A NEW FORCE WITH CHARACTERISTICS OF NUCLEAR FORCE AND BOTH ATTRACTIVE AND REPULSIVE COMPONENTS

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As we know, in nature, nothing occurs unnecessarily, e.g., our hearts beat persistently without having any source of infinite energy, not unnecessarily; there is an important purpose as to why they beat persistently, and they have special structure, unlike simple balloons of blood, that keeps them beating persistently and provides all the properties our hearts possess. And therefore, as electrons, nucleons etc. all the particles possess persistent spin motion without having any source of infinite energy and several properties; there should positively be some important purpose as to why they possess persistent spin motion, and they should have special structure, unlike simple balloons of charge, that keeps them spinning persistently and provides all the properties they possess. Further, as all the phenomena/activities related with our hearts, e.g., continuous blood circulation etc. taking place in our bodies are the effects of the purpose behind persistent beating of our hearts and their special structure, similarly, all the activities/phenomena related with electrons, nucleons etc. taking place in their systems should be the effects of the purpose behind their persistent spin motion and their special structure. And therefore, presently, that purpose and the special structures of electrons and nucleons have been determined. The determined purpose and the special structures of electrons and nucleons enable to determine a new force with characteristics of nuclear force and both attractive and repulsive components. The attractive component of this force keeps the electrons, nucleons etc. bound together in their respective beams, despite similar charges on them, and nucleons in deuterons, alpha particles and nuclei etc. And the repulsive component causes the emissions of alpha and beta particles from the nuclei. The presently determined force gives rise to a potential of super soft core nature. It can explain the phenomena of scattering between particles.

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1. INTRODUCTION

As we know, electrons, protons etc. are bound together in their respective beams despite similar charges on them. Neutrons (having zero net charge) are also bound together in their beams though their beams do not persist as long as the electron and the proton beams persist because the neutrons, after their mean life time start decaying. These examples lead to conclude that, between electrons, between protons and between neutrons in their respective beams, a force, stronger than the Coulomb repulsive force and independent of charge is also generated. But currently, no knowledge is available anywhere about this force, and how it is generated.

Further, as we know, as soon as electrons, protons and neutrons etc. start flowing in their respective beams and the electrons start flowing through the electric current carrying specimens, an electromagnetism is generated in them and a magnetic field which possesses direction is generated around and along their length in a plane perpendicular to the direction of flow of particles through them. When no current flows through the specimens, no magnetism in them and no magnetic field around them are generated. But currently no explanation is found of any of the above phenomenon/event anywhere.

As the generation of a force of attraction between electrons, between protons and between neutrons in their respective beams, the generation of electromagnetism in beams and current carrying specimens, and the generation of magnetic field around them etc. all the phenomena/events take place simultaneously as soon as the electrons, protons and neutrons start flowing through their respective beams and the electrons start flowing through the specimens, otherwise not, it leads to conclude:

1. Electrons protons and neutrons etc. possess some property (see Sec. 2) that generates linear velocity in them. And when some voltage is applied across the specimens

and across the electron guns to make the electrons to flow through them, the directions of linear velocity of electrons are oriented in one direction. Otherwise, due to the possible collisions of electrons among themselves and consequently their deflections in different directions, especially when the electron beams deviate up and down, or left and right in CRO (cathode ray oscilloscope), the beams cannot persist as such. (For confirmation that, due to voltage or external electric field, the directions of linear motion of electrons are oriented, see Sec. 4.5, Ref. 1.)

2. The electrons, protons and neutrons possess some special structure (see Sec. 3), unlike simple balloons of charge. And according to their special structure, they possess some magnetism too by the virtue of nature as they possess charge, and in such a manner and form that when the directions of their linear velocity are oriented in one direction, their magnetism and magnetic fields are also oriented simultaneously in such a manner that a resultant magnetism is generated in their beams and specimens, and due to interactions between their magnetic fields, an attractive force is generated between them and a magnetic field is generated around and along the length of beams and specimens in a plane perpendicular to the direction of flow of electrons, protons and neutrons in their beams and electrons through the specimens.

The above conclusions cannot be ruled out because, as we know, electrons, nucleons etc. all the particles possess persistent spin motion without having any source of infinite energy and several properties; there should positively be some important purpose as to why they possess persistent spin motion, and they should have some special structure, unlike simple balloons of charge, that keeps them spinning persistently and provides all the properties they possess. For example, our hearts beat persistently without having any source of infinite energy, there is an important purpose as to why they beat persistently, and they have special structure, unlike simple balloons of blood that keeps

them beating persistently and provides all the properties our hearts possess. Further, as all the phenomena/activities related with our hearts, e.g., continuous blood circulation etc. taking place in our bodies are the effects of the purpose behind persistent beating of our hearts and their special structure, similarly, all the phenomena/activities related with electrons, nucleons etc. taking place in their systems, e.g., their beams, deuterons, alpha particles, nuclei and specimens should be the effects of the purpose of persistent spin motion of electrons, nucleons etc. and their special structures.

Presently, that purpose (see Sec. 2) and the special structures of electrons, protons and neutrons (see Sec. 3) have been determined. The determined purpose fulfills the mentioned above first conclusion, and the special structure fulfills the second conclusion. And consequently, their determinations enable to:

1. Give very clear and complete explanation as to how electromagnetism is generated in electron beams and current carrying specimens, which type of magnetism (electromagnetism) is generated, how a magnetic field is generated around them in a plane perpendicular to the direction of flow of electrons through them, and how that field possesses direction (see Sec. 4, Ref. 1).

2. Determine a new force (see Sects. 4 and 5) with characteristics of nuclear force (see Sec. 6) and both attractive (see Sects. 4.1 and 5.1) and repulsive components (see Sects. 4.2 and 5.2).

The attractive component of the generated force enables to: i. Explain as to how electrons, protons etc. are held together in their respective beams despite having similar charges on them (see Sec. 4.1, Ref. 1); ii. Explain as to how an energy gap is generated between electrons at their superconducting state and at their normal state (see Sec.7.9,

Ref. 2); iii. Give almost a complete understanding about the structures, properties etc. of deuterons, alpha particles and nuclei (see Sec. 4, 5, 6, 7, 8 and 9, Ref. 3).

And the repulsive component of the generated force enables to give a complete understanding as to how the emissions of alpha (α) and beta (β) particles take place from the nuclei (Sec. 9.2.1, Ref. 3).

Currently, we know about the Yukawa's force [4] of attraction, stronger than the repulsive Coulomb force. According to Yukawa's meson field theory, a field of virtual π mesons occurs between nucleons in nuclei and due to continuous exchange of virtual π mesons between nucleons, the nuclear force is generated between nucleons and the nucleons are held together in their nuclei. But it gives rise to numerous very fundamental questions. For example:

1. Virtual means that does not exist physically, then how can the field of such (i.e. virtual) π mesons occur?

2. How can such π mesons possess charge, that too positive or negative?

3. The real π mesons possess both charge and mass, while to virtual π mesons, only charge has been assigned and mass has not been assigned, why is this double standard?

4. As far as the author's knowledge is concerned, it is believed that there exist only matter and energy in the universe, in which category, matter or energy, do the virtual π mesons lie?

Further, does the field of virtual π mesons occur in proton and neutron beams, and protons and neutrons are held together in their respective beams due to the continuous exchange of virtual π mesons between them? If not, then:

1. Why is this inconsistency? When the field of virtual π mesons can occur in nuclei, it should occur in proton and neutron beams too because these are also nucleons.

2. How electrons, protons etc. are held together in their respective beams against the repulsive Coulomb force?

And if yes, then:

1. The field of virtual π mesons should occur in electron beams too, and due to the exchange of π mesons between electrons, the electrons should be held together in electron beams. Can it happen so? If not, then how are the electrons held together in their beams?

2. The neutron beams should exist in nature similarly as nuclei exist in nature, even with more strong stability. Because, in neutron beams, there occur no protons and hence no repulsive Coulomb force comes into play. But on the contrary, the neutron beams do not survive even as long as the proton beams survive. Here some people may argue, it happens because neutrons start decaying after their mean life time and consequently neutron beams are destroyed. This argument is true but it gives rise to questions: Then what does happen in deuterons (D), alpha particles (α) and nuclei such that neutrons in them stop decaying and become stable?

In addition to the above faults, the Yukawa's mesons field theory fails to give any explanation regarding, e.g. 1. Structure and properties of nuclei; 2. Why does only deuteron occur in nature, not di-neutron and di-proton, while theoretically their occurrences are also possible? 2. How does H^3 decay into He^3 emitting a beta particle while E_b (binding energy per nucleon) for $H^3 > E_b$ for He^3 ? 3. How are nucleons in alpha particle (E_b) so strongly bound that its E_b, i.e. $(E_b)_\alpha > 6(E_b)_D$, where $(E_b)_D$ is E_b of deuteron (D), such that it starts behaving as particles like electron, proton etc.

The presently determined force gives very clear and complete explanations of all the above questions (see Sects. 4, 5 and 6, Ref. 3).

2. DETERMINATION OF THE PURPOSE AS TO WHY ELECTRONS, PROTONS AND NEUTRONS ETC. POSSESS PERSISTENT SPIN MOTION

The spin motion of electrons, nucleons etc. all the spinning particles generate the following two properties in them:

2.1 First property

The spin motion of spinning particle generates the tendency of linear motion in it along the direction of its spin angular momentum L_S (for verification of its truth, see Sec. I B, Ref. 5). And as electron, nucleon etc. all the particles possess spin motion; a tendency of linear motion is generated in them along the directions of their respective L_S.

If the frequency of spin motion of such a particle is increased by some means, a stage comes when the particle starts moving itself along the direction of its L_S. Then after, as the frequency of spin motion of particle increases, the velocity of particle goes on increasing in accordance to expression[5]

$$v^2 = h\omega / m \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

where m, v and ω respectively are the mass, linear velocity and frequency of spin motion of the particle, and h is Planck's constant [for verification of the truth of expression (1), see Sec. I A, Ref. 5].

Electrons, nucleons etc. all the particles probably possess such amount of frequency of spin motion that keeps them always moving with some linear velocity (v). And consequently, they are found always in moving state, not in position of rest, and their motions are always oriented along the directions of their respective L_S. Their linear velocity (v) varies as the frequency of their spin motion (ω) varies, according to expression (1).

2.2 Second property

As a particle, due to its linear motion, obtains kinetic energy (E_K), and due its kinetic energy (E_K), obtains its linear momentum (p_{LIN}), similarly, due to its spin motion, it obtains spin energy ($E_S = h\omega/2$, for detail, see Sec. II, Ref. 5), and due to its spin energy, it obtains spin momentum ($p_S = h\omega/\mathrm{v}$, see Sec. II, Ref. 5). [For verification of the truth that the particle obtains p_S due to its spin motion, see Sec. I C, Ref. 5.]

And therefore, electrons, nucleons etc. all the particles possess motional energy (E_M) = $E_K + E_S$ and motional momentum (p_M) = $p_{LIN} + p_S$. And whenever arises the situation of conservation of energy and momentum etc. of electrons, nucleons etc. during their motion, their E_M , p_M and L_S actually conserve, not their E_K and p_{LIN} . [For verification of the truth of conservation of p_M , see Sec. I D, Ref. 5. And for how E_M , p_M and L_S conserve, see Sec. 3.1.1, Ref. 6.] Due to conservation of E_M , p_M and L_S of electrons, nucleons etc., no violation of the laws of conservation of their energy and momentum etc. happens to be possible, even, e.g.: 1. During motion of electron along its elliptical orbit, where the velocity of electron varies; 2. During motion of electron (accelerated by a large voltage), after attaining relativistic velocity by it, when the rate of increase in its velocity starts decreasing (see Sec. 2.2, Ref. 6).

3. DETERMINATION OF SPECIAL STRUCTURE OF ELECTRONS, PROTONS AND NEUTRONS THAT KEEPS THEM SPINNING PERSISTENTLY AND PROVIDES ALL THE PROPERTIES THEY POSSESS

3.1 Determination of the special structure of electrons

The current concept about the structure of electron that it is like a ball of charge (-e), and the magnetic field, spin magnetic moment (μ_S) etc. properties it possesses are

obtained due to spin motion of its ball of charge is not true (for verification of its truth, see Sec. 1, Ref. 1).

The electron has special structure, unlike simple ball of charge (-e). It possesses a bundle of magnetism too by the virtue of nature as it possesses a bundle of charge ($-e$) by the virtue of nature. And the magnetic field the electron possesses occurs due to this magnetism. The magnetism the electron possesses occurs in the form of a circular ring, shown by a dark solid line circle around the charge of electron, Fig. 1(a), where charge has been shown by a spherical ball, as for example, around the planet Saturn, there occurs a ring. Around the ball of charge of electron, there occurs its electric field (which has not been shown in figure), and around the ring of magnetism of electron, there occurs its magnetic field shown by broken line circles, Fig. 1(a). The ring of magnetism and the ball of charge of electron both spin with frequencies ω_{EM} and ω_{EC} respectively, but in directions opposite to each other, shown by arrows in opposite directions, Fig. 1(b), where the ball of charge has been shown by quite a thick dark line circle and the ring of magnetism by comparatively a thinner dark line circle.

The spin motion of the ring of magnetism and the ball of charge of electron in directions opposite to each other is the special characteristic of the special structure of electron, because when they spin in directions opposite to each other, there is created such situation (see Sec. 3.2, Ref. 6) and their fields interact (electromagnetic interaction) with each other such that their spin motion persists.

When the ring of magnetism and the ball of charge of electron spin with frequencies ω_{EM} and ω_{EC} respectively, due to their spin motion, the linear velocities v_{EM} and v_{ES} respectively are generated in them according to expression (1) along the directions of their respective spin angular momentum L_{SM} and L_{SC}. And consequently,

the electron obtains linear velocity v_E ($= v_{ES} - v_{EM}$ or $= v_{EM} - v_{ES}$) along the direction of its spin angular momentum L_S which (L_S) is generated in electron due to the frequency of its spin motion ω_E, where ω_E is corresponding to v_E of the electron obtained according to expression (1). During motion of electron along its elliptical orbits or after attaining relativistic velocity by it, the frequency of spin motion ω_E of the electron corresponding to its linear velocity v_E ($= v_{ES} - v_{EM}$) is obtained according to expression[6] (2).

The μ_S the electron possesses, is generated due to the spin motion of its ring of magnetism and occurs along the direction of L_{SM}. As normally v_E occurs along the direction of L_{SC} (for detail, see Sec. 3.1.1, Ref. 6), and L_{SC} occurs in direction opposite to the direction of L_{SM}, v_E occurs in direction opposite to the direction of μ_S.

3.2 Determination of the special structure of protons

Since the proton possesses the same amount of charge (+e) as the electron possesses (-e) but it is about 2×10^3 times more massive than electron, it means, proton possesses something more, probably some material along with its charge (+e). Its charge and material probably exit together in the form of a ball as the charge of electron exists in the form of a ball.

Proton possesses all the properties similarly as the electron possesses. And hence the ball of charge and material and the ring of magnetism of proton too spin with frequencies ω_{PM} and ω_{PC} respectively in directions opposite to each other, and it is the special characteristic of the special structure of proton that keeps it spinning persistently.

Proton possesses frequency of spin motion ω_P and linear velocity v_P along the direction of its spin angular momentum (L_S) in the same manner as the electron

possesses ω_E and v_E along the direction of its spin angular momentum L_S. And μ_S the proton possesses, is generated due to the spin motion of its ring of magnetism and occurs along the direction of spin angular momentum of its ring of magnetism (L_{SM}).

3.3 Determination of the special structure of neutrons

See Sec. 2, Ref. 7.

4. EXPLANATION OF HOW A FORCE IS GENERATED BETWEEN, E.G., ELECTRONS DUE TO INTERACTION BETWEEN THEIR MAGNETIC FIELDS

As electrons (and similarly nucleons etc.), due to their persistent spin motion, possess v, L_S, E_m and p_m, where their v occurs along the directions of their respective L_S (see Sec. 2), and due to their special structure, the planes of their magnetic fields occur in a plane perpendicular to the directions of their respective v (see Sec. 2.2), in nature or in their systems, e.g. their beams, current carrying specimens, nuclei etc., when two electrons or two nucleons or one electron and one nucleon are found in position as shown in Fig. 2 (i.e. when the directions of their v are in the same direction and parallel to each other), or found in position as shown in Fig. 4 (i.e. when the directions of their v are in opposite directions and parallel to each other), due to interaction between their magnetic fields, attractive (see Sec. 4.1) or repulsive (see Sec. 4.2) force respectively is generated between them.

4.1 Explanation of how the force of attraction is generated

Let us consider two electrons A and B lying in the same vertical plane (plane of the paper) when the directions of their v are in the same direction and parallel to each other, Fig. 2(a). Then, due to their special structure, the planes of their magnetism and

magnetic fields lie in the same plane perpendicular to the directions of their v, and the directions of their spin motion lie in the same direction, as shown in Fig. 2(a).

Let r be the radii of the outermost co-centric circular lines of force of the magnetic fields of electrons A and B. If the distance d between their centers becomes $<2r$, their lines of force start interacting, as shown in Fig. 2(b). Let the distance d be such that the outermost two lines of force a_1 and a_2 of electron A interact with the outermost two lines of force b_1 and b_2 of electron B. In this situation, in the region of their interaction (i.e. in between the electrons A and B) since the directions of lines of force a_1 and a_2 of electron A are opposite to the directions of lines of force b_1 and b_2 of electron B, Fig. 2(b), they repel each other. And consequently, the lines of force a_1, a_2 of electron A, after their repulsion, are diverted towards the electron B and dragging along with the lines of force b_3, b_4 etc. of the electron B, they are pushed behind the electron B, as shown in Fig. 2(b). And similarly, the lines of force b_1, b_2 of the electron B, after their repulsion, are diverted towards the electron A and dragging along with the lines of force a_3, a_4 etc. of the electron A, they are pushed behind the electron A. Finally the lines of force a_1, a_2 of electron A and b_1, b_2 of electrons B acquire the form, as shown in Fig. 2(b), and around point P, a neutral region (the region free from the effects of magnetic fields of electrons A and B) is created. In the process of getting pushed behind of the lines of force a_1, a_2 and b_1, b_2, since they are expanded, in order to obtain their original form (shape) as they had before their interaction, they apply some pushing force on magnetic lines of force b_3, b_4 and a_3, a_4 respectively, which in turn apply pushing force on electrons B and A respectively. All these happen because, according to properties of magnetic lines of force, they are just like flexible strings and experience the longitudinal tension in their length, hence possess tendency to acquire their original form. In order to verify its truth,

we can see Fig. 3, where the lines of force 3,4,5 and 6,7,8 of earth's magnetic field acquire their original positions and forms after coming out from the north pole of a bar magnet placed in magnetic meridian of earth's magnetic field. Consequently, a force of attraction $\boldsymbol{F}$ is generated between electrons A and B (for detail knowledge about force $\boldsymbol{F}$, see Sec. 5.1).

4.2 Explanation of how the force of repulsion is generated

Let us consider two electrons A and B lying in the same vertical plane (plane of the paper) when the directions of their v are parallel to each other but opposite in directions, Fig. 4(a).

If the distance *d* between their centers happens to be < 2r, their lines of force start interacting, Fig 4(b). Let the distance *d* between their centers be such that the two outermost lines of force a_1 and a_2 of electron A interact with the two outermost lines of force b_1 and b_2 of electron B, Fig 4(b). In this situation, in the region of interaction between their magnetic fields (i.e. in region between the electrons A and B), their lines of force a_1, a_2 and b_1, b_2 are not repelled by each other but are dragged along with the lines of force of each other, as shown in Fig. 4(b). [Because in this case, when their lines of force come close to each other, they are found moving along the same direction, not in opposite directions, as occurs in previous case, Fig. 2(b).] Hence, when their lines of force are dragged along with the lines of force of each other (i.e. a_1, a_2 of electron A are dragged along with b_1, b_2 of electron B) and try to pass through the space in between the lines of force a_3 and b_3 of the magnetic fields of electrons A and B respectively, as the space has become narrow, the lines of force a_1, a_2 and b_1, b_2 cannot pass through this space maintaining their original shapes, the lines of force a_1, a_2 apply some pushing force on the lines of force a_3, a_4 etc., which in turn apply pushing force on electron A

towards our left; and the lines of force b_1, b_2 apply some pushing force on lines of force b_3, b_4 etc., which in turn apply pushing force on electron B towards our right. And consequently, a force of repulsion ***F*** is generated between electrons A and B (for detail knowledge about force ***F***, see Sec. 5.2). But, since the directions of v of electrons A and B are in opposite directions, they come in position as shown in Fig. 4(b) just for a moment. And they receive a sudden kick type of repulsive force from each other.

5. EXPLANATION OF HOW THE FORCE GENERATED DUE TO INTERACTION BETWEEN MAGNETIC FIELDS OF TWO ELECTRONS VARIES AS THE DISTANCE BETWEEN THEM VARIES

5.1 When the electrons are in position as shown in Fig. 2(b)

The force caused due to interaction between magnetic fields of electrons A and B when they are in position as shown in Fig. 2(b), varies as

$$F \propto d^{-q} \quad \text{……..} \qquad (2)$$

where d is the distance between their centers, $q = a\,d^{b}$, and *a* and *b* are constants which depend upon their velocities and charges (if suppose A is electron and B is proton) etc.

Why and how do the constants *a* and *b* depend upon the velocities of electrons A and B and their charges (if A is electron and B is proton), are as follows:

The velocity v and the frequency of spin motion ω of electron vary according to expression $m\,\mathrm{v}^2 = h\,\omega$ [see Eqn. (1)], and hence when v of electrons A and B vary, their ω also vary accordingly. When ω of electrons A and B increase, the strengths of their magnetic fields and hence the strength of pushing force by the lines of force of electron A on the electron B, and similarly the strength of pushing force by the lines of force of electron B on the electron A, Fig. 2(b), increase. This increase in force is accounted in expression (2) by variation in constants *a* and *b*.

For verification of the truth of increase in the strength of magnetic fields of electrons A and B due to increase in their velocity (v), we can take the example of increase in the strength of magnetic field around the current carrying rod when the current through the rod is increased. The increase in current through the rod means the increase in velocity of electrons through the rod.

In expression (2), the force F is actually the resultant of two forces F_1 (attractive force caused due to interaction between the magnetisms of electrons A and B) and F_2 (repulsive force caused due to interaction between the charges of electrons A and B), i.e. $\boldsymbol{F = F_1 - F_2}$, because electrons possess both electric and magnetic fields, and hence F should be generated as the consequence of interaction between their both electric and magnetic fields. As d decreases, both F_1 and F_2 increase but such that F, after attaining a maximum value at $d = D$ (where $d = e^{-1/b}\ and > d'$), it starts decreasing as d decreases because at $d = D$, $(dF/dd) = 0$ and $(d^2F/dd^2) = -\text{ve}$.

When the two interacting particles in position, as shown in Fig. 2(b), are of opposite charges, e.g. A is electron and B is proton, the interacting force F between them becomes as $\boldsymbol{F = F_1 + F_2}$. This variation in force F is accounted in expression (2) by variation in constants *a* and *b*.

5.1.1 Evidences to confirm the truth of the above equation (2)

There is no mathematical proof to confirm the truth of equation (2). It has been speculated. But there are numerous evidences from the well established existing knowledge to confirm its truth. For example, the electron, proton, α particle beams are obtained due to component F_1 of force F but, due to component F_2, the above beams do not persist for long time. (Behind non-persistence of electron, proton etc. beams, there are several more reasons, e.g. no uniform velocity of all the electrons, protons etc. in their

beams. But the component F_2 plays the important role.) For more evidences, see Sects. 4, Ref. 3.

5.2 When the electrons are in position as shown in Fig. 4(b)

The force caused due to interaction between electrons A and B when they are in position as shown in Fig. 4(b), varies probably as

$$F \propto \exp(-a\,d^{b}) \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \qquad (3)$$

because, in this position, the forces F_1 and F_2 both are happened to be repulsive.

5.2.1 Evidence to confirm the truth of the above force (i.e. of eqn. 3)

To confirm the truth of the above expression (3) too, there is no mathematical proof. It has just been speculated.

6. CONCLUSION

As we observe from Figs. 2(b) and 4(b):

1. Since the force is generated when the interacting particles are very close to each other, the generated force should be short range.

2. Since the force is generated due to interaction between magnetic fields of the interacting particles, the generated force should be charge independent. If the interacting particles possess charge, the generated force depends upon their charge too.

3. Since the generated force happens to be stronger than the repulsive Coulomb force, the generated force should be strong.

The above characteristics are exactly the same as we speculate for nuclear force to have.

7. DEDUCTION OF AN EXPRESSION FOR POTENTIAL BETWEEN NUCLEONS, ITS PECULIAR NATURE AND IMPORTANCE

As we see from expression (2), in it, since the term d^{-q}, where $q = a\,d^{b}$ (see Sec. 6.1), is very complicated; it is very-very difficult to deduce an expression for potential

between nucleons analytically. But it can be estimated approximately or roughly as follows:

$$V \propto d\, d^{-q} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

If we plot a graph between V and d, we find the potential to be of super soft core nature, different from the natures of Yukawa and Gaussian potentials, which are respectively of hard and soft core nature.

As the force, i.e. expression (2) succeeds to give very clear and complete understanding about the structures, properties etc. of deuterons, alpha particles and nuclei (see Sects. 4, 5, 6, 7, 8, Ref. 3), the potential, i.e. expression (4) too should succeed to explain the phenomena of scattering etc. equally well.

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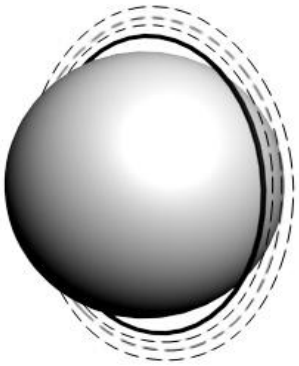
FIGURE CAPTIONS

Fig. 1: (a) Spherical ball, dark solid line circle and concentric broken line circles respectively represent the charge, magnetism and magnetic field of electron. (b) Transverse cross sectional view of electron, where, in order to introduce arrow marks with the ball of charge to show the direction of its spin motion, the ball of charge has been shown by a dark thick solid line circle in place of a dark disc.

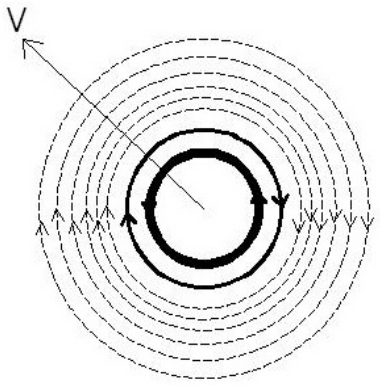
Fig. 2: (a) Transverse cross sectional view of two electrons A and B at the instant when they are in the same vertical plane and at distance *d* apart while moving parallel to each other with same velocity v. (b) Transverse cross sectional view of interaction between their magnetic fields when the distance *d* between them is reduced to < 2r.

Fig. 3: Longitudinal cross sectional view of interaction between the earth's magnetic field and the magnetic field around a bar magnet, placed in magnetic meridian.

Fig. 4: (a) Transverse cross sectional view of two electrons A and B at the instant when they are in the same vertical plane and at distance *d* apart while moving parallel to each other with same velocity v but opposite in directions. (b) Transverse cross sectional view of interaction between their magnetic fields when the distance d between them is reduced to < 2r.

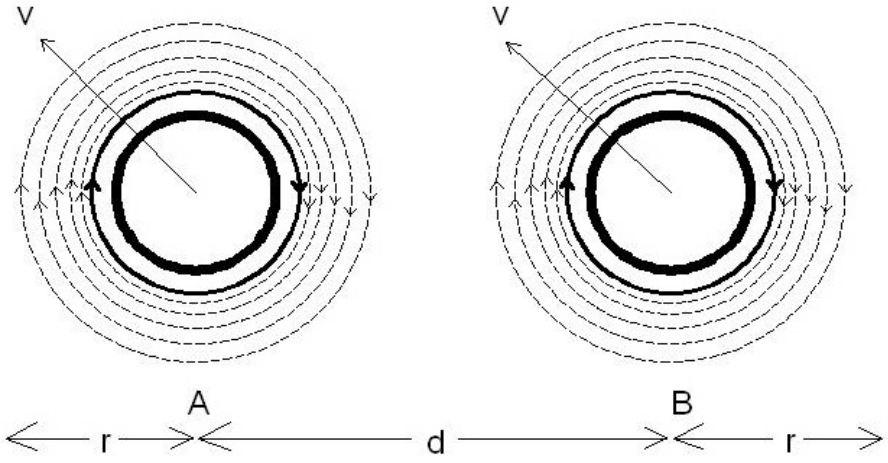


(a)

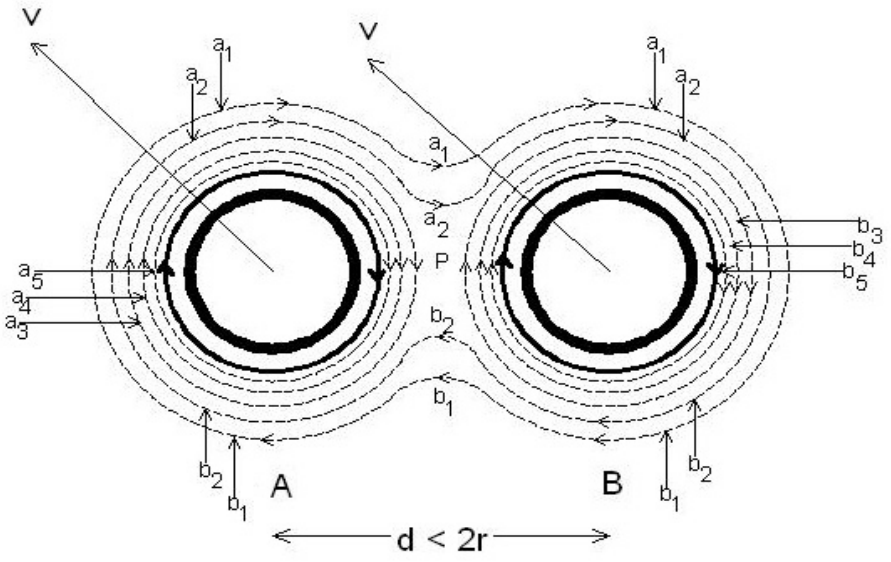


(b)

Fig. 1



(a)



(b)

Fig. 2

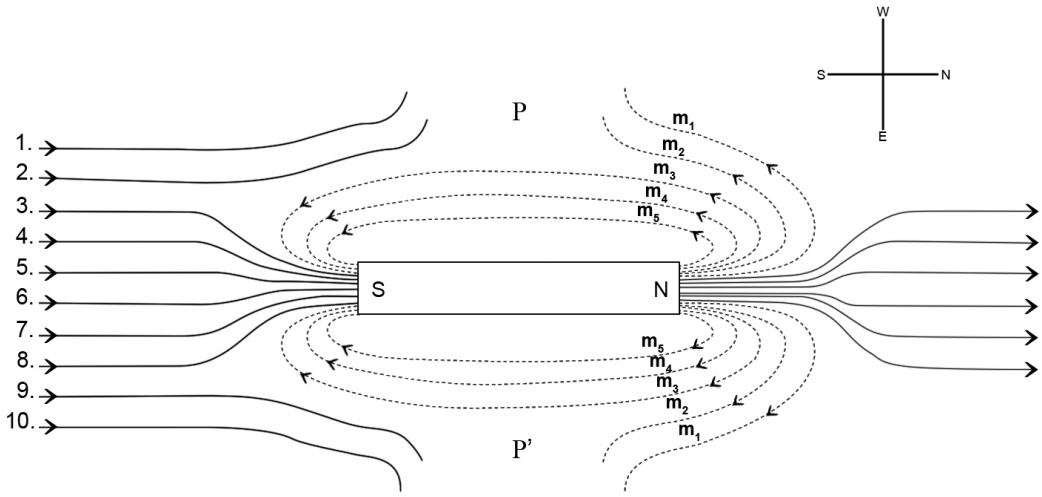
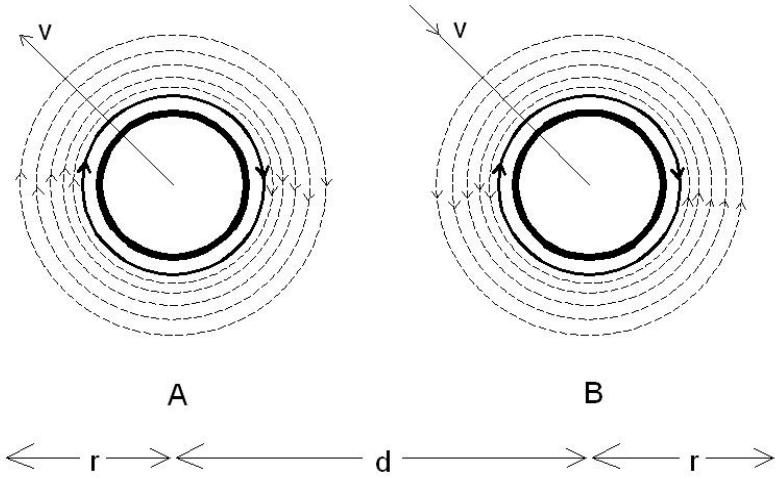
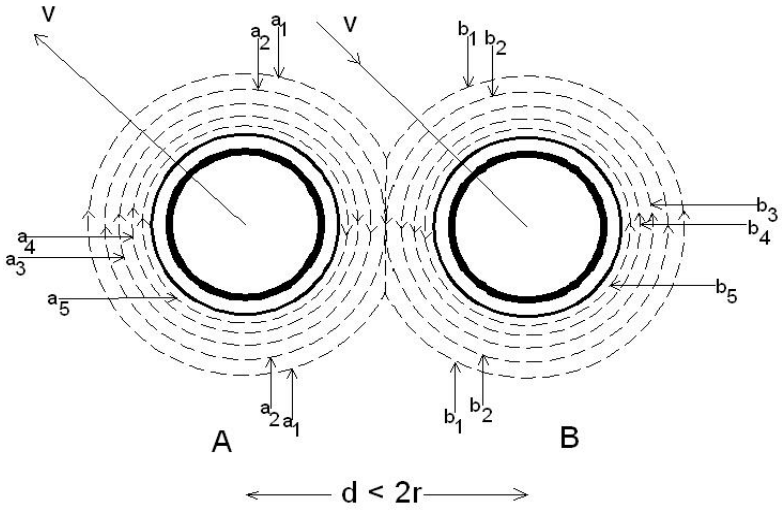


Fig. 3



(a)



(b)

Fig. 4