A Discussion about the Kinetic Energy of an Electrically Charged Body and its Implications on Other Related Issues

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Abstract:

The Nowadays Science of Physics states that when an external Force is exerted on ***any*** Massive Body it causes an Acceleration of this Massive Body according to Newton's Second Law of Motion, F=ma.

From the above follows that, when an external Force is exerted on an Uncharged (Not Electrically Charged) Body, since that Body Accelerates according to Newton's Second Law of Motion, F=ma, then, this also implies, as will be presented also in this paper, that that Body acquires a Kinetic Energy equal to: $mv^2/2$, according to the Newtonian Physics.

But, if that Uncharged Body Accelerates according to Newton's Second Law of Motion, F=ma, this also implies, as will be also presented in this paper, that ***all the Work*** done by this external Force, is ***already manifested*** and ***embedded*** in the Kinetic Energy that that Uncharged Body acquired, because of the above-mentioned external Force which was exerted on it.

However, if an external Force is exerted on an Electrically Charged Body, what was presented above might need some modifications.

Because, if an Electrically Charged Massive Body does indeed Accelerates ***also*** according to Newton's Second Law of Motion, F=ma, and ***all the Work*** done by the external Force exerted on it, is ***already manifested*** and ***embedded*** in the Kinetic Energy embedded in this Electrically Charged Massive Body, then this ***cannot explain*** the ***origin*** of the ***Extra Energy*** that an Electrically Charged Body acquires when it Accelerates, which is manifested in the Electromagnetic Waves it emits and the Magnetic Field that surrounds it when it moves.

A possible resolution to the above stated dilemma might be, as presented in this paper, that Newton's Second Law of Motion, F=ma might ***not be*** the proper equation which should be used to calculate the Acceleration that an Electrically Charged Body acquires, when an external Force is exerted on it.

This might provide extra support to what is already presented in additional papers, by the author of this paper, which also present the above possibility.

The above-mentioned additional papers also propose an experiment.

Thus, what is presented in this paper might provide extra support to the statement that an implementation of the above-mentioned experiment, might be an important endeavor.

1. The Kinetic Energy that a moving Uncharged Massive Body acquires because of an External Force Exerted on it.

The Nowadays Science of Physics states that when an external Force is exerted on ***any*** Massive Body it causes an Acceleration of this Massive Body according to Newton's Second Law of Motion, F=ma.

Thus, from the above follows that, the infinitesimal Work, dW, done by an external Force, F, exerted on an Uncharged Massive Body is:

$dW = Fdx = ma\,dx,$

where dx is the infinitesimal length of route covered by this external force F.

Since the Acceleration a is equal to:

$a = dv/dt = (dv/dx)(dx/dt),$

and since:

$dx/dt = v$

then $a = v(dv/dx)$.

Then, the infinitesimal Work, dW, is equal to:

$m\,v(dv/dx)dx = m\,v\,dv.$

Then, the ***Total Work***, W, done by that external Force, F = ma, is:

$W = m \int v\,dv = m\,v^2/2 + C.$

Assuming the Uncharged Massive Body starts moving from rest, then, when W=0 also v=0 which results in C=0.

Thus, the above presents that the ***Total Work*** (or, in other words, ***all the Work***), W, done by the above-mentioned external Force, F, exerted on the above-mentioned Uncharged Massive Body is also equal to:

$m\,v^2/2,$

which is also the known equation for the Newtonian Kinetic Energy that that Uncharged Massive Body acquired, because of that external Force, F, which was exerted on it, if indeed that Uncharged Massive Body, accelerates according to Newton's Second Law of Motion, F=ma.

The nowadays Science of Physics also states, that the above-mentioned Newtonian Kinetic Energy is only an approximation.

Because, the nowadays Science of Physics states, that the magnitude of the embedded Mass of an Uncharged Massive Body actually increases, when an external force, F, is exerted on that Massive Body, according to the equation:

$m=m_0 (1-v^2/c^2)^{-1/2}$,

presented by Einstein's Special Relativity Theory.

And the nowadays Science of Physics states that the resulting embedded Energy, of that Uncharged Massive Body,

mc^2,

embeds in it the Rest Energy of this Uncharged Massive Body,

m_0c^2,

Plus, the additional Kinetic Energy that that Uncharged Massive Body acquired, because of the external Force, F, which was exerted on it.

But it can be presented, that also in the above-presented relativistic approach, the Kinetic Energy results in

$m\ v^2/2$

For velocities v which are significantly smaller than the velocity of Light in vacuum, c, as presented below:

The Kinetic Energy K is equal to:

$K= mc^2 – m_0c^2 = m_0\ c^2\ (1-v^2/c^2)^{-1/2} - m_0c^2$.

And since from the Binomial Theorem $(1+x)^{-1/2}$ is equal approximately to $1 – x/2$, for very small x values, then:

$K= m_0\ c^2\ (1+v^2/2c^2) - m_0\ c^2 = m_0\ c^2 + m_0\ v^2/2 - m_0\ c^2 = m_0\ v^2/2$.

Thus, the above also presented, that ***all the Work*** done by an external Force, F, exerted on a Massive Body, is ***already manifested and embedded*** in the Kinetic Energy, $m_0\ v^2/2$, that that Massive Body acquired because of that Force, F, that was exerted on it, ***if*** the Massive Body ***indeed Accelerates*** according to Newton's Second Law of Motion, F=ma, when an external Force, F, is exerted on it.

2. The Kinetic Energy that a moving Electrically Charged Massive Body acquires because of an External Force Exerted on it

The previous chapter, of this paper presented that ***all the Work*** done by an external Force, F, exerted on a Massive Body, is ***already manifested and embedded*** in the Kinetic Energy, $m_0 v^2/2$, that that Massive Body acquired because of that Force, F, that was exerted on it, ***if*** the Massive Body ***indeed Accelerates*** according to Newton's Second Law of Motion, F=ma, when an external Force, F, is exerted on it.

But if an external Force, F, is exerted on an Electrically Charged Body, the statement presented above might need to be modified.

Because, an Electrically Charged Body which Accelerates, also emits Electromagnetic Waves.

And also, because, an external spectator, which inspects a moving Electrically Charged Body, detects an additional Magnetic Field generated because of this Electrically Charged Body movement, ***in addition*** to the Electric Field that surrounded this Electrically Charged Body before its movement.

It should be also emphasized, that any Electrically Charged Body embeds both, Electric Charge and Mass.

And if the external Force exerted ***also*** on an Electrically Charged Body also causes that body to Accelerate according to Newton's Second Law of Motion, F=ma, as the nowadays Science of Physics ***does state***, then as already presented above, ***all the work*** done, by that external Force is ***already embedded*** in the Kinetic Energy that that Electrically Charged Body acquired, because of that Force exerted on it.

And since that external Force is the ***only cause*** which caused that Electrically Charged Body to acquire an Accelerated movement, and ***all the work*** done by that external Force, is ***already embedded*** in the Kinetic Energy that that Electrically Charged Body acquired, then, the following questions might arise:

What generates the ***extra Energy*** embedded in the Magnetic Field that surrounds this Electrically Charged Body because of its movement, and ***what generates*** the ***extra Energy*** embedded in the Electromagnetic Waves that that Electrically Charged Body emits because it now Accelerates?

It cannot be the Work done by the external Force which was exerted on that Electrically Charged Massive Body, because, if that Electrically Charged Body ***does Accelerate*** according to Newton's Second Law of Motion, F=ma, then as stated above, ***all the work*** done by that external Force, is ***already embedded*** in the Kinetic Energy that that Electrically Charged Body acquired.

A possible resolution to the above stated dilemma might be, as presented in this paper, that Newton's Second Law of Motion, F=ma might ***not be*** the proper equation which should be used to calculate the Acceleration that an Electrically Charged Body acquires, when an external Force is exerted on it, which might also imply that the Kinetic Energy that an Electrically Charged Body acquires, when an external Force, F, is exerted on it, is not presented exactly by $m v^2/2$.

Thus, this paper might also provide extra support to what is already presented in additional papers, by the author of this paper, which also present the above possibility, that F=ma might ***not be*** the proper equation which should be used to calculate the Acceleration that an Electrically Charged Body acquires, when an external Force is exerted on it.

Some on these additional papers are:

"Implications if the Electric Field will be recognized as a form of Acceleration" (1)

0r " Kaluza Klein Theory versus the possibility that the Electric Field Strength might be recognized as a form of Acceleration" (2).

These additional papers also explain other issues, which are unresolved by the nowadays Science of Physics, such as providing a simple Unification between Gravity and Electromagnetism, or explaining the ***origin*** of the Attraction or the Repulsion between Electrically Charged Bodies, an issue which is still a mystery today.

The above-mentioned additional papers also propose an experiment which might either discard the above-mentioned possibility, that F=ma might ***not be*** the proper equation which should be used to calculate the Acceleration that an Electrically Charged Body acquires, when an external Force is exerted on it, if the results of that experiment will turn out to be unsuccessful, or, alternatively, provide validity to the above-mentioned possibility, if the results of that experiment will turn out to be successful.

Thus, what is presented in this paper might provide extra support to the statement that an implementation of the above-mentioned experiment, might be an important endeavor.

3. Summary and Conclusions.

The paper highlights a paradox resulting from the statement, presented by the nowadays Science of Physics, that when an external Force is exerted on ***any*** Massive Body it causes an Acceleration of this Massive Body according to Newton's Second Law of Motion, F=ma.

That paradox appears when the above statement is applied to an external Force exerted on an Electrically Charged Body.

Because, an Accelerating Electrically Charged Body also emits Electromagnetic Waves and has a Magnetic Field which surrounds it, in addition to the Electric Field, which surrounded it, before that Electrically Charged Body started its movement.

And, if that Electrically Charged Body ***indeed*** also Accelerates according to Newton's Second Law of Motion, F=ma, as the nowadays Science of Physics ***does state***, then, because, as presented in this paper, ***all the Work*** done by this external Force is ***already manifested and embedded*** in the ***Kinetic Energy*** that that Electrically Charged Body acquired, because of that external Force that was exerted on it, then this implies that, there is ***no additional Energy*** exerted on that Electrically Charged Body, which ***can explain*** the ***origin*** of the ***additional Energies*** that

appear after that Electrically Charged Body started its movement, which are the Electromagnetic Waves that that Electrically Charged Body emits after it started its Acceleration, or the Magnetic Field which surrounds it after that Electrically Charged Body started its movement.

The paper presents the assumption that for an external Force exerted on an Electrically Charged Body, F=ma might ***not be*** the proper equation which should be used to calculate the Acceleration that an Electrically Charged Body acquires, when an external Force is exerted on it, which might also imply that the Kinetic Energy that an Electrically Charged Body acquires, when an external Force, F, is exerted on it, is not presented exactly by $m v^2/2$.

Thus, this paper might also provide extra support to what is already presented in additional papers, by the author of this paper, which also present the above possibility, that F=ma might ***not be*** the proper equation which should be used to calculate the Acceleration that an Electrically Charged Body acquires, when an external Force is exerted on it.

The above-mentioned additional papers also propose an experiment which might either discard the above-mentioned possibility, that F=ma might ***not be*** the proper equation which should be used to calculate the Acceleration that an Electrically Charged Body acquires, when an external Force is exerted on it, if the results of that experiment will turn out to be unsuccessful, or, alternatively, provide validity to the above-mentioned possibility, if the results of that experiment will turn out to be successful.

Thus, what is presented in this paper might provide extra support to the statement that an implementation of the above-mentioned experiment, might be an important endeavor.

It should be also added, that if the above-mentioned experiment will turn out to be unsuccessful, this will ***indeed discard*** the above-presented assumption that for an external Force exerted on an Electrically Charged Body, F=ma might ***not be*** the proper equation which should be used to calculate the Acceleration that an Electrically Charged Body acquires, when an external Force is exerted on it, which might also imply that the Kinetic Energy that an Electrically Charged Body acquires, when an external Force, F, is exerted on it, is not presented exactly by $m v^2/2$.

But in such a situation the paradox presented in this paper will still remain as an unresolved open question.

References

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