

## Room temperature alternative superconductor system based on classic dielectrodynamics

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### Abstract

Superconductor is good for carrying huge current, but extreme low cryogenic temperature is cumbersome, expensive and high energy consumption for keeping the condition. As alternative, spinning electric charged metal disc(s) can mimic superconductor in normal ambient condition or even high temperature as long as not too hot to deform parts, and such is more convenience and far less energy consumption than cryogenic deep freezer. In fact, velocity of electrons drift in current carrying disc is very slow, e.g. only 23 $\mu\text{m/s}$  for 1 ampere in a 2mm diameter wire, in contrast, mechanic motion can easily reach sound speed, hence huge virtual current can exist.

### How fast do electrons flow when a conductor wire is carrying current?

Let me take copper wire as example, and assuming current  $I = 1\text{A}$ , diameter  $2\text{mm}$ .

Electricity is most commonly conducted in copper wires. Copper has a density of  $8.94\text{g/cm}^3$ , and an atomic weight of  $63.546\text{g/mol}$ , so there is  $140685.5\text{mol/m}^3$ . In one mole of any element there are  $6.02 \times 10^{23}$  atoms (Avogadro's constant). Therefore in  $1\text{m}^3$  of copper there are about  $8.5 \times 10^{28}$  atoms ( $6.02 \times 10^{23} * 140685.5\text{mol/m}^3$ ). Copper has one movable electron per atom as its outer shell configuration is  $4s(1)3d(2+2+2+2)$ , hence the charge density  $n$  is equal to  $8.5 \times 10^{28}$  electrons per cubic meter.

As per the assumption, such wire has a cross sectional area of  $3.14 \times 10^{-6}\text{m}^2$  ( $A = \pi * (0.001\text{m})^2$ ).

The charge of one electron is  $q = -1.6 \times 10^{-19}\text{C}$ , with all given data, electrons drift velocity is:

$$u = \frac{I}{nAq} = \frac{1\text{C/s}}{(8.5 \times 10^{28}\text{m}^{-3}) * (3.14 \times 10^{-6}\text{m}^2) * (1.6 \times 10^{-19}\text{C})}$$

$$u = 2.3 \times 10^{-5} \text{ m/s} = 23 \mu\text{m/s}$$

It obviously indicates the electrons drift very slowly.

Strictly speaking, there are no free electrons in conductor; all electrons are bounded, except the unpaired electrons are shared by crystal lattice of **1** or multiple atoms. In a sense, the so-called free electrons are moving in parallel **S**-shape routines, never straight lines. It is the said routines along that joule heat is generated when the movable electrons are switching smoothly from one lattice unit to next lengthwise, and it is also referred as resistance phenomenon.

When every **2** moveable electrons are all incorporated as Cooper pair, the superconductor phenomenon will occur, which means resistance is zero. Current technology can only realize it in extreme cold cryogenic environment from temperature **1K** to **100K** roughly.

It will cost quite large amount of energy to maintain cryogenic environment, though the electric current itself does not consume energy because of zero resistance.

### **Alternative or quasi superconductor**

As per previous calculation, now we know the electron's drift velocity is very slow, but by mechanic means, electric charges can be easily speeded to very high velocity, e.g. sonic speed, that is many orders of magnitude greater than the snaillike electrons in conductors.

The key problems are how to carry charges as more as possible on disks, and lessen the energy of maintenance of high speed spin as low as possible.

Even when disks rotating, its surface charges are still stationary in reference frame of disks, but charges do rotate fast if seen from reference frame of ground, hence, there is virtual electric current though no real current.

Just like as real current, huge virtual current can also induce strong magnetic field, but without joule heat, hence I name it alternative superconductor.

Many applications are very greedy of huge current, and regular conductor can only carry so-so current because of resistance, even real superconductor can only carry limited current e.g.

circa 2000A, but mechanic powered alternative superconductor system can generate as super high as Alfvén current 17kA, thus, never depreciate virtual current alternative superconductor system, as a cheap replacement, it can also be used in magnetic levitation, cyclotron accelerator, etc.

In a sense, perhaps our Earth is also alternative superconductor because she has a net negative charge of about **400,000** Coulombs and spin in period of **24** hours.

It is the virtual current that induces Earth magnetic field recorded **0.25 - 0.65** Gauss, roughly coincident with theoretical  $\mathbf{B} = \mu n \mathbf{l}$  ( $n = 1$ ,  $\mathbf{l}$  = virtual current) on approximation of solenoid.

The net charge of Earth can be deduced from formula of surface electric field strength:

$$\mathbf{E}(\mathbf{r}) = \frac{Q}{4\pi\epsilon_0 r^2} \approx 100 \text{ V/m (recorded mean volts per meter)}$$

One day in future, with the cosmic rays sending more and more protons to Earth, polarity of net charge will toggle to positive, then our Earth magnetic poles will switch reversely. Hence never assume the cosmic rays dose, components and energy spectra are constant.

### **How to get high density of charges on disks?**

Proposing a solution to this question is just one of my inventions.

In my previous patent application: “Dielectric blade comb piston unlimited voltage generator, fusor and more” (ref. 1), a new theory **dielectrodynamics** has been proposed, where only the sandwiched dielectric media is switchable.

By extending the theory of dielectrodynamics, herein, only electrode plates can be rotatable.

In my alt-superconductor system, the larger the density of charges, the higher the virtual current, and then the stronger the generated magnetic field will be.

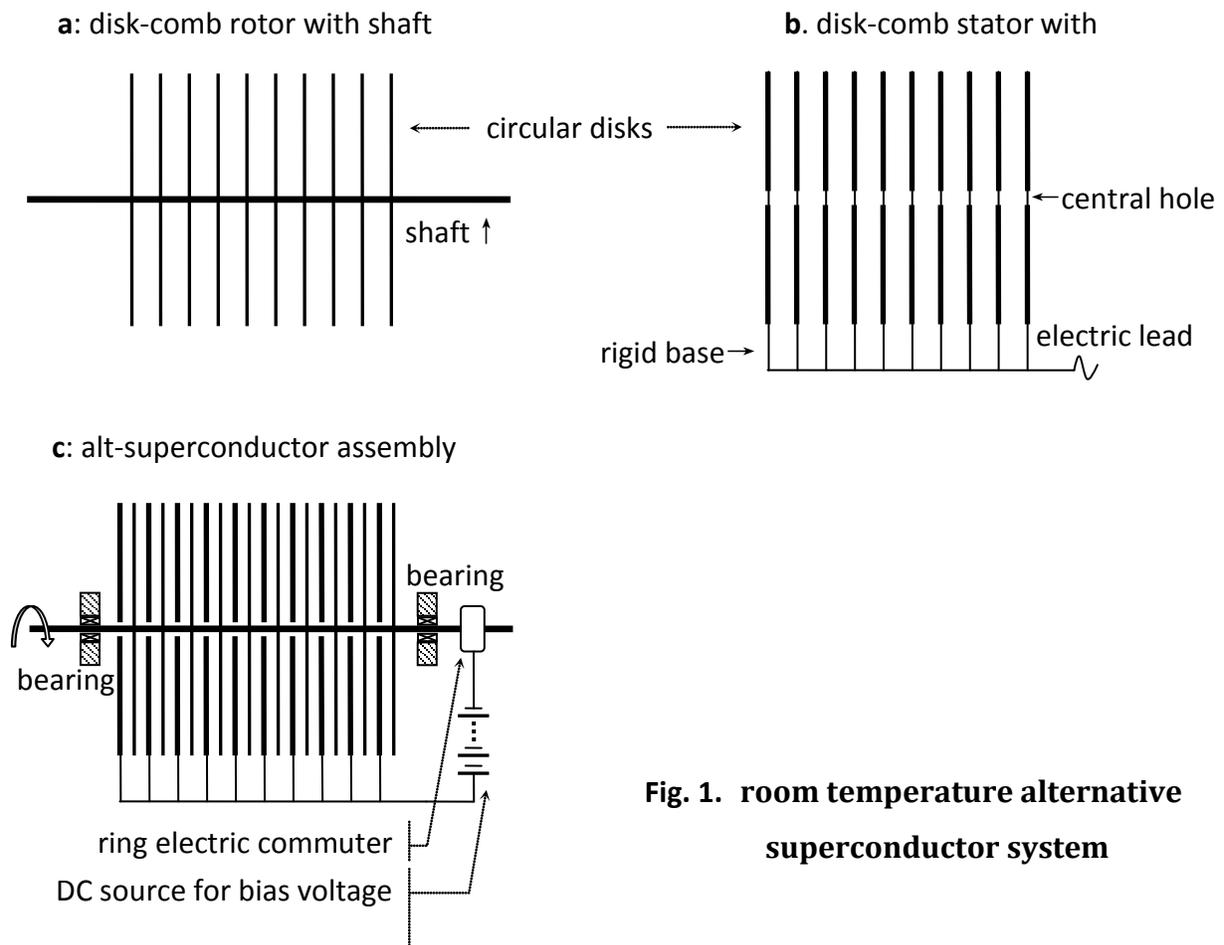
But there is limitation on  $\sigma_{\max}$  the max density of charges, because  $\sigma_{\max} = \epsilon * E_{\max}$  where  $\epsilon$  is permittivity of dielectric medium and  $E_{\max}$  is the max tolerable electric field strength or breakdown threshold.

Even if no limit on  $E_{\max}$ ,  $\sigma_{\max}$  is still limited by the atom lattice density. Empirically speaking, the acceptable and feasible densest charges should ensure that there are about **10** neutral atoms between **2** charged atoms either positive or negative, otherwise it becomes plasma.

For example of copper **Cu** electrode plate, atomic radius is **145pm**, **10** atoms span **1450pm** or **1.45nm**, assuming partial atoms positive charged with **1** electron loss, therefore empirical max density of charges is about  $1.6 \cdot 10^{-19} / (1.45 \cdot 10^{-9})^2 = 0.076$  coulomb per square meter.

### Embodiment of basic alternative superconductor system

As per the aforementioned calculation, electrons in current carrying real conductor, just runs as slowly as snail, fortunately, by other method, great advantage can be taken to virtually and exponentially increase velocity of electric charges by rotating electric charged disk(s), though only virtual electric current exists, yet still makes sense.



**Fig. 1. room temperature alternative superconductor system**

**Fig. 1** presents the alternative superconductor system, of course, room temperature works.

As there is no relative motion between rotating disk base structure and metal ions on disk, the intrinsic resistance of regular conductor does not act on joule heat dissipation, so such a system can be regarded as virtual superconductor, though little mechanic energy is needed to maintain a constant rotation.

A plurality of disks are mounted on or casted as assemble with a shaft that is supported on a pair of low friction bearings at both ends; another set of similar disks with central holes are interleaved with the disk-shaft assembly in even space.

Size of the said central hole is slightly larger than shaft diameter, so as not to bring extra friction to shaft rotation.

The disk-shaft combo or assemble functions as abstract electrode with same electric potential everywhere when it is connected to one pole of DC (direct current) power supply via the electric commuter ring or just a bearing with good conductance.

All other interleaved disks are mounted and electrically connected to metal base, and this combo functions as another abstract electrode with same electric potential everywhere when connected to another pole of DC power supply.

By setting the spacing interval as reasonably small as possible between neighboring disks, core of the whole system becomes good capacitor with decent high density of electric charges on surfaces after fully recharged.

In general, the capacitance **C** of planar capacitor with spacing interval **d** and surface area **A**, can be expressed by formula:  $C = \frac{\epsilon A}{d}$ , where  $\epsilon$  is the permittivity of dielectric medium, for vacuum  $\epsilon_0 = 8.85 \cdot 10^{-12}$  farads per meter.

The density  $\sigma$  of electric charges can be calculated by formula:  $\sigma = \epsilon E = \frac{\epsilon V}{d}$ , where **E** is the electric field strength, **V** is the applied voltage across electrodes.

The higher breakdown dielectric strength the dielectric medium, then the closer the disk spacing, and usually vacuum environment is preferred in this application, because dielectric strength in vacuum is theoretically unlimited, though limited yet very high in reality.

The voltage across the electrodes is also called **bias voltage**, or capacitor voltage, and its polarity setting does not matter if only pursuing high virtual current, otherwise is determined by associated application.

As positive and/or negative electrodes can be mechanically driven to rotate, such an abstract capacitor is called **dyno-capacitor**. It is another building block in my whole dielectrodynamics theory that has been defined at first time in my previous patent application wherein a typical model is implemented with dynamic switchable multi-dielectric flakes or blades.

As the appearance of disk-electrodes arrangement looks like a comb, hence **disk-comb** is also used as adjective to literally decorate dyno-capacitor.

Huge virtual electric current can be obtained as long as the rotation speed is high enough.

According to the Guinness world records, the manmade highest speed of revolution is **600** million **rpm** (revolutions per minute) rendered by a diameter **4μm** tiny ball.

Of course, that top speed is far less economical; empirically the affordable and feasible speed is under **1** million rpm.

Doing math can be more convincing for industry estimation.

Assuming super large Alfvén current, i.e. **17kA** (thousand ampere) is needed, disks total **1000** pairs, radii **10cm**, let voltage high enough to get charge's density **1e** per square **nm** (nanometer), i.e.  $1.6 \cdot 10^{-19} / (10^{-9})^2 = 0.16 \text{C/m}^2$ .

Total area with electric charges =  $1000 \cdot \pi \cdot 0.1^2 = 31.4 \text{m}^2$ , then total charges =  $31.4 \cdot 0.16 = 5 \text{C}$ ;

The time span to turn all charges one revolution =  $5 \text{C} / 17000 \text{A} = 0.00029 \text{s}$ , then the revolutions per second =  $1 / 0.00029 = 3448$ , i.e.  $3448 \cdot 60 = 206880 \text{ rpm}$ .

The result rev speed seems not too difficult to reach.

Most real superconductors usually allow mediocre **2kA**, far less than **17kA**, though many nuclear physics experiments wish the super strong magnetic field induced by Alfvén current.

Starting alternative superconductor system should input initial mechanic energy to establish stable rev speed, i.e.  $0.5 \cdot (\text{moment of inertia}) \cdot (\text{angular speed})^2$ , since then, maintaining input only compensates small friction loss because of no other mechanic loads.

Rotation can be driven by whatever reasonable means, such as high speed electric motor or accelerating gearbox transmission.

To save initial input, the disk-shaft assembly is required to be as light as possible to minimize rotary inertia.

Because disks are arranged very close, and as thin as flakes, so machining accuracy is very strict.

It is highly motivated to increase density of electric charges on electrodes as high as possible for achieving high virtual current as well as lessening burden of high rev speed.

Therefore some improvements are derived.

As an electrochemical cell battery can hold large colony of charges on electrode plates, if we can rotate specified electrode plate(s), then such an improvement can be better in virtual current performance than air or vacuum dyno-capacitor system.

To distinguish from dyno-capacitor, **dyno-battery** is hereby defined as alt-superconductor system based on a battery frame.

Electrolytic capacitor is similar to electrochemical battery, despite only hold a fraction of charges of the same size battery.

In principle, electrolytic dyno-capacitor distinguishes itself from regular dyno-capacitor only by changing vacuum or air medium to electrolyte aqueous.

Fig. 2 illustrates a schematic structure of disk-comb dyno-battery or dyno-capacitor immersed in electrolytic solution.

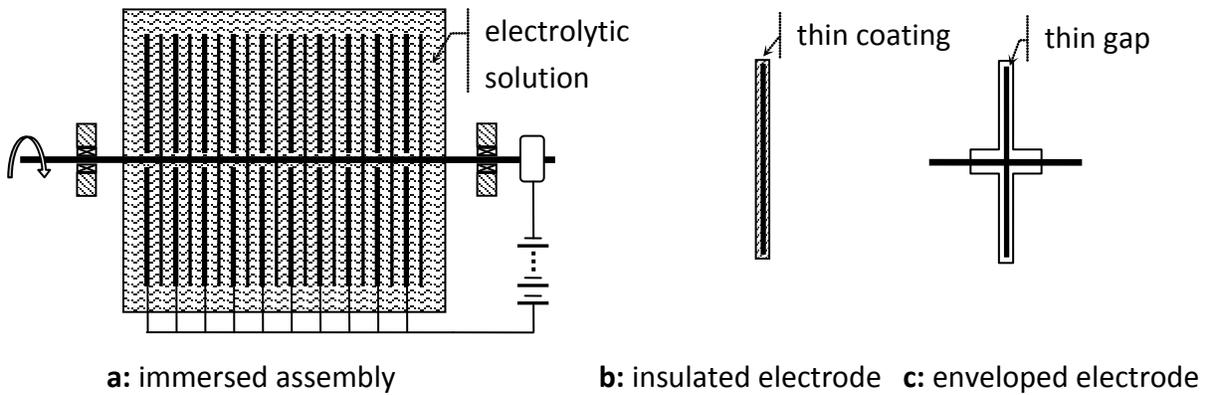
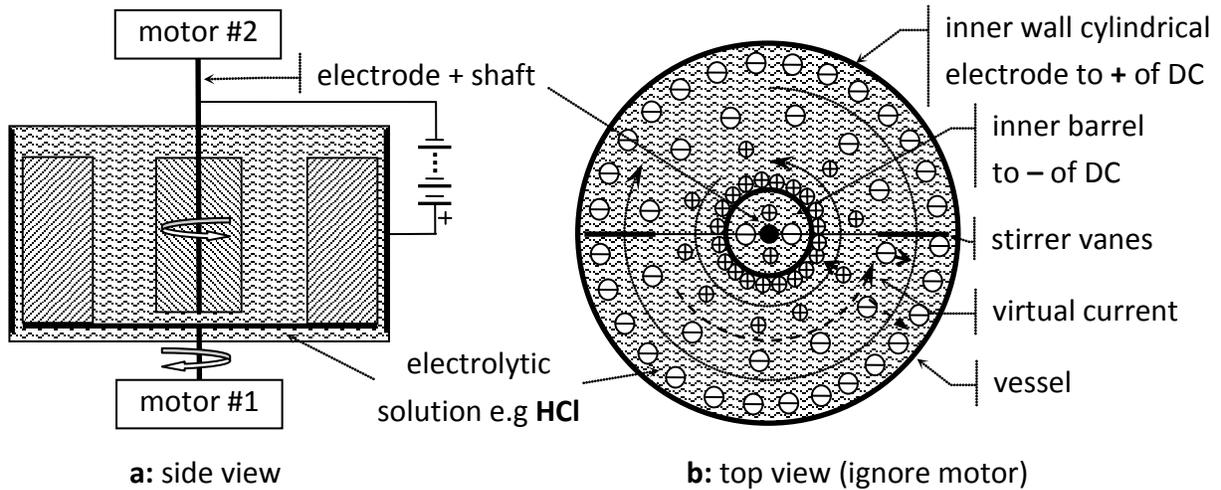


Fig. 2

Fig. 3 illustrates a cylindrical electrolytic dyno-capacitor with enhanced charge separation.



**Legend:**

⊖ anion, e.g.  $\text{Cl}^-$ , heavier than      ⊕ cation e.g.  $\text{H}^+$       → electrofield force      ↻ centrifugal force

Fig. 3

In figure 2, the immersed disks can either be coated with layer of or enveloped within pocket of thin dielectric medium, but coating may increase energy consumption during starting and maintaining because of viscosity, and enveloping may suffer from sealing issue though costing

lesser driving energy.

In fig. 3, the cylindrical container is filled with electrolytic solution, and its inner sidewall is laminated with a large area electro-foil made of anti-corrosion inertial metal, such as gold.

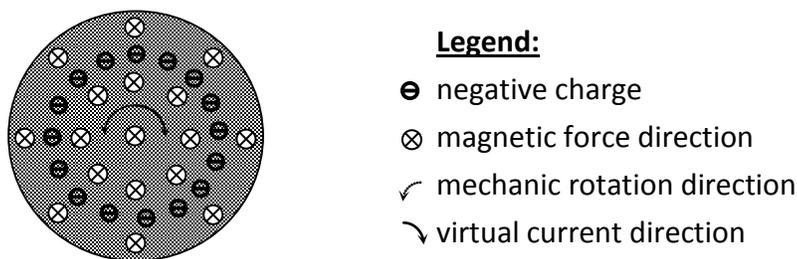
A central co-axial barrel functions as rotatable cathode driven by motor #2, and a stirrer with 2 rectangle-shape vanes is driven by motor #1, and the two rev directions are opposite.

The electrolytic solution should possess positive ion (cation) with light mass, e.g.  $H^+$ , and negative ion (anion) with heavy mass, e.g.  $Cl^-$ , so as to facilitate anion to be centrifuged toward wall where electro-foil is connected to positive pole of DC power supply.

Consequently, the ion polarized distribution or separation is double enhanced by both centrifugal force and external electric field, though extra energy should pay for stirrer.

The central barrel can either be coated with low friction dielectric material such as Teflon, or enveloped with double layer cylindrical pocket so as to reduce friction.

**Fig. 4** illustrates the virtual electric current and induced magnetic field on a rotating negative charged disk from disk facial view. The direction of magnetic field is determined by right hand rule, and the current direction is the counter-direction of rotation because of negative charges.



**Fig. 4.** virtual electric current and real magnetic field

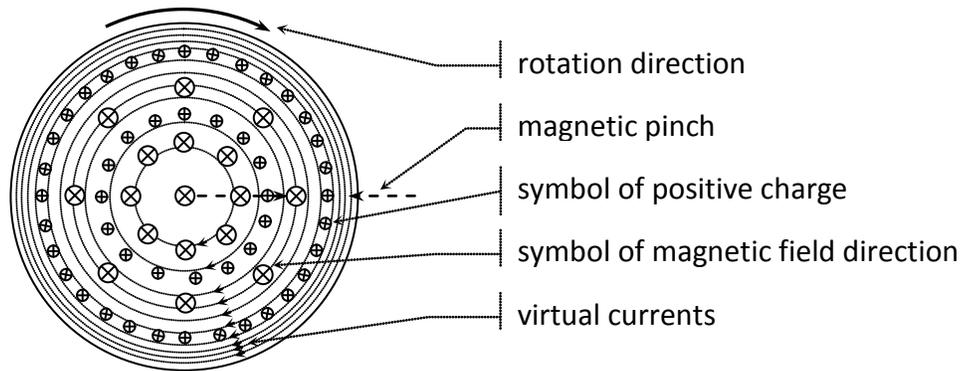
The cross-shape symbolizes that direction is pointing towards the figure laid canvas, just looks like the visual effect of seeing tail of flying arrow.

In coaxial multidisc comb of alt-superconductor capacitor, the total strength of magnetic field comes from superposition or addup of respective value induced from every disk.

### The pinch effect of virtual electric current

Same with real current, pinch effect also exists on virtual current, because both currents will induce magnetic field, then magnetic force results in pinch.

**Fig. 5** shows the pinch effect on clockwise rotating and positive charged disk circular virtual current, whereby the closer to rim or edger the radial position, the denser the current, and the higher the pinch.



**Fig. 5.** pinch effect of virtual electric current on disk

Pinch effect can occur not only for positive charged disk, but also for negative charged disk, and all cases will make charges concentrated along rim.

### Converting virtual current to real current

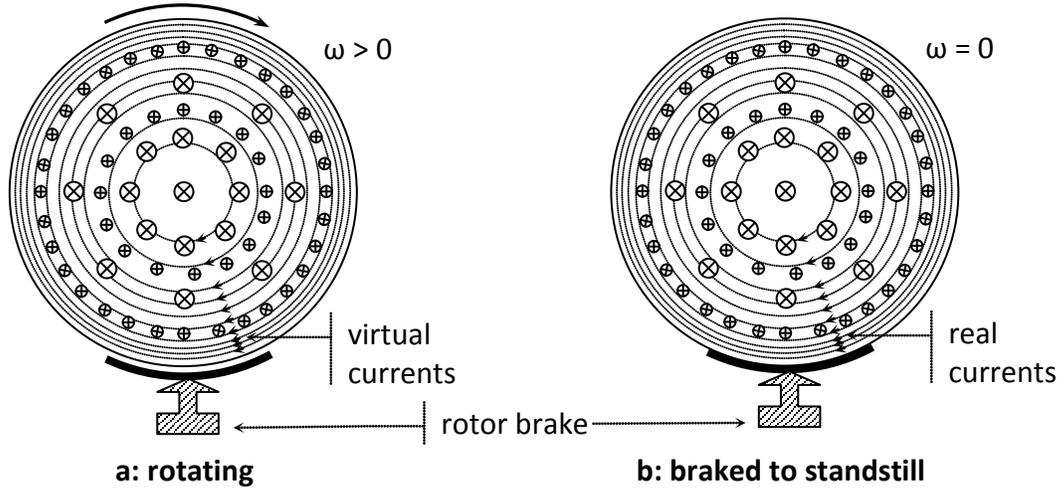
Virtual current can be converted to real current when the rotor is braked to stop, the charges and magnetic field are both unchanged temporarily, because intrinsic parasitic inductance prohibits current sudden change.

If rotary disk is made of real superconductor, then it will become quasi-permanent-magnet after braked and can keep long time.

Just imagine cutting a current-carrying disk into 2 pieces, high voltage will arc out spark along

the cut-edges, because of air dielectric breakdown.

**Fig. 6** shows the moments before and after disk is braked to standstill, where many details are presented, such as direction of virtual current and real current, magnetic field, polarity of charges, and even rough distribution of density of current caused by pinch.



**Fig. 6.** converting virtual current to real current

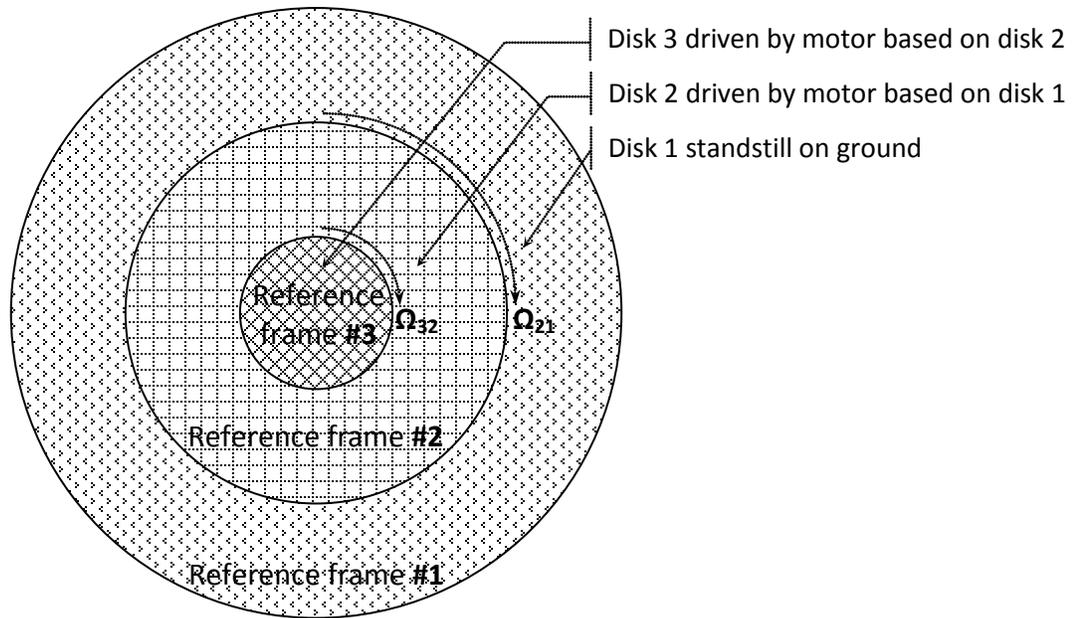
### Boosting virtual current by nesting multiple reference frames

**Fig. 7** presents a system of special nested dynamics reference frames **#1**, **#2** and **#3**, where disk **1** is standstill on ground, i.e. the **#1** stationary inertial reference frame, disk **2** is mounted on shaft of motor that is based on disk **1**, and disk **3** is mounted on shaft of another motor that is based on disk **2**.

When both motors (undrawn in figure, underneath disk **2** & **3**) are powered, disk **2** & **3** will spin in their host reference frames with respective relative angular velocity  $\Omega_{21}$  and  $\Omega_{32}$ .

If observing the motion of disk **3** across reference frames from its host **#2** to **#1**, then the speed of disk **3** relative to disk **1** is increased to  $\Omega_{31} = \Omega_{32} + \Omega_{21}$ .

Hence, it can obviously boost virtual current and magnetic field strength greatly, if applying this parent-child nesting system in alt-superconductor system.



**Fig. 7.** nested reference frames

**So what is the best application for such alt-superconductor?**

Of implementation of alt-superconductor system, all above means of making disk charged via embedded capacitor seems clumsy, thus good application with high ratio of output to input may be not easy to find, except special interest active magnetic field generator, though a passive permanent magnet made of rare earth could be better and cheaper.

However if radioactive material is used in alt-superconductor system, great prosperity will be looming soon, especially for application of beta decay based nuclear battery. Generally speaking, the beta minus disk can make itself positive charged naturally more or less dependent on its radioactivity because of high rate spurting electrons leaving disk surface and low rate neutralizing from ambient electrons callback, and vice versa, even in solitary parking state, though polar-arbitrary voltage biased disk embedded in capacitor can disobey this rule.

And the induced strong magnetic field can not only catalyze the decay rates, but also guide beta particles along the electric field direction, so as to recharge the DC supply, therefore the system can function as a powerful nuclear battery.

I combine it with other technologies in  $\beta$  reactor, detailed in my pending patent US15486412.