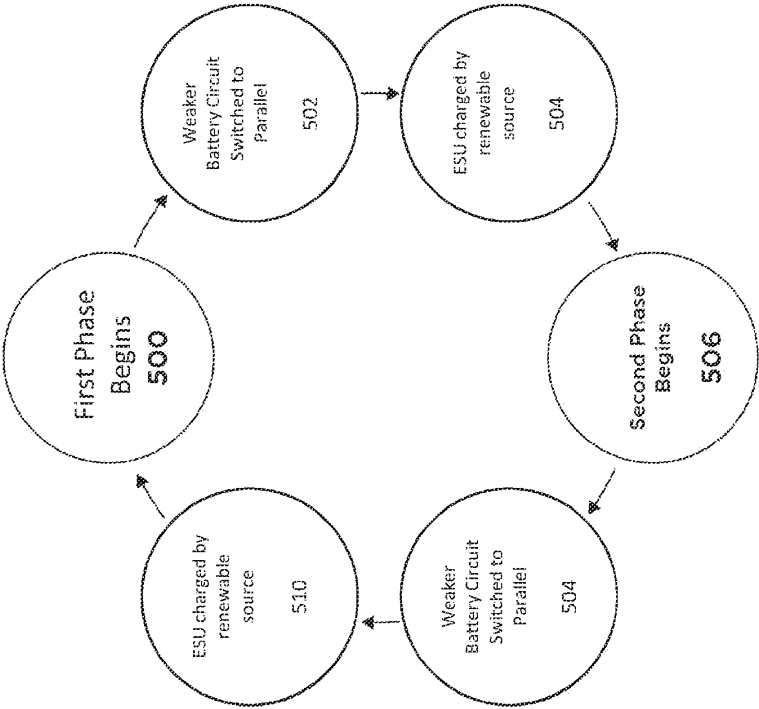


FIG. 5 is an alternative embodiment of implementing a parallel input switching circuit.

Typical Discharge of Battery

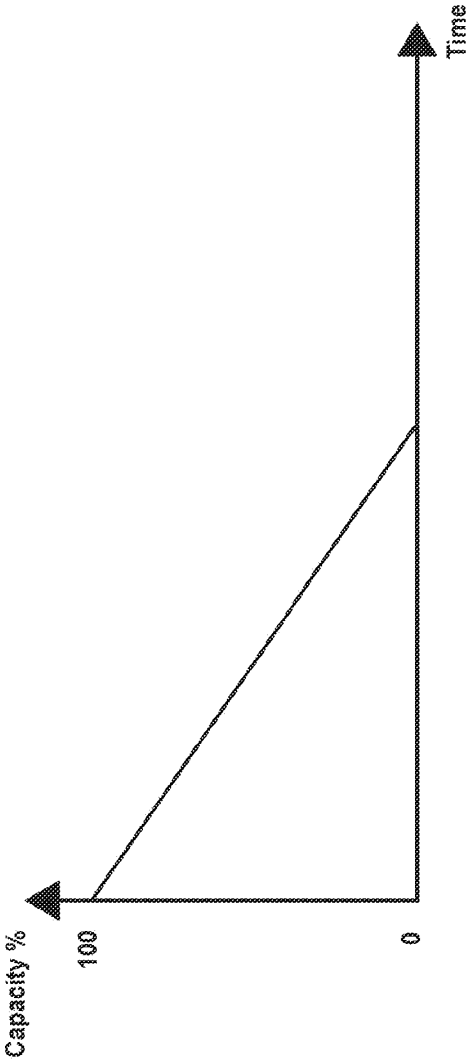


FIG. 6A shows the Discharge (D) cycle in a typical series-stacked battery system.

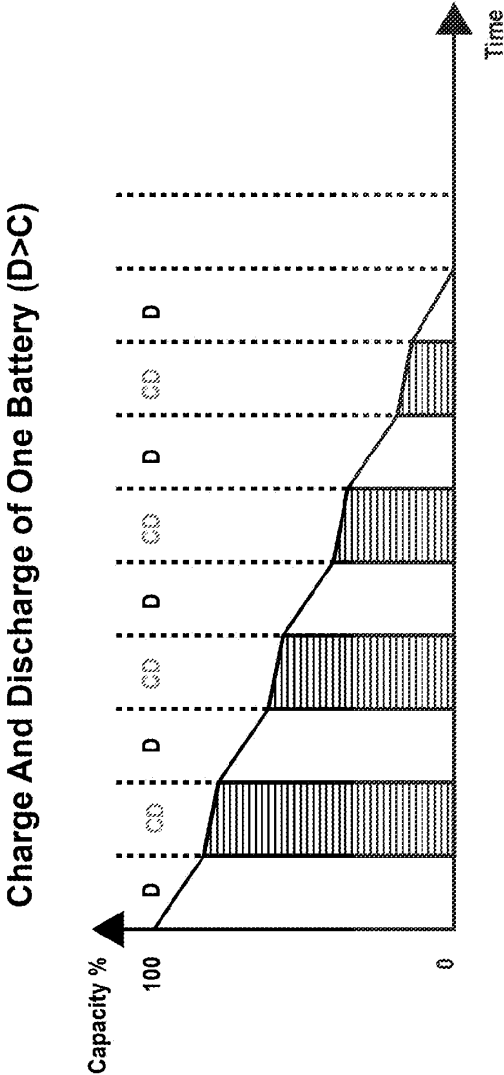


FIG. 6B shows the Discharge (D) and Charging/Discharging (CD) cycles in an exemplary 2-battery embodiment.

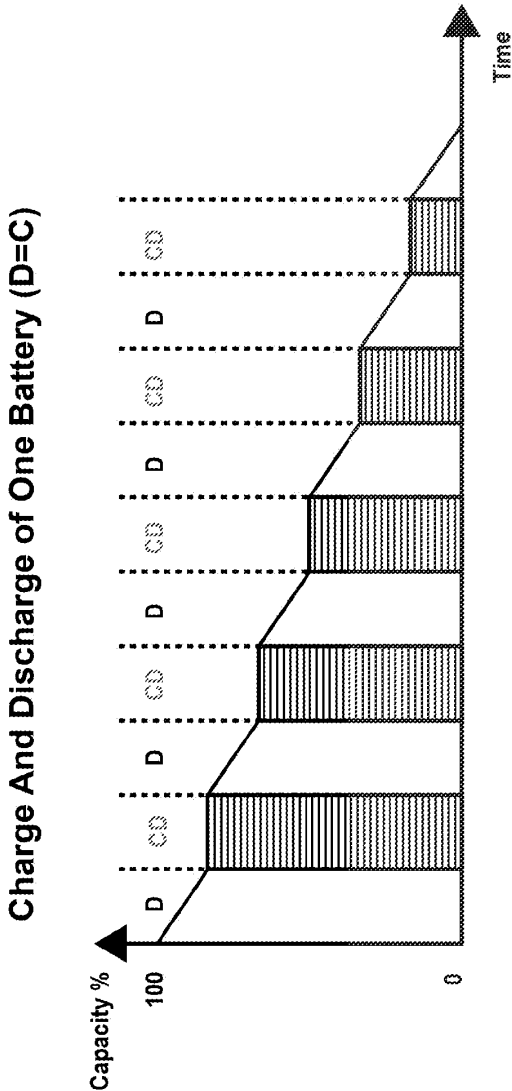


FIG. 6C shows the Discharge (D) and Charging/Discharging (CD) cycles in an exemplary 2-battery embodiment.

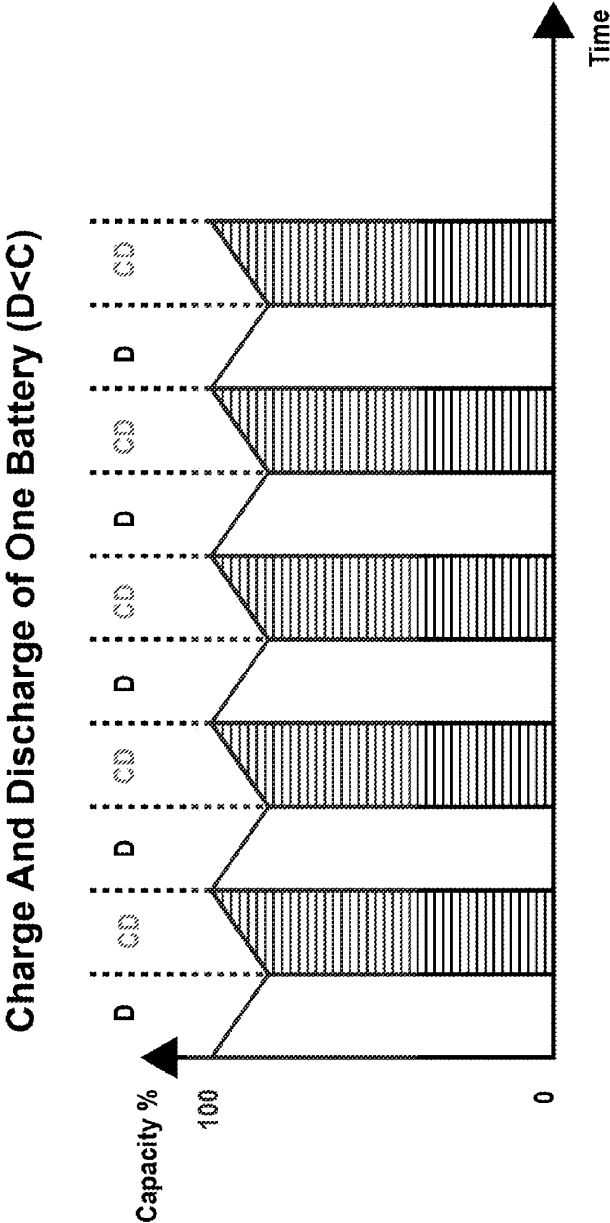


FIG. 6D shows the Discharge (D) and Charging/Discharging (CD) cycles in an exemplary 2-battery embodiment.

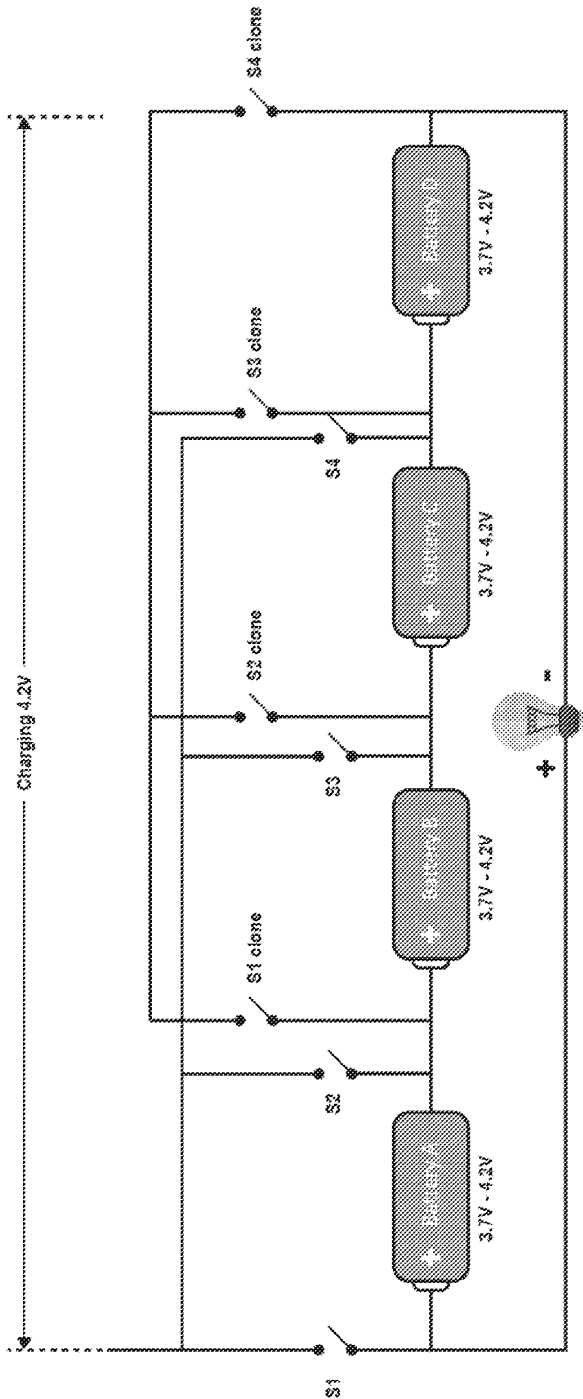


FIG. 7A is an exemplary 4-battery embodiment

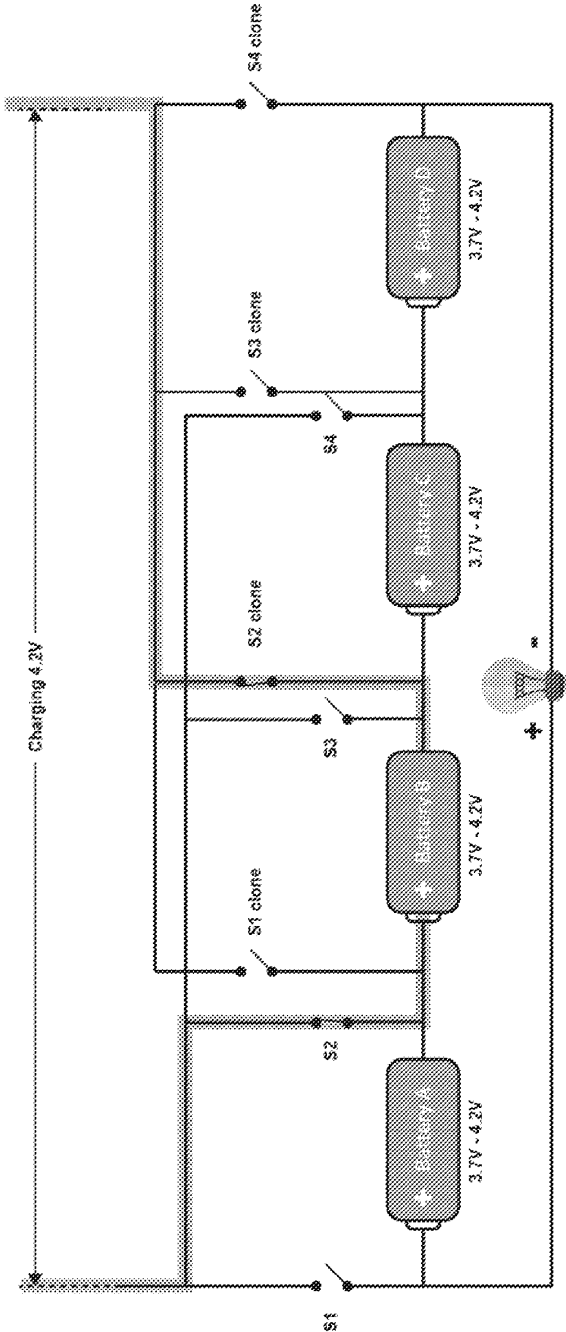


FIG. 7B is an exemplary embodiment where Battery 2 is charging

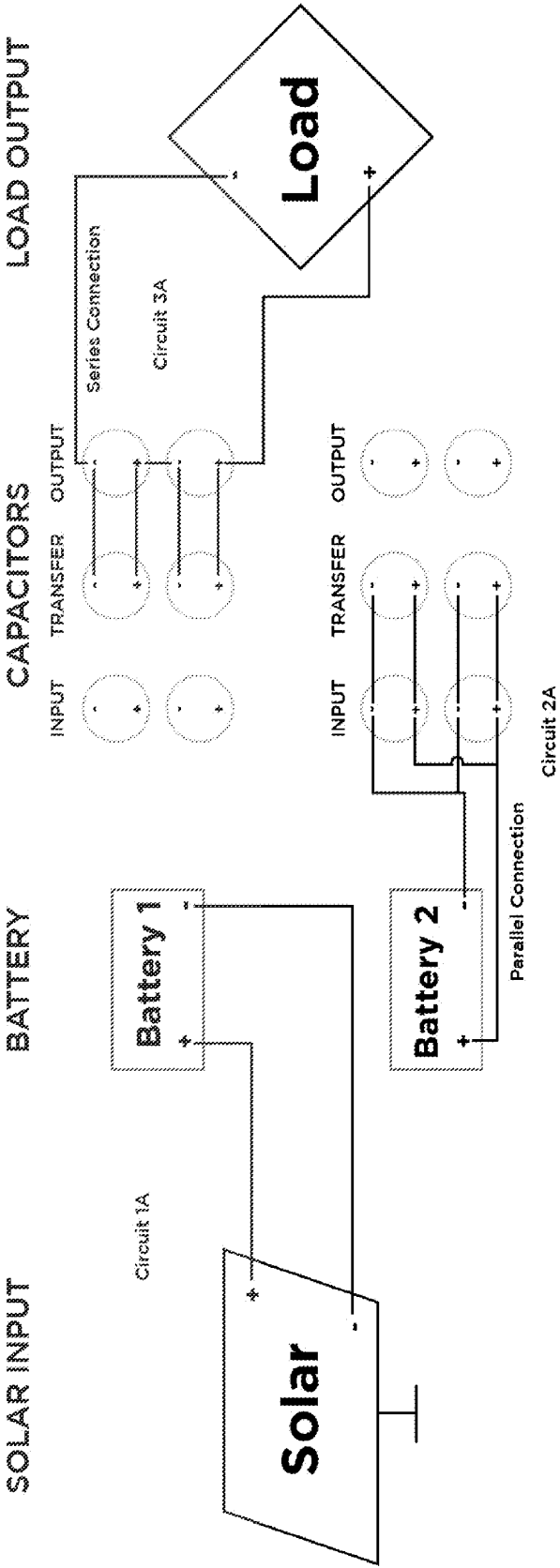


FIG. 8A is a twin battery system using capacitors where Battery 1 is charged

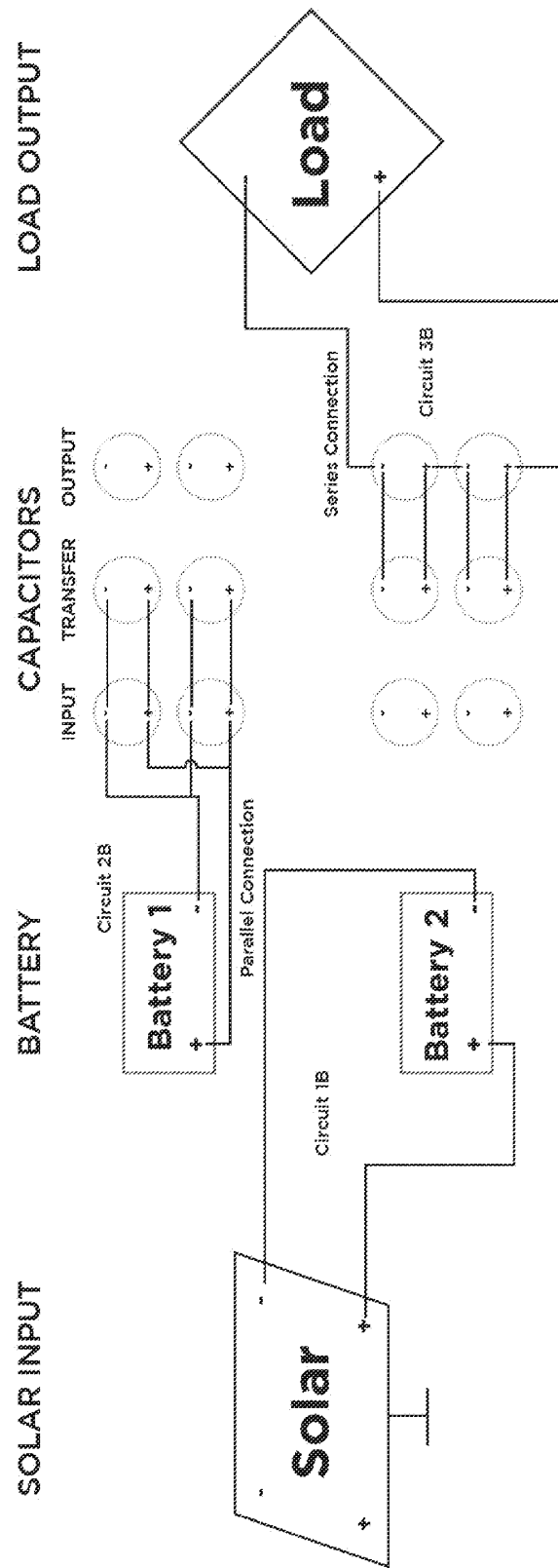


FIG. 8B is a twin battery system using capacitors where Battery 2 is charged

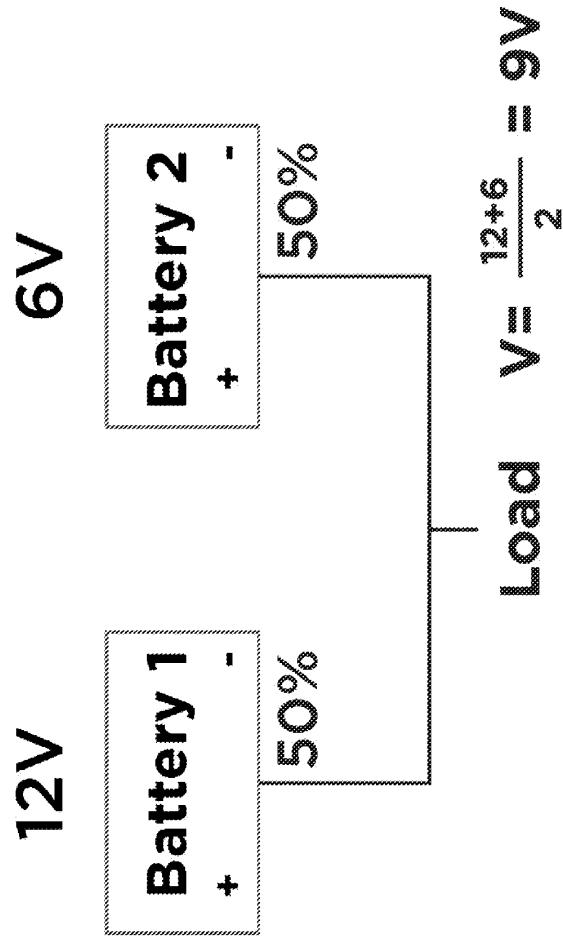


FIG. 9 is an exemplary isolated asymmetrical twin battery system using 50-50 duty-cycle to supply an average voltage to the load.