A New 3d Flywheel Battery: 3D CR KEMA 3 Dimensional, Counter Rotating, Kinetic Electro-Mechanical Accumulator[1]

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Kinetic energy storage is the oldest man made battery, used in flywheels for making string and pottery since before 15,000 BC. Stationary and mobile flywheels have since evolved for key energy storage in many machines. Flywheel use has recently increased in capacity and effectively improve performance over other batteries. These include: Flywheel UPS, flywheel assisted HEV buses, flywheel driven trains, flywheel assisted boats, cars, scooters, trams, and stationary banks. All feasible yet limited to operate within natural influences of gyro, low road shock tolerance and the automotive threat of a burst in accidents.

These things have been addressed and solved with 3D CR KEMA, a new 3D flywheel battery, designed to operate gyro neutral, road shock tolerant, burst controlled and overall high efficiency. A powerful, permanent long life battery
could compliment or substitute many present battery banks, and be adopted to provide electricity in emergency and continous service in many applications.

3D CR KEMA (KEMA) is a six portal sided sphere, housing 6 double cone flywheels, where 3 pairs of flywheels counter-rotate on 3 axis, resulting in a strong sphere frame housing a strong vacuum.. The sphere arrangement provides a safe, gyro free, maintenance free, long life, high surging, high regenerative battery, at a favorable weight density over commercial batteries. Each flywheel is driven with an electric motor, whose windings and core is effectively water cooled in a circuit. The stators are hard mounted on each of 6 lids.

KEMA can be a modern low cost battery system as a large stationary bank to operate as a large UPS on utility grids to provide energy in moments of switching, blown fuses and natural events. These vacuum spheres can be built cheaper when operated in stationary uses, without road shock or bursting provisions.

The mobile model is destined to optimize a HEV mode in cars, buses, trucks, wheeled machine tools, etc. EV, NEV, electric trams and carts will see improved performance; the dominant purpose is a substitution of fuel for a system which will pay for itself by using electricity over gasoline or diesel for the same range.

Composite flywheels have been made to operate at +100,000 RPM, which competes with the energy storage of gasoline by weight. This technology is out of reach, but a clear indicator where the future lies. Realistic operating goals of safe,
public use flywheels is around 60,000 RPM in stationary uses, and under 40,000 RPM in road vehicles. Still enough to operate at important fuel savings.

It is no secret, the use of ideas and flywheel research and published works of Mr. Jack Bitterly, Dr. H. Rosen, Dr. Charles Bakis, and data amassed under Mr. Dave O'Kain,ORNL. Likewise, flywheel research by companies such as Rockwell, Chrysler and Ford and others, seeking the nobility of flywheels; now new as a 3D neutral drive. New Patented ideas around KEMA involve long life high speed bearing, 3 D, CR, 6 flywheel arrangement, with safety and efficiency.

13 USA firms offer electric flywheel systems for UPS and grid stability, six others make centrifuges, and another 5 universities delve in flywheel electro-mechanics. NASA is active in this research to eliminate limited life batteries, the main cause of satellite failure. Modern flywheels are possible because of the innovation of high strength fiber composites, where flywheels can operate at higher speeds safely.

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No one has achieved in making mobile road worthy flywheels. The main consideration to increase flywheel speed is strength, and to be able to be made in quantity inexpensively. The flywheels in KEMA are based on composite rings, densified with tungsten wire into very strong, low fatigue long life rotors.
Flywheels are mounted on strong hollow pipe steel shafts, to ride on superior compound bearings using magnetic suspension and soft mounted pin & jewel.

It is well known, the larger the diameter, the more the energy storage for the weight. In England at the birth of steam generators, huge flywheels were used to carry through cycling, still today; all engines use flywheels to carry through.
In Europe there are trains that speed-up a flywheel, as it's only source of power, recharging at stations. Likewise, mass produced HEV buses with a medium speed flywheel mounted in gimbal provides substantial fuel and service savings.

High speed flywheels must be smaller in diameter to hold up to fatigue under hard centrifugal force, improving higher weight density characteristics. A partial vacuum is pulled on a light gas to reduce drag and friction are reduced. In KEMA, a sphere allows the strongest vacuum, thus optimum efficiency is achieved.

The accumulation of the energy from 6 flywheels, is greater than 1 or 2 flywheels for the same weight. Likewise, banks of 2 or more spheres are tabulated to be lighter against most other commercial batteries.

Regenerative braking is optimized by many smaller flywheels, reaching the best
possible quick speed-up regenerative performance against lower inertia.

Composites of modern fibers such as boron glass or carbon and graphite, and Kevlar or Nylons are light and strong and safe in medium speed flywheels. In high speed applications, carbon fiber is used. High micro vibration of variable amplitude occurs at high speeds, so elastic composite layers are used between rings. KEMA flywheels, use forged steel rings on aluminum hubs, supporting composite fiber ring layers densified with tungsten wire. The rims are made of the strongest composite fiber to reinforce the entire flywheel. Portable KEMA flywheels are expected to be able to be road worthy in normal turns, which translates to changes of angular momentum, with ample strength and suspension in mountings and bearings to handle road shock..

Each flywheel has all the gyro characteristics, it is the 6 flywheel arrangement and in counter-rotation on all three axis that make the assembly gyro-free. The forces involved encompass the rotor mass, shafts, bearings and frame. The strength advantage of smaller diameter flywheels are notable, but as the speed rises, the mass becomes charged, increasing its weight many times. The sphere frame is rigid and stronger to sustain a vacuum and frame strength.

Vehicle accidents with fast flywheels can be avoided with distance detectors. Still, if an accident occurs a drastic brake that involves flywheels to cram together and brake at the smallest diameter. Flywheel rings break free, other rubbing occurs, extinguishing syrup is injected, motor reversal, etc., thus, a burst is avoided.
A bad hard accident, where flywheels and spheres burst, the explosion is directed into heavy duty ballooning airbags involving latex and stainless mesh.

Vehicle mounted sets subjected to normal road shock, and the forces of momentum in moving flywheels will improve comfort, smoothness and vehicle power. This supposition and the array of energy storage requirements, place these ideas and engineering in the forefront of breakthrough technology.

Today's high strength plastics, ceramics and metal alloys are mostly employed in defense as shielding in tanks and aircraft. Normally not available to civilians, but the need for a modern flywheel battery to provide adequate energy storage for both stationary and mobile applications may allow use of new high strength materials to share in kinetic solutions above expectations. Still, with present composite flywheels, enough strength to render important energy counts will allow ample energy to drive vehicles and always-on systems in the most dependable system.

Charging is accomplished through an automatic plug-in into utility current or regenerative when the engine is engaged. The need of an additional “charger” is not necessary, as direct home or business two or three phase power is adequate. An additional set of stationary sphere`s may be used as an auxiliary quick charge up unit for the EV’s, or double as a UPS and auxiliary power.

CONCLUSION:
The play of these four factors, SPEED, DIAMETER, WEIGHT and STRENGTH, have been optimized with the tools of modern engineering into 3D CR KEMA. A commercial design of 2 KEMA cubes with a differential wheel drive will provide rear wheel installation in half the trunk of normal front wheel drive cars. KEMA operates with AC drives, and AC variable speed control electronics. The GM EV-1, airport trams, etc. use variable AC motors control technology, at good efficiency. Everything is in place, so the right price, the market is huge.

The fuel saving is anticipated to be proportional to the degree of use, vehicle weight, road and traffic conditions. A normal car may expect a KEMA package for around 10 KW/hrs. for medium distance. Fuel saving will be substantial, and the re-charging use of electric power will grow in the same proportion.