New Patent Reveals Details of EEStor's Ultracapacitor Technology

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A newly-granted US patent (PDF) for the upcoming ultracapacitor technology from secretive Texas-based EEStor contains a ton of detailed information about their near-mythical Electrical Energy Storage Unit (EESU), which has the potential to revolutionize transportation and our energy infrastructure.

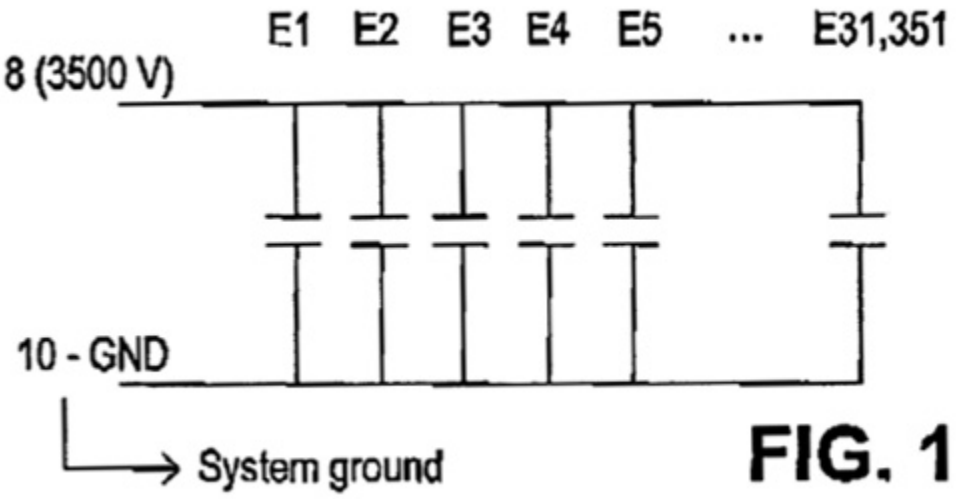

FIG. 1

Apparently one EESU weighs 281 pounds, has a volume of 2.63 cubic feet, can be fully charged in 3-6 minutes, is completely unaffected by temperature, will not explode or catch fire in an accident, and provides 52 kWh of electricity (nearly the same amount of energy the Tesla Roadster battery can hold, which reportedly takes the Roadster about 240 miles).

The speed at which an EESU can be charged is fully dependent on the type of power source used to charge it. Ultracapacitors, in general, can accept a near-instantaneous charge, so, if you want to take advantage of the super fast recharge time, you'll need to get a heavy-duty circuit installed. For instance, if you are trying to charge it from a regular US 110V/15A outlet, it could take you up to 30 hours to get a full charge.

Continuing on with the Tesla Roadster comparison (why the hell not?), we find that one Tesla lithium-ion battery pack (PDF), containing 6800 small batteries, weighs almost 1000 pounds and has takes up about 4-5 cubic feet of space. The Tesla Battery can be charged in about 3.5 hours, again given a high enough voltage and amperage. Given this comparison, you can clearly see how the EESU, if it ever comes to market, would truly be a game-changer.

I spent a couple hours last night combing through the detailed EEStor patent (PDF) looking for other clues and made some minor discoveries of my own. The EESU consists of thousands of tiny "components," each consisting of 10 "elements." In turn, each element has 100 alternating screen-printed dielectric layers of barium-titanate ceramic powder (94%) mixed with PET plastic (4%) and screen-printed layers of an aluminum electrode.

EEstor says the volume of each dielectric layer is 0.0005651 cubic centimeters and the volume of each electrode layer is 0.00005806 cubic centimeters. Given that there are a thousand of each layer in each component (10 elements X 100 layers), the total volume of each component would be: 0.5651 cubic centimeters + 0.05806 cubic centimeters = 0.62316 cubic centimeters.

To get to a capacity of 52 kWh of electricity, EEStor calculates that each EESU would need about 31,351 of these components. Therefore, the total volume of an EESU's charge holding parts with a capacity of 52 kWh, according to my calculations, would be: 31,351 X 0.62316 cubic centimeters = 19,537 cubic centimeters, or roughly 0.7 cubic feet.

What's odd about this is that, according to the patent, the volume of a 52 kWh EESU plus it's "box, connectors and associated hardware" is 2.63 cubic feet. So, almost 2 cubic feet of the EESU is devoted to the "box, connectors and associated hardware"? I find this hard to believe. Maybe somebody else should check my calculations (look at column 5, Table 1, and columns 9 and 10 of the patent for the details).

If you were to combine two of these EESUs in one vehicle, it would still weigh roughly half as much as a Tesla battery pack, but take the car twice as far (almost 500 miles). Additionally, because of the nature of ultracapacitors, it would still only take 3-6 minutes to charge both packs (again, only if you have a powerful enough outlet).

I've still got my fingers crossed that EEStor is really making progress on the EESU. The fact that they're backed by ZENN Motors and Lockheed Martin lends some credence to their claims, but I'll believe it when I see it.