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New Free Electron Wire for Loss Free Utilization of Electrical Energy and Highly Energy Efficient Electrical Appliances

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ABSTRACT

New Free Electrons Wire will enable the use of electrical energy and also energy in various other forms, in a loss free way, at room temperature. Free Electrons confined in vacuum at the order of 10^{-4} torr or more, at the core of the wire, can move a distance as long as about, to a few kilometers without any collision. The vacuum is maintained in a tube made up of alternate layers of Teflon and Silicon Oxynitride. **The columbic repulsion between these free electrons will actually conduct energy without any loss**. The free electrons **trapped in vacuum tube, should be at a particular density of around 2.02 x 10^8 electrons per unit area.** A metal encapsulation(s) over the wire is there to keep the electromagnetic field remain confined within the free electron wire, to make it harmless to the health of living creatures. Apart from loss free energy transportation, the free electron wire is also capable of generating very high electromagnetic field due to the free electrons**,** simply by removing the metal encapsulation(s), which can be used for various purposes. The materials and techniques adopted will make New Free Electron Wire producible commercially, at the cost of general copper wires.

***Keywords* –** Free Electrons, Electron Density, Teflon, Silicon Oxynitride, Columbic Repulsion, Electromagnetic Field

I. INTRODUCTION

Every material in this world has electrical resistance which is responsible for huge loss of energy mainly during electrical transmission and also this loss reduces the efficiency of electrical appliances. This loss free, “ New Free Electron Wire” will address to the biggest, very basic and fundamental problem of electrical engineering, to create a electrical wire or device that will enable the use of electricity, virtually in a loss free way. This wire can also be used to enable the use of various other forms of energy in a loss free way.

This invention is to create a new kind of wire that can be used to replace conventional metal wires, for loss free electrical transmission at room temperature and loss free utilization of energy in various forms. Electrical appliances can be made far more efficient in terms of their energy consumption verses their power by the use of this New Free Electron Wire to redesign and manufacture them.

This wire can be used to manufacture coils with very high energy efficiency. These coils can be used to create very highly efficient motors, transformers and many other electrical appliances. The performance of these electrical appliances will be very high in terms of energy i.e. they will consume least amount of energy and do much greater amount of work. As for example very powerful and efficient motors that can be used in automobile industry to make absolutely pollution free electric cars, which may in due time replace the fossil fuel cars at all. The use of these wires to create the motors of automobiles will make them as powerful as fossil fuel cars but extremely efficient i.e. these cars will be very fuel efficient or in other words comparatively much smaller batteries can be used to drive even huge vehicles like ten wheelers, to drive for long distances, without recharging the batteries. Also these wires can be used where very high electromagnetic fields are required like MRI machines in medical field etc. The wire can be used to manufacture aircrafts of all kinds with very high energy efficiency. The aircrafts can be so highly energy efficient that they may be able to fly around the globe several times without re-fueling. The entire conventional flying method of modern day aircrafts, which entirely depend on aerodynamics, can be changed and they may be made to levitate on their own. This will make flying much more safe than any modern day aircraft and thus will be far more energy efficient.

II. INDENTATIONS AND EQUATIONS

DEATAILED DESCRIPTION OF INVENTION WITH REFERANCE TO DRAWINGS and EXAMPLES:

For our own convenience and to conduct a sample test with ease let us take a vacuum tube of cylindrical shape of length 1 meter or 1000mm, and 2cm or 20mm in diameter and made up of alternate layers of Teflon and Silicon Oxynitride. We will proceed with our calculation on this and we will see that our calculation will be proved to be effective in

this 1m long with 2cm diameter tube. Hence if we proceed by increasing the length and put the increased length values in the mathematical equations, we will see that it still works. Hence it will work even if the tube is 100s of kilometres long for real transmission lines.

Also there are two identical copper coils on both ends of the proposed wire to deliver electrical energy in the form of an Alternating Current (A.C) and to recollect that electricity for commercial use or to test the efficiency of the wire after the AC gets transported to the other end of the wire.

In this sample calculation we will taste the wire with 230volt / 2ampere AC.

Here the New Free Electron Wire for Loss Free Electrical Transmission or loss free utilization of energy has been created with the help of absolutely free electrons trapped in a vacuum tube. The perfectly elastic columbic interaction, between the free electrons, confined in a vacuum tube will transport electricity without any loss. This concept is proved below with the help of **A Sample Mathematical Calculation and method(s): -**

As stated before we are supposed to have electrons and only electrons inside a vacuum tube. Now we have to calculate that there should be how many electrons inside the tube and the average distance between electrons?

Now form coulomb's law we know that [6]$F = (1/ 4\prod\varepsilon) \times (q_1.q_2) / r^2$. If we consider q_1 & q_2 be constants then r^2 is inversely proportional to F. So we can conclude that if the electrons inside the vacuum tube come infinitely close to the electrons of the inner most wire wall, the force F will increase and will be strong enough to knock out electrons from the wire wall. So if even one electron gets knocked out from the wire wall, the body of the wire will be short of electrons and will try to draw electrons from inside the tube (as electrons inside the tube are free and easily available) to remain neutral or uncharged and thus the process may be continuous and there may be a continuous flow of electrons from inside the tube and in the process a time will come when there will be no electrons inside the tube. So the electrons inside the tube must be at a considerable distance from the inner most wire wall.

The body of the tube will be made up of layers of Ceramic or Polymer or Dielectric Material or Teflon (PTFE = Poly-tetra-fluoro ethylene, PFA = Per-fluoro alkoxy, FEP = Fluorinated ethylene), as per requirement (2_1, $4a_2$) and Silicon Oxy-Nitride (SiO_2-Si_3N_4-SiO_2) or Silicon Dioxide (SiO_2) or Silicon Nitride (Si_3N_4) or Ceramic Materials or Polymers or Dielectric Materials (2_2, $4a_3$). 1st there will be a layer of Ceramic or Polymer or Dielectric Material or Teflon (PTFE = Poly-tetra-fluoro ethylene, PFA = Per-fluoro alkoxy, FEP = Fluorinated ethylene), as per requirement (2_1, $4a_2$) then over it, Silicon Oxy-Nitride (SiO_2-Si_3N_4-SiO_2) or Silicon Dioxide (SiO_2) or Silicon Nitride (Si_3N_4) or Ceramic Materials or Polymers or Dielectric Materials (2_2, $4a_3$), then again Ceramic or Polymer or Dielectric Material or Teflon (PTFE = Poly-tetra-fluoro ethylene, PFA = Perfluoro alkoxy, FEP = Fluorinated ethylene), as per requirement (2_1, $4a_2$) and Silicon Oxy-Nitride (SiO_2-Si_3N_4-SiO_2) or Silicon Dioxide (SiO_2) or Silicon Nitride (Si_3N_4) or Ceramic Materials or Polymers or Dielectric Materials (2_2, $4a_3$). We know Teflon is a very good material that can get statically charged i.e. to some extent it has the capacity to gather electrons within itself and can be made negatively charged. Now this negative static charge will prevent the free electrons inside the wire to escape. The inner most Teflon layer will get saturated at one point by gathering electrons and not been able to release them because of the number of alternate layers of Teflon and Silicon Oxy-Nitride coating over it. Thus its inner most tubular surface will get deposited by a layer of electrons. This electron layer will stop the free electrons coming towards the wire wall because of the columbic repulsion among themselves and thus will stop them to escape. Also this will stop the free electrons to collide with the vacuum tube wall. Also the resistivity of Teflon is very high which will play an additional role to keep free electrons confined within the tubular shaped wire. Moreover Teflon will give good mechanical strength and durability to the wire. Hence Teflon can be the best material to make the body of the wire. A schematic diagram of the above mentioned situation is shown in **figure 6.**

There will be a high amount of electric field due to the free electrons inside the tube. As the electrons inside the tube are *absolutely free*, a slightest variation in the electric or magnetic field by the In Put coil (A), shown in **figure 1g,** will make the free electrons inside the tube vibrate inside the volume of the input coil and this vibration will be transported by the columbic repulsion of the electrons all throughout the tube to the electrons inside the volume of the Out Put Coil (B). So obviously there will be a huge amount of flux change through the Out Put coil (B) in **figure 1g** leading to an induction of e.m.f. in the coil. We can calculate and prove that the In Put POWER through the In Put Coil (A) will be transmitted *without any loss* to the Out Put Coil (B).

All coils in the In Put and in the Out Put in figure 1g have approximately 1000 turns and the total resistances of the coils with the resistance of the wire of the coils and the inductive resistance due to AC together will be such that there will be a current of 2 ampere flowing through the coils at the r.m.s. value of the voltage of the applied AC. This is taken so as to make the calculations easier. Over the tube coils are wound and through the Input coil an Alternating Current (A.C) is applied to create changing flux to make the electrons move to and fro so that we can have a good changing flux through our output coil. We know that our supply line gives us a current of 50cycles/sec. so one cycle gets completed in 20 milli-second. Now by the property of a sinusoidal A.C. we know that, for the 1st 5milisecond the voltage will increase and hence the current will also increase proportionately (as the resistance of the coil is constant) and then at the 5th millisecond it will attain maximum voltage and hence the maximum current will pass through the coil, at this instance. Then for the next 5 millisecond the voltage and hence the current will decrease going back to zero. Then the voltage along with the current will flow in the reverse direction in the same way as mentioned above.

Now we know that magnetic field at a point due to a coil of ‘n’ turns is

[1] $$B'' = (\mu_0 \times n \times i) \div (2 \times a)$$

Where B’’ → the magnetic field produced

μ_0 → permeability of air (1.256×10^{-6} H/m)

n → number of turns of coils (1000)

i → current flowing through the coils (2)

a → radius of the coils (2cm or 0.02m)

Now putting the values we get $B'' = (1.256 \times 10^{-6} \times 1000 \times 2) \div (2 \times 0.02)$

$= 0.0628$ Tesla = 628gauss

So the above calculated magnetic flux will change according to the change in current mentioned above. Hence the change of magnetic field from 0 Tesla to 0.0628 Tesla will take place in 5 milli-second since we have applied a 230volt A.C. and made the coil in such a way so that there is such a resistance to allow a 2 ampere of current through the coil when the A.C voltage attains the R.M.S value i.e. 230 volt.

Now we will try to calculate by using Faraday’s Law, what will be the induced e.m.f. (ξ) in the region inside the tube covered by the In Put coil (A) in **figure 1g.** From Faraday’s Law we know that if there is a change in magnetic flux ($d\Phi_B / dt$) through a coil of ‘N’ turns then the induced e.m.f. in the coil is:

[2] $$\xi = - N (d\Phi_B / dt)$$

We can also modify the above equation to find out what will be the electric field due to changing magnetic field and the expression for that is:

[3] $$\oint E.ds = - (d\Phi_B / dt).$$

From this relation we will find out the electric field due to the above calculated changing magnetic flux and hence find out the influence due to this varying magnetic flux on each electron.

Again we know $\Phi_B = B.A$

Where, B → is the magnetic flux;

A → is the area in the magnetic field.

Here we will take the area of an electron as we want to calculate the influence due to this varying magnetic flux on each electron. We know that the radius of an electron is (2.5×10^{-14}) meter.

So, $A = \prod \times (2.5 \times 10^{-14})^2$

So, $\Phi_B = B.A = B \times \{\prod \times (2.5 \times 10^{-14})^2\}$

$= B \times 2 \times 10^{-27}$

Now, $d\Phi_B / dt = 2 \times 10^{-27}$ (dB/dt)

$= 2 \times 10^{-27} \times 0.0628 \times (5/1000)$

$= (6.28 \times 10^{-31})$ Weber (Wb)

where → [dB = 0.0628 Tesla ; dt = 5/1000 for 1st 5 mili-second].

As the coils we have wound is cylindrical in shape so we can assume that the electric field (E) has same value at all points inside the symmetrically cylindrically shaped coil. So the left hand of the equation reduces to -

$$E. \oint ds = - (d\Phi_B / dt)$$

We will take the circumference of an electron for $\oint$ ds, so that we get to know the influence of the changing magnetic flux due to the In Put coil(A) on each electron. So the circumference of an electron is $2 \times \prod \times (2.5 \times 10^{-14})^2$

$= (1.6 \times 10^{-13})$ m

So from Faraday’s equation we get

$$E = -(1/\oint ds) \times (d\Phi_{\mathbf{B}} / dt)$$

$$= -\{1 / (1.6 \times 10^{-13})\} \times (6.28 \times 10^{-31})$$

$$= -(3.93 \times 10^{-18}) \text{ volts/m}$$

So, force on each electron due to this electric field is

[4]$F_1 = qE$

Where $F_1 \rightarrow$ is the required force

$q \rightarrow$ is the charge of an electron

$E \rightarrow$ is the calculated electric field

So, $F_1 = (1.602 \times 10^{-19}) \times (3.93 \times 10^{-18})$

$= (6.3 \times 10^{-37})$ Newton

Again we know: Force(F) = mass(m) × acceleration(a)

Or $a = F_1 / m$

Or $a = (6.3 \times 10^{-37}) / (9.12 \times 10^{-31})$

$= 6.9 \times 10^{-7}$ m/sec²

Now from Newton's laws of motion

$$\upsilon = u + at$$

where: - $\upsilon \rightarrow$ final velocity

$u \rightarrow$ initial velocity

$a \rightarrow$ acceleration

$t \rightarrow$ time of acceleration, here 5milisecond

Here the electrons have an initial velocity as they are free and kept at room temperature. But we will neglect that velocity of electrons due to room temperature and consider that the electron is initially at rest. This is because if we consider that the electrons are at an initial velocity due to room temperature then we will have to consider that the electrons are socking up some energy form the atmosphere. But here we set out to prove whether our experimental set up is a loss free, free electron wire or not i.e. to find out whether the free electrons are transferring the exact amount of the energy we are putting in through the In Put to the Out Put coil. So we will neglect the velocity of electrons due to room temperature or due to any other factor.

So, $\upsilon = 0 + \{6.9 \times 10^{-7} \times (5/1000)\}$

= 3.45 x 10^{-9} m / sec = 3.45 nanometre / sec

Now let's see what will be the kinetic energy (K.E) of each electron due to this changing magnetic flux.

We know K.E = $\frac{1}{2} m v_1^2$

or K.E. = $\frac{1}{2} (9.12 \times 10^{-31}) \times (3.45 \times 10^{-9})^2$

$= 5.43 \times 10^{-48}$ Joule

Now as we have applied AC to the input coil the current will obviously make the electrons move to and fro. Say for the 1st 5milisecond the electrons will accelerate in the positive direction of the X-axis then for the 2nd 5milisecond they will decelerate but will still keep moving in the same positive direction of the X-axis and will come to rest finally. Then when the AC will start flowing in the negative direction of its cycle, the electrons will start moving in the reverse direction in the same way mentioned above. So the electrons will keep vibrating along a straight line of (3.45nm × 2) = 6.9 nm maximum. So we see that there will be no real movement of electrons for transferring the energy from the In Put Coil (A) to the Out Put Coil (B). Then how the energy from the In Put Coil (A) gets transferred to the Out Put Coil (B) in **figure 1g**?

As the electrons will vibrate they will produce a changing electromagnetic field in the same frequency as the AC in the In Put Coil. We will calculate that electromagnetic field and then we will see what will be the influence of that electromagnetic field of an electron in the vicinity. If there is no energy loss then we can conclude that the energy from one end of the tube will get transferred to the other end of the tube without any loss. This is because if there is no loss in the transfer of energy between the 1st pair of electrons then consecutively when there is a transfer of energy between the 2nd and the 3rd then between the 3rd and the 4th there will be no loss of energy as all the electrons are in the same state i.e. all of them are free and inside a vacuum tube having only their spin quantum numbers and all other quantum numbers constant or eliminated.

Now let's do the calculation: -

We have calculated above the force experienced by the 1st electron due to the Input coil. Now let's see what will be the influence for 1st electron on 2nd electron? For this we will have to calculate the variable magnetic flux caused due to the vibration of the 1st electron.

From the equation [5]$F_2 = q \cdot (v \times B) \sin\theta$

where 'F_2' → required force

'q' → charge of an electron

'v' → velocity of the electron

'B' → magnetic field

Here we will choose the 2nd electron from the pool of electrons in such a way so that sin θ = 1. [θ = 90º]

So, $B = F_2 / (q \cdot v)$

$= (6.3\times 10^{-37}) / \{(1.602\times 10^{-19}) \times (3.45 \times 10^{-9})\}$

$= 1.14 \times 10^{-9}$ Wb.

One point must be noted here that the above calculated force (F_2) and also the velocity of the 1st electron varies with time and hence here this calculated "B" will also vary with time and as all the above calculations done on the basis of a 50 cycles/sec AC and r.m.s value of the voltage was taken i.e. 230 volt we need not integrate the variable force (F_2) to get the total force or calculate the final velocity of the 1st electron due to acceleration or deceleration. Another important point that has to be mentioned here is that during all the calculations of 'F' or 'B' or 'v' the lower limit of the calculations is always taken as ZERO as this is a typical property of a sinusoidal AC.

Now let's calculate the force F_c experienced by the 2nd electron due to the varying electromagnetic field caused by the 1st electron. Now if this has to happen there should be an interaction between the two electrons. Now as electrons are charged particles the interaction between them will take place with the help of the electric field that persists in the surrounding area of each electron. This phenomenon is formulated by Coulomb and the expression for this is:

$$^{[6]}F_c = (1/4\prod\varepsilon) \times \{(q_1 \times q_2) / r^2\}$$

Now in the above expression the value of $(1/4\prod\varepsilon)$ is constant, the value of $(q_1 \cdot q_2)$ is also constant for two electrons. So what can vary is "r" i.e. the distance between two electrons. So if the electrons are too close to each other the force between them will be enormous and a lot of work has to be done externally to bring two electrons close to each other. So we can't calculate the force from here without knowing the right distance between the two electrons so that there is a proper interaction between the two electrons, so that energy can get transferred without any loss. So to get the right distance between the 1st and the 2nd electron we should know the force between them if we want to derive the distance by using coulomb's law. Again the 2nd electron is in the varying electromagnetic flux caused by the 1st electron. So we can know the force by using the equation $F = q \cdot (v \times B) \sin\theta$, as B and q is already known here. We have considered the 2nd electron w.r.t. the 1st electron in such a way so that sinθ = 90º = 1. Now what about 'v'? Our motto is no loss transmission. So the 2nd electron should have the same kinetic energy as the 1st one. Here also in case of K.E. (½ m v²) mass of an electron is constant. So, it's only the velocity of the 2nd electron that can give the 2nd electron the same K.E. as the 1st one. Again in coulomb's law all others are constant except that of the distance between the two electrons and if the two electrons are in each other's vicinity, there will a fore between the two because that's the intrinsic property of the electrons. Now if this force is just to give the 2nd electron the velocity equal to the 1st one by coulomb's law, just distance between them should be right. **<u>The 1st electron will do it by its intrinsic property of its electric field and will exert the force on the 2nd electron giving it just the right velocity and hence equal Kinetic energy.</u>** So to solve it mathematically we have to do the back calculation i.e. let us assume that the 2nd electron has a velocity of 6.9×10^{-8} m/sec.

So, $^{[5]}F_3 = q \cdot (v \times B) \sin\theta$

$= (1.602 \times 10^{-19}) \cdot (3.45 \times 10^{-9}) \times (1.14 \times 10^{-9})$

$= (6.3 \times 10^{-37})$ Newton.

Now from coulomb's law:

$$^{[6]}F_c = (1/4\prod\varepsilon) \times \{(q_1 \times q_2) / r^2\}$$

or $r^2 = (1/4\prod\varepsilon) \times \{(q_1 \times q_2) / F_c\}$

$= (8.99 \times 10^9)\times \{(1.602\times 10^{-19})^2 / (6.3 \times 10^{-37})\}$

or $r = 3.6 \times 10^8$ meter.

So any FREE electron in a Spherical area of <u>3.6 x 10^8 meter radius</u> from the 1st electron and if the electric field of the two electrons are perpendicular to each other will conduct the energy without any loss from one end of the vacuum tube to the other end even if the tube is 100s of kilometres long, at room temperature.

Now let's calculate the amount of charge necessary to induce e.m.f. in the Out Put Coil due to the electrons inside the tube of length 1m and of 2cm in diameter to make the tube a New Free Electron Wire for loss free electrical transmission. Now here one point we should carefully consider and i.e. we cannot have electrons too far from each other or in other words the electrons should be close to each other considerably so that there is no loss of energy while transmission of electricity or any kind of energy. We need to calculate this because, remember, we are doing all the above calculation with respect to one electron only.

We know that the e.m.f. induced in a coil due to change of flux is

[2]$e = - n (d\Phi_B / dt)$

where $e \rightarrow$ the induced e.m.f.

$d\Phi \rightarrow$ the flux change

$n \rightarrow$ number of turns of the coil

$t \rightarrow$ time taken for the change of flux

$- \rightarrow$ sign indicates that the induced e.m.f. will be in the opposite direction of the change of flux

Now from the above equation we can calculate the amount of charge necessary inside the volume of the free electron wire covered by the input coil to transfer the whole amount of energy supplied by the In Put Coil (A) to the Free Electron Wire. So if there is no loss during the electrical conduction, there should be a 230 volt / 2ampere, AC in the secondary coil. So from the equation let's calculate the induction for each electron first, by using the equation:

[2]$e = - n (d\Phi_{\mathbf{B}} / dt)$

$= 1000 \times (1.14 \times 10^{-9}) = 1.14 \times 10^{-6}$ volts.

So, if there is **2.02×10^8 electrons** in the area covered by the output coil in the vacuum tube then there will be 230 volt / 2 ampere AC, in the output coil which is exactly the same as the input coil. **This fixed number of electrons can be termed as a constant, for the "New Free Electron Wire", at Room Temperature. Even if the area of coils be increased or decreased the number of electrons in that area remains fixed**. **Thus, the density of the electrons can be reduced by increasing the coved area by the Input and Out Put Coil for easy and cost effective commercial production by making a suitable adjustment between the required electron density and the area of the Input and the Output Coils.**

Now we must examine the effect of the free electrons inside the tube, on the electrons of the wall of the vacuum tube. We take the diameter of the vacuum tube to be 2cm or 20mm. To do this let us consider a very small volume 'dv' of the allotted space for electrons. Let the influence on every coulomb of electrons due to the free electrons present inside the considered small volume 'dv' be 'dE'.

Let the influence due to all free electrons inside the tube on the considered electrons be E_T.

$\therefore$ To get E_T we have to integrate dE over the total volume

Or $E_T = \int_{5.244 \times 10^{-31}}^{78.54} dE$

[As volume cannot be zero, hence, I have consider the volume occupied by an electron – 5.244×10^{-31} m³ as the lower limit of the integration]

Now we know that volume (V_1) = length × breath × height or in this case of the cylinder concerned, it will be - $\prod r^2 \times h$

where $r \rightarrow$ radius of the vacuum tube

$h \rightarrow$ length of the vacuum tube

Again, if we integrate 'dv' over the total length of the tube, we will get the total volume and hence automatically the total no of free electrons will get considered. We will also assume that the free electrons are all lying on the circumference of their spiral path. Now if we look at the **figure 2** carefully, we will see that r´ and r both are constants and only 'h' varies. Now let us prepare for the integration. For integrating we will take the lower limit (α) equal to that of the diameter of an electron i.e.

$\alpha = 2 \times (2.5 \times 10^{-14})$ m $= 5 \times 10^{-14}$ m and the upper limit equal to 1m.

$\therefore$ The total volume $V_1 = \int_{5.244 \times 10^{-31}}^{78.54} dv$

$= \prod \times r'^2 \times \int_{\alpha}^{.4} dh$

Let the amount of charge present in the considered volume dv be dq also let the charge density ρ = dq

$\therefore$ The total charge $Q = \int_{5.244 \times 10^{-31}}^{3.14 \times 10^{-5}} dq$

$= \rho \times \int_{\alpha}^{.4} dv$ ------- eq. (i)

Now we will calculate the value of 'ρ'. To do this we will consider the volume –

dv = ∏×(radius of the cylindrical shaped space allotted for electrons)² × (diameter of an electron)

$= \prod \times (.005)^2 \times (5 \times 10^{-14})$

$= 3.93 \times 10^{-12}\ cm^3$

$= 3.93 \times 10^{-18}\ m^3$.

Now 'ρ' will be equal to the amount of electrons present in this volume.

$\therefore \rho = (3.93 \times 10^{-18}) \div (5.244 \times 10^{-31})$

$= 7.5 \times 10^{12}$ electrons

$= (7.5\times10^{12}) \times (1.602 \times 10^{-19})$

$= 1.204 \times 10^{-6}$ coulomb

We know electric field

[7]$E = (1/4\prod\varepsilon) \times (q / r'^2)$

Let for the electrons present in the volume 'dv', produces the electric field on unit volume of the glass wall be 'dE'.

$$\therefore E_T = \int_{5.244\times10^{-31}}^{78.54} dE$$

$$= \int_{\alpha}^{.4} (1/4\prod\varepsilon) \times (dq/r'^2)$$

$$= [(1/4\prod\varepsilon)/r'^2] \times \int_{\alpha}^{.4} dq$$

Now from eq. (i)

$$\therefore E_T = \int_{5.244\times10^{-31}}^{78.54} dE$$

$$= [\{(1/4\prod\varepsilon) \times \rho\}/r'^2] \times \int_{\alpha}^{.4} d(\prod \times r^2 \times h)$$

$$= [\{(1/4\prod\varepsilon) \times \rho \times \prod \times r^2\}/r'^2] \times \int_{\alpha}^{.4} dh$$

$$\therefore E_T = \int_{5.244\times10^{-31}}^{78.54} dE$$

$$= [\{(1/4\prod\varepsilon) \times \rho \times \prod \times r^2\}/r'^2] \times [h]_{\alpha}^{.4}$$

$$\therefore E_T = \int_{5.244\times10^{-31}}^{78.54} dE$$

$$= [\{(1/4\prod\varepsilon) \times \rho \times \prod \times r^2\}/r'^2]\ [.4 - 5 \times 10^{-14}]$$

$$\therefore E_T = [E]_{5.244\times10^{-31}}^{3.14\times10^{-5}}$$

$$= [\{(1/4\prod\varepsilon) \times \rho \times \prod \times r^2\}/r'^2] \times .4$$

$$\therefore E_T = E \times (3.142 \times 10^{-5})$$

$$= [\{(1/4\prod\varepsilon) \times \rho \times \prod \times r^2\}/r'^2] \times .4$$

$$\therefore E_T = E$$

$$= [\{(1/4\prod\varepsilon) \times \rho \times \prod \times r^2\}/r'^2] \times .4/(3.142\times10^{-5})$$

$\therefore$ Putting the value of $(1/4\prod\varepsilon)$, ρ, ∏, r^2, r'^2 we get

$E_T = [\{(8.99 \times 10^9) \times (1.204 \times 10^{-6}) \times \prod \times (.005)^2\} / (.005)^2] \times .4 / (3.142 \times 10^{-5})$

$\therefore E_T = 4.33 \times 10^8$ newton/coulomb

$= 4.33 \times 10^8$ volt/meter

Here one point should also be made clear i.e. about 'R' shown in the **figure 3.** We have considered electron at one end of the tube in a very small volume 'dv' and with the help of that and with a series of calculation we have calculated the influence of the total amount of free electrons on every coulomb of electrons on the glass wall of the tube. Now it may appear that the distance 'R' between the considered electrons and electrons on the other end of the tube will vary as we will proceed from our consider end of the tube to the other end of the tube. But we have set our calculation in such a way that we need not consider 'R'. This is because we have consider 'dv' to be a very small volume in which R = r´ and where both 'r´' & 'R' are constants, and 'dE' being a very small electric field on the glass wall due to the electrons present in 'dv'. Then we have integrated 'dE' over the total volume to get the total amount of electric field $\mathbf{E_T}$ on every coulomb of electrons, of the glass wall of the vacuum tube. Thus the complication of varying 'R' has been eliminated.

So, form the above calculation we see that, this amount of voltage in nowhere strong enough to cause electron emission from the wall of the vacuum tube (4a).

Thus the vacuum tube made up of alternate layers of Ceramic or Polymer or Dielectric Material or Teflon (PTFE = Polytetrafluoro ethylene, PFA = Perfluoro alkoxy, FEP = Fluorinated ethylene), as per requirement (2_1, $4a_2$) and Silicon Oxy-Nitride (SiO_2-Si_3N4-SiO_2) or Silicon Dioxide (SiO_2) or Silicon Nitride (Si_3N_4) or Ceramic Materials or Polymers or Dielectric **Materials (2_2, $4a_3$) with** ***free electrons inside and with two identical Input and Output coils on both ends of the tube with an AC voltage across the input coil will transport the electrical energy delivered by the input coil to the wire to the out put coil at the other end of the wire without any loss at room temperature and it will maintain its property even at few hundred degrees of centigrade. This specially designed wire for loos free electrical transmission at room temperature is termed as "New Free Electron Wire".***

III. FIGURES AND TABLES

BRIEF DESCRIPTION OF DRAWINGS:

Procedure to read the Drawings in various parts of the whole application: Every major component of this invention when mentioned in this article is accompanied by its relevant position in the drawings with a particular alpha-numeric numbering system in the brackets.

- **(i)** In the bracket the first numeric in big case represent the figure number.
- **(ii)** The first numeric sometimes is accompanied by an alphabet, if the figure is subdivided e.g. a, b…etc.
- **(iii)** All the numeric subscripts denote an individual component in a figure or sub-figure.
- **(iv)** Sometimes there is a second big case numeric in the brackets with 'coma' which represent a different second figure entirely, with numeric subscript to identify the same component in the other figure as in the first set of representations.
- **(v)** For Example – ($4a_3$, 2_2) represents '4' as figure 4; 'a' as sub-figure '4a' of figure 4; the numeric subscript '3' as the particular component Silicon Oxynitride or equivalent in figure 4a. The second numeric '2' represents figure 2 and the numeric subscript '2' represents the same material or component, Silicon Oxynitride or equivalent in figure 2.

Figures 1a to 1g: Shows schematically, step by step, simplest manufacturing methods of New Free Electron Wire to develop a simplest model of the invention.

Figure 2: Shows schematically, the different layers by which the body of the New Free Electron Wire is made up of.

Figure 3: Shows schematically how the electron of the body of the New Free Electron Wire may get influenced by the free electrons trapped in the core of the wire.

Figure 4a, 4b: Shows the whole invention schematically with all its components and only ONE utility or application.

Figure 5a, 5b, 5c: Shows schematically the two components that will be used for sealing the New Free Electron Wire without loosing the vacuum and the free electrons inside wire.

Figure 6: Shows schematically how the individual materials used to make the body of the New Free Electron Wire, will help to keep the free electrons remain confined at the core of the wire for considerable amount of time to make the wire capable for commercial uses.

IV. CONCLUSION

This invention lies, in the area of Solid State Physics and Plasma Physics. From the engineering point of view it deals with developing a new kind of electrical conductor with a very high capacity of almost loss free transportation and use of energy. Hence it lies in the field of Electrical Engineering.

The cost effective materials used to manufacture this wire like Teflon, Silicon-Oxy-Nitride (SiO_2-Si_3N_4-SiO_2) and a thin layer of metal foil like the one to wrap food or a little bit thicker than that, will make its production cost more or less equal to that of normal copper wires. As this device works on the basic principles of free electrons trapped in a vacuum tube at the order of 10^{-4} torr to 10^{-8} torr hence the arrangements for free electron generation and vacuum creation is required. Also an arrangement for thin film deposition of Silicon-Oxy-Nitride is also necessary. But these are all one time investments and millions of kilometers of Free Electron wires can be produced from this setup once established. Hence it can be safely concluded that the regular production cost of the Free Electron Wire will not cost more than general copper wires. Hence this technology will be the backbone of various other technologies already in commercial use. Where ever this technology will be used it will increase the efficiency of that machine radically. So undoubtedly this technology has an excellent commercial future and has the ability to give a pollution free, clean and cheap energy dependable, better human civilization.

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(iv) USPTO Application No.: 13/583932

(v) USPTO Publication No.: US-2013-0098655-A1

(vi) UK Application No.: 1310230.6

(vii) UKIPO Publication No.: GB 2499555 A

VI. FIGURES

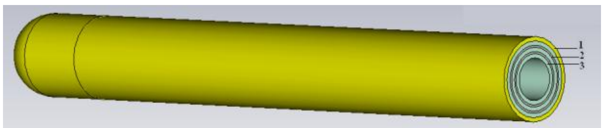


Fig. 1a

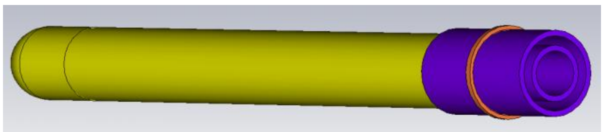
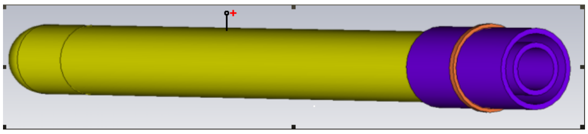


Fig. 1b



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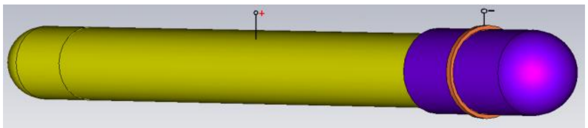

Fig. 1d

Fig. 1e

Fig. 1f

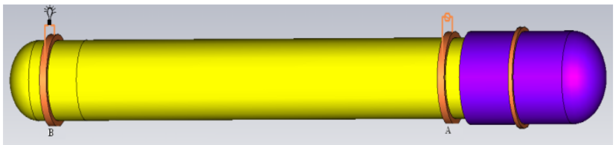

Fig. 1g

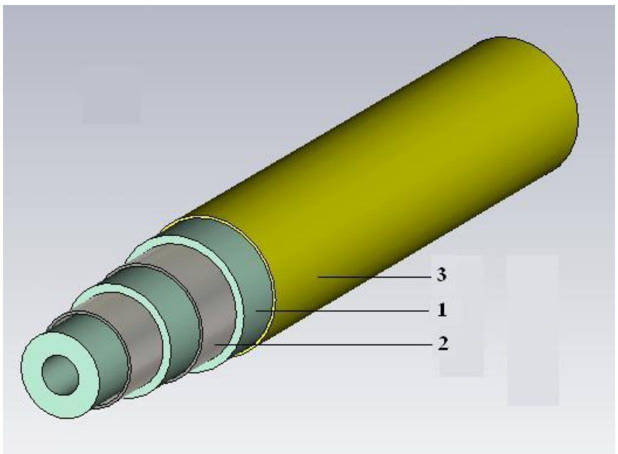

Fig. 2

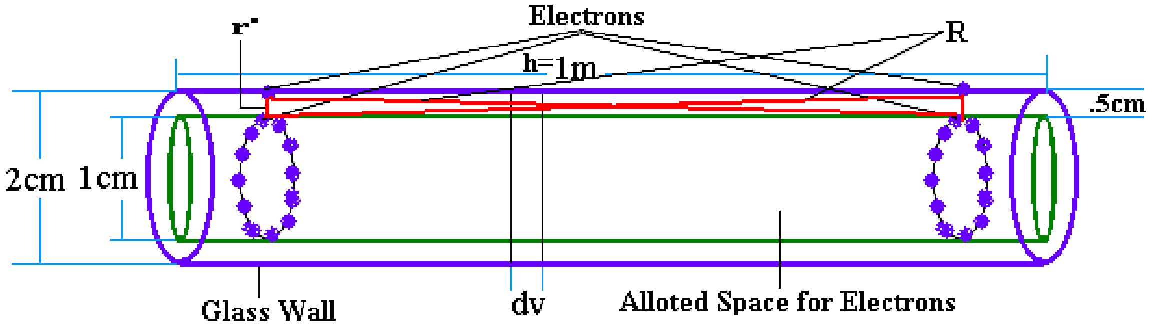

Fig. 3

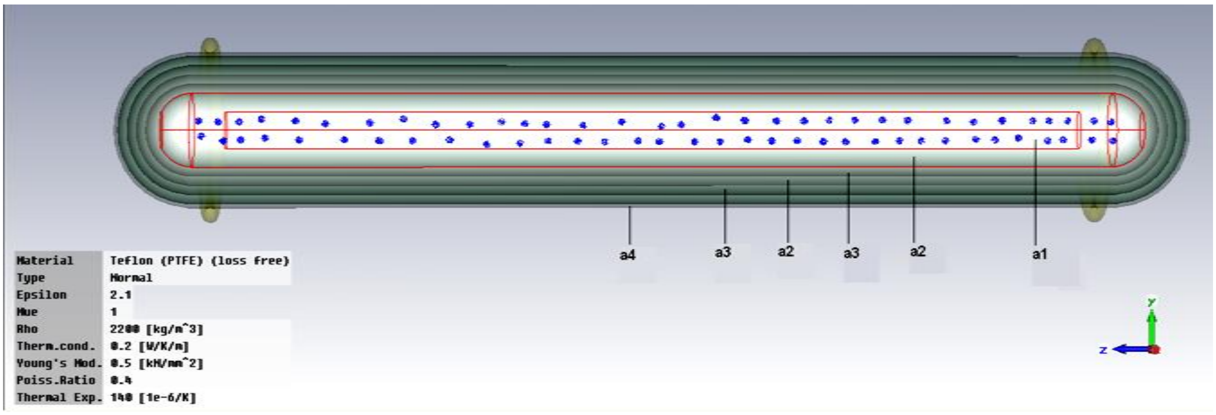

Fig. 4a

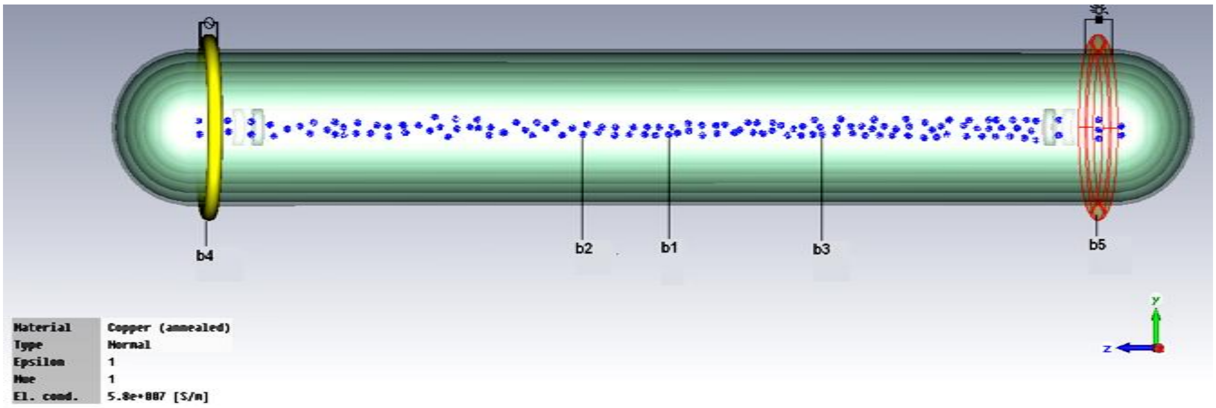

Fig. 4b

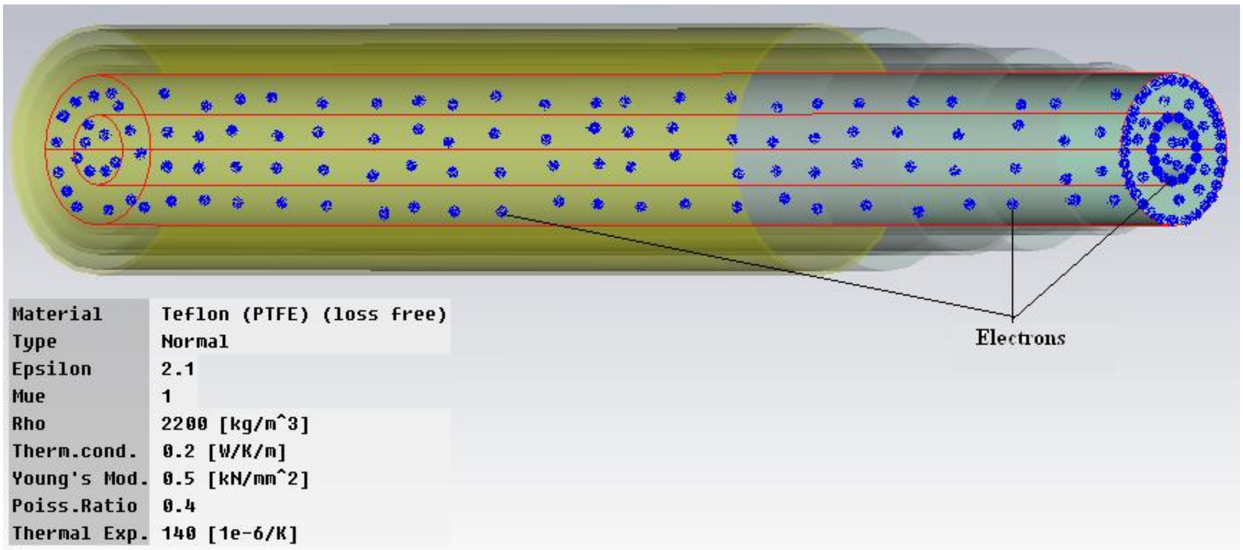

Fig. 6

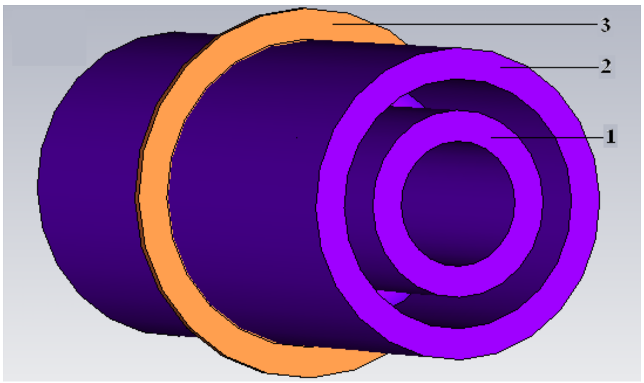

Fig. 5a

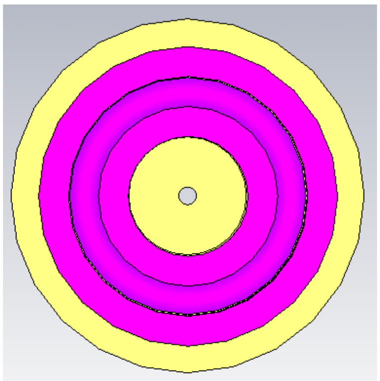

Fig. 5b

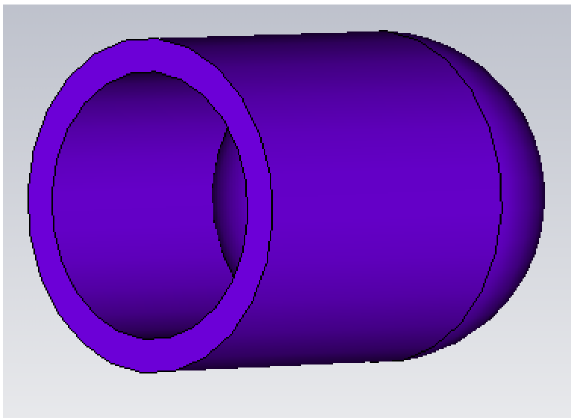

Fig. 5c