

FORM 2

(39 OF 1970)

AND

The patent rules, 2003

COMPLETE SPECIFICATION

(See section 10: rule 13)

1. TITLE OF INVENTION

BODY MOVEMENT ELECTRICITY GENERATING/CHARGING APPARATUS

2 APPLICANTS

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3. PREAMBLE TO THE DESCRIPTION

COMPLETE

Following specification particularly describes the invention and the manner in which it is to be performed.

4. DESCRIPTION.

Technical field of invention:

This invention generally relates to a linear electricity generator, motor means actuator, brake and particularly relates to body movement electricity generator and more specifically human being chest movement electricity generator and charger.

Use:

As a result of recent advances in the fields of permanent magnets especially rare earth permanent magnets which can be formed in different shapes, it is now possible to design light weight generators which can be placed on human body at suitable places without inconvenience and can charge rechargeable batteries for cell phones and other appliances like cardiac pace maker and many other medical utilities where continuous electrical power source is desirable. Further the novel electrical machine so described hereinafter can be used as a generator, motor, actuator, shock absorbers, brakes in conjunction with linear and reciprocating motion in many industrial applications such as air, liquid flow control valves requiring electrical actuators, electrical regenerative shock absorbers to smoothen unwanted vibration.

One such body charger in U.S. pat. No. 3,943,963 discloses a self powered pacemaker device energized by nucleonic battery however, it has to be implanted within the body.

Another such device in U. S, pat. No. 4,245,640 discloses electrical power generation from human being chest motion where electricity is generated from the relative distance between a permanent magnet and an electrical induction coil mounted on a ferromagnetic material. The principle is to change the flux in the ferromagnetic material on the principle $e = -n \cdot d\phi / dt$ where rate of change of flux in the magnetic circuit generates electricity however, devices based on this principle suffers from certain disadvantages due to inherent attraction between the permanent magnet and

the ferromagnetic material of the induction coil rendering snappy non-linear motion and electromagnetic and acoustic noise during the reciprocating operation and may cause discomfort to the user. Further such device should be magnetically shielded to avoid the sticking of magnetic material/objects appearing in the vicinity of the user due to magnetic attraction.

Hence there was a long felt need in the art to have such an apparatus means device, having dispensed with above mentioned disadvantages and when installed on human body would provide continuous electrical energy for various appliances and further for other industrial applications involving linear motions.

Object:

1. Primary object of the present invention is to device a novel electrical apparatus, working in conjunction with linear/reciprocating motion.
2. Another object of the present invention is to generate electrical power from human being body movements particularly from chest movements.
3. Another object of the present invention is to provide a smooth working electrical generator without electromagnetic and mechanical acoustic noise.
4. Still another object of the present invention is to provide magnetically shielded apparatus means device.
5. Still further object of the present invention is to provide linear electric machine with all its functions like rotary electric machine.

6. Still further object of the invention is to provide a homo-polar magnetic circuit to simplify electrical circuit to optimize material, process time and cost in its manufacturing.
7. Still another object of the present invention is to provide enough energy to charge a rechargeable battery during 24 hrs means every day when the breathing rate more than 10 per minute and expansion of the chest more than 3 cm.

Other objects, features and advantages will become apparent from detail description and appended claims to those skilled in art.

STATEMENT:

Accordingly following invention providing a novel linear electric machine working in conjunction with linear and/or reciprocating motion using homo-polar magnetic circuit wherein a single magnet means homo-pole or plurality of magnet poles means hetero poles so arrange with alternate magnetic polarities and when force applied to interact means cut electric conductors to produce electricity or a develops a mechanical force when current passing through the electric conductors interacting with flux based on well known law i.e. $E = B * L * V$ where, E is electromotive force (EMF) means voltage, B is flux density, L is length of conductor(s), and V is the relative velocity perpendicular to conductor L and B and similarly $F = B * L * I$ where, F is mechanical force, I is electric current; whereas hetero pole electrical machine the electrical winding is always associated with winding overhang; and the said overhang winding provides only a return path to current and hence passive and therefore increases the length of the machine unduly; whereas in homo-polar construction entire length of conductor(s) is associated in generation of EMF thus making it cost

effective and furthermore the magnetic circuit in the present invention being closed hence much higher flux density in the air-gap achieved making the machine much lighter in weight and renders it magnetically shielded; and the said apparatus described having single or plurality of permanent magnets (PM) mounted on a suitable straight ferromagnetic core for providing return path for magnetic flux and the said magnetic lines of flux from PM are radial and passes through the ferromagnetic yoke provided on the outer side of the said PM at certain distance thus forming an air-gap means mechanical clearance between the PM and said yoke, a continuous electrical conductor in a form of winding is placed in the said air-gaps such that it is free to move axially within the said air-gap and plurality of such mechanically bound electrical windings are mounted axially with plurality of conductors in the form of a coil having suitable winding and number of such windings are electrically connected and being generally equal to the number of plurality of PM so mounted on the said core such that when the plurality of electrical coil move axially within the air-gap, they cut the radially oriented flux and generates electricity wherein the electrical polarity of voltage depends on the direction of motion of the windings with respect to PM and in an embodiment a restoring spring is provided such so as to store the energy of the reciprocating motion and to restore the plurality of said coils to its original position during relaxation and on either side of the said yoke, core, spring (optional) and windings preferably ferromagnetic end plates means end-shields are provided to enclosed the said embodiments and during the operation of the said apparatus an alternating voltage (A.C.) is generated which when rectified and filtered further connected to a charging circuit of a rechargeable battery.

BRIEF DESCRIPTION OF DRAWING:

This invention is described by way of example with reference to the following drawing where:

Sheet 6/1 Figure 1A, 1B show detailed front elevation and side elevation of the generator assembly with plurality of cylindrical permanent magnets in one extreme position respectively and Figure 1C shows detailed front elevation of plurality of cylindrical permanent magnets when the assembly assumes other extreme position.

Sheet 6/2 Figure 2 shows isometric projection of the exploded view of the assembly with cylindrical permanent magnets (PM).

Sheet 6/3 Figure 3 shows detailed front elevation of generator with single means homopolar cylindrical permanent magnet and Figure 4A, 4B show detailed front elevation and side elevation of the generator assembly with plurality of rectangular permanent magnets.

Sheet 6/4 Figure 5 shows isometric projection of the exploded view of the assembly with rectangular plurality of permanent magnets.

Sheet 6/5 Figure 6A shows elevation of plurality of cylindrical magnets formed from single permanent magnetic material block with orientation of flux lines, Figure 6B shows elevation of plurality of independent cylindrical permanent magnets with orientation of flux lines, Figure 6C shows side elevation of cylindrical permanent magnet with orientation of flux lines. Figure 7A shows elevation of plurality of rectangular magnets formed from single permanent magnetic material block with orientation of flux lines, Figure 7B shows elevation of plurality of independent rectangular permanent magnets with orientation of flux lines, Figure 7C shows side elevation of rectangular permanent magnet with orientation of flux lines, Figure 8 shows the electrical circuit for the charging of batteries.

Sheet 6/6 Figure 9A and 9B show different suitable locations for mounting the said apparatus on human being body.

In order that the manner in which the above-cited and other advantages and objects of the said invention are obtained, a more particular description of the invention briefly described above will be referred, which are illustrated in the appended drawing. Understanding that these drawing depict only typical embodiment of the invention and therefore not to be considered limiting on its scope, the invention will be described with additional specificity and details through the use of the accompanying drawing.

Detailed description:

The present invention provides a novel body movement electrical generator for charging rechargeable batteries. Referring now to the drawings wherein like reference numerical designate identical or corresponding parts throughout the several views. Figure 1A, Figure 1B, Figure 1C, and Figure-2 show the assembly of the said embodiment comprising a cylindrical ferromagnetic core 102 on which cylindrical PM magnets 103, 104 having opposite magnetic polarities are mounted side by side. On a former 105(optional) windings 101 and 102 are wound having opposite directions orientation means one clockwise and other counterclockwise directions and respective electrical terminals 115 and 116 are brought out through insulated guide bars 113 and 104 respectively and the said insulated guide bars 113 and 114 pass through clear holes 117 and 118 of side cap 111 for further connection and the said coils are mounted on the said magnets 103 and 104 having annular clearance or air gap 109, a suitable spring 124 or springs (optional) placed between winding 108 means former 105 and endplate 111 and a cylindrical hollow ferromagnetic yoke 101 encloses the said coils 107, 108 having certain annular clearance means air gap 106 and further encloses spring 124 (optional) including magnets 103, 104, core 102 and endplates 110 and 111 are place at either end of the hollow ferromagnetic yoke 101 wherein the end plates 110, 111 locates core 102 centrally thus coils 107, 108 move to and fro in axial direction freely and against the spring (optional) provided to

restore the coil position when axial force applied and core 102, magnets 103, 104 and yoke 101 and endplate 110, 111 form a closed magnetic circuit and between the annular air gaps 109, 106 when coils 107, 108 move to and fro means from one extreme position means end as shown in figure 1A to another extreme position means end as shown in Figure 1C due to external force, interact in the air gaps 106, 109 with flux due to magnets to generate electromagnetic force means voltage with respective polarities and for assisting the said movement hooks 119 and 120 (optional) attached to endplate 120 and insulated rods 113 and 114 respectively. Figure 3 shows another variation in the said embodiment wherein hetero poles are replaced by a single means homo-pole permanent magnet 153 and a single electric conductor coil 157. Figure 4A, Figure 4B and Figure 5 show another variation in the said embodiment wherein each cylindrical permanent magnet 103 is replaced by pair of rectangular permanent magnet 203A and 203B and similarly for magnet 104 by 204A and 204B respectively and ferromagnetic core in the form of plate 202, rectangular electrical coils 207, 208, rectangular endplates 210, 211, rectangular ferromagnetic yoke 201 and other principally remaining same as described. Figures 6A, 6B and 6C show the permanent magnet embodiment having cylindrical shape wherein Figure 6A shows the formation of N pole 303 and S pole 304 on the same block 330 of permanent magnet material whereas Figure 6B shows to separate N poles 313 and S pole 314 and Figure 6C shows the orientation of flux 335 from the face of a typical cylindrical permanent magnet respectively. Figures 7A, 7B and 7C show the permanent magnet embodiment having rectangular shape wherein Figure 6A shows the formation of N pole 403 and S pole 404 on the same block of permanent magnet material 430 whereas Figure 6B shows separate N poles 413A, 413B and S poles 414A, 414B and further showing replacement of each cylindrical magnet 303 by two equivalents rectangular permanent magnet 413A and 413B. Figure 6C shows the orientation of flux 435 from the face of a typical permanent magnet respectively. Figure 8 (not being part of the embodiments) shows output from

the said generator 515, 516 connected to typical full bridge rectifier circuit with capacitor filter 520 associated with charger regulating circuit block 530 and connected to rechargeable batteries 540.

Figure 8A and Figure 8B show typical locations means places on human body parts 701, 702,703, 704, 705 where relative body movements take place and particularly on the chest near the diaphragm 701 where during respiration cycles there is a continuous involuntary movement due to expansion and contraction during inhaling and exhaling respectively due to diaphragm movement where the said embodiment being worn will generate electricity throughout breathing cycles whenever worn on human body.

It is obvious from the functioning of the said embodiment means apparatus that with certain modifications a reciprocation motion or certain mechanical repetitive motion converted in to reciprocating motion can be transformed in to electricity generation, which further can be utilized in shock absorber or similar appliances for braking or generation or combination of both means for dampening unwanted oscillations or vibrations and furthermore the said embodiment works in a controlled manner hence parameters can be controlled easily to suit the requirement. Similarly when electric power is applied to the conductor, the said embodiment converts electrical power into mechanical power in the form of linear or oscillating motor and which can be utilized as electromechanical actuator for controlling various parts of a control system such fluid flow etc. and electric hammer, press, vibrator wherever linear or oscillating motion in controlled manner is desired.

Additional advantages and modification will readily occur to those skilled in art. Therefore, the invention in its broader aspect is not limited to specific details and representative embodiments shown and described herein. Accordingly various modifications may be made without departing from the spirit or scope of the general invention concept as defined by the appended claims and their equivalents.

CLAIMS

We claim:-

1. Body movement electricity generating/charging apparatus means linear electro-magnetic machine apparatus comprising:

A plural permanent magnet pairs means magnets, in the form of toroid means plurality of rings having thickness or circular discs having radial directed flux on respective outer surfaces, mounted with alternating magnetic polarity means flux generating on ferromagnetic core means return flux path, means core and plurality of electrical conductor in the form of coils, means coils, mounted over the said plurality of permanent magnets and the said coils and said magnets having certain annular air gap in between means to facilitate means for sliding over each other means electromagnetic interaction and a ferromagnetic yoke, means magnetic return path, in form of open means hollow pipe enclosing the said core, said magnets and said coils means mounted and having certain annular air gap in between means to facilitate sliding over each other and end covers means end shields mounted on the open ends of said yoke on either side whilst locating means fixing the said core in position and generally plurality of insulated rods means guiding pins fixed to the said electric coils passing through the suitable holes provided on the said end covers or by conventional ways such that the said rod means guiding pins slide easily through the said holes being provided on the said end covers and for mounting one hook fixed on one of the end covers and second hook fixed to the said insulated rods and spring means plurality of springs mounted between the said coils and said end cover means for restoring one position of said coils with respect to the said magnets and electrical connection means terminals from the said coils brought through the said

insulated rod means outside the said end covers means for further electrical connection and the said loops connected to a belt or harness whilst mounted on the human body over the chest near stomach diaphragm and during human breathing means during inhalation the said diaphragm make the body to expand and activates relative linear motion between said magnets and said electric coils leading electromagnetic interaction thus generating voltage whilst compressing the said spring and whilst during exhalation means during said chest relaxing means said diaphragm relaxation means body contraction means reverse linear motion between said magnet and said coil means electromagnetic interaction between said magnets and said coils to generate voltage however, with opposite polarity thus availing the generated electricity for further application.

2. Body motion linear electro-magnetic machine apparatus according to claim 1 wherein plurality of permanent magnets having rings having thickness or circular disc configuration being replaced by rectangular permanent magnets suitably.
3. Body motion linear electro-magnetic machine apparatus according to claim 1 and claim 2 wherein plurality of permanent magnets replaced by single means homopolar permanent magnet suitably.
4. Body motion linear electro-magnetic machine apparatus according to claim 1 and claim 2 wherein plurality of permanent magnets suitably magnetized from single material block.
5. Body motion linear electro-magnetic machine apparatus according to claim 1, claim 2 and claim 3 wherein the said electric conductor coil means a single

having multi-turn electric insulated conductor wire wound means wrapped over a suitable former to form a suitably shaped said coils and the plurality of said coils ends means leads means connections are suitably means electrically connected means the generated voltage circuits formed being additive and the said electric terminals means electric connections brought out suitably.

6. Body motion linear electro-magnetic machine apparatus according to claim 1, claim 2 and claim 3 wherein the said plurality of electric conductor coils connected to suitable electric source means current develop force to cause linear relative motion of said permanent magnet and electric conductor being linearly proportion to the magnitude of current for actuating external devices or apparatus.
7. Body motion linear electro-magnetic machine apparatus according to claim 1, claim 2 and claim 3 wherein the said plurality of electric conductor coils connected to suitable resistance and subjected to external motion to develop breaking force means resistance means oppose means shock absorbing.
8. Body motion linear electro-magnetic machine apparatus according to claim 1, claim 2 and claim 3 wherein the said core, said permanent magnets, said yoke and said end covers form a closed magnetic circuit thus dispensing with magnetic leakage, fringing and render the said apparatus magnetically sealed means free from influencing external environment magnetically.
9. Body motion linear electro-magnetic machine apparatus according to claim 1, claim 2 and claim 3 wherein the flux orientation of the said permanent being radial to the surface thus interacting with the whole length of conductor all through thus rendering the electromagnetic interaction efficiently and thus

dispensing with the so called winding overhang known to be wasteful and thus rendering the present apparatus light in weight and cost effective as compared to conventional electric machine.

10. Body motion linear electro-magnetic machine apparatus according to claim 1, claim 2 and claim 3 the said spring means plurality of springs, the said end hooks be dispensed with.

ABSTRACT

The present invention provides a novel electric machine which can be used to operate and/or charge body worn equipment where other perennial electric source is not available. Breathing activity is perennial in living vertebrates thus the said machine can generate electrical energy to charge rechargeable batteries to be utilized especially for operating mobile/cell phone or any other low power consuming equipments. The outstanding feature of the said machine is low weight, cost effective, easy to manufacture, magnetically shielded and based on linear and/or reciprocating motion. Due to its innovative concept and construction, the said machine can be utilized as controllable electro-mechanical actuators, as precision position controllers, as regenerative shock absorbers in various applications especially in two-wheelers and four wheelers, electro-mechanical vibrators etc.

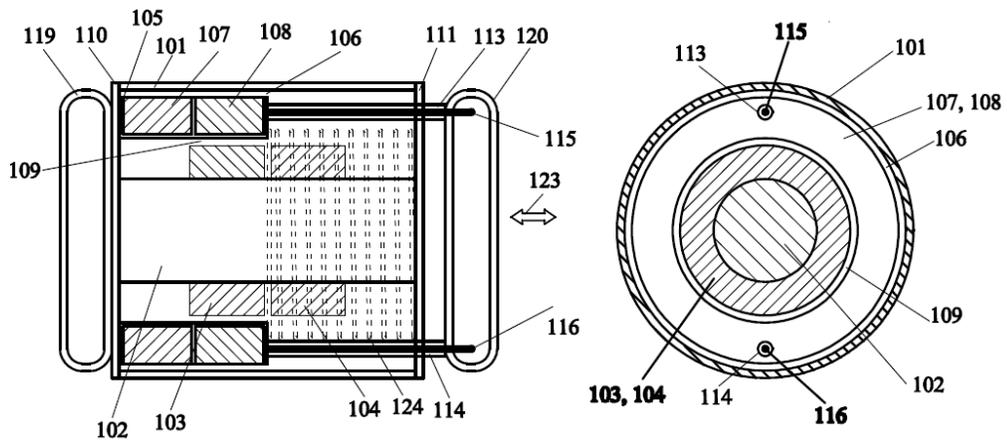


FIGURE-1A

FIGURE-1B

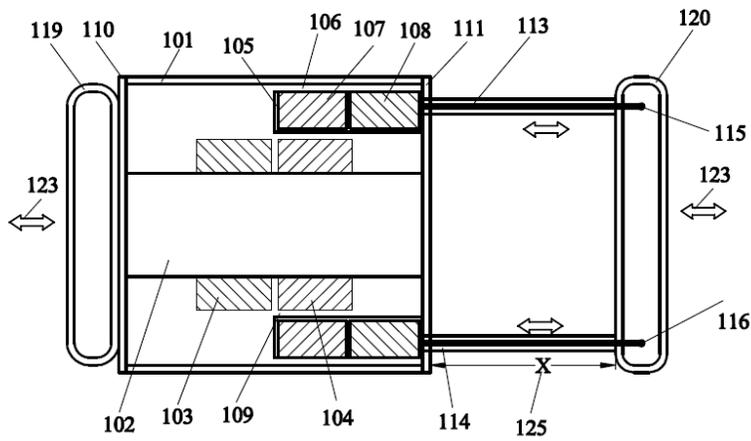
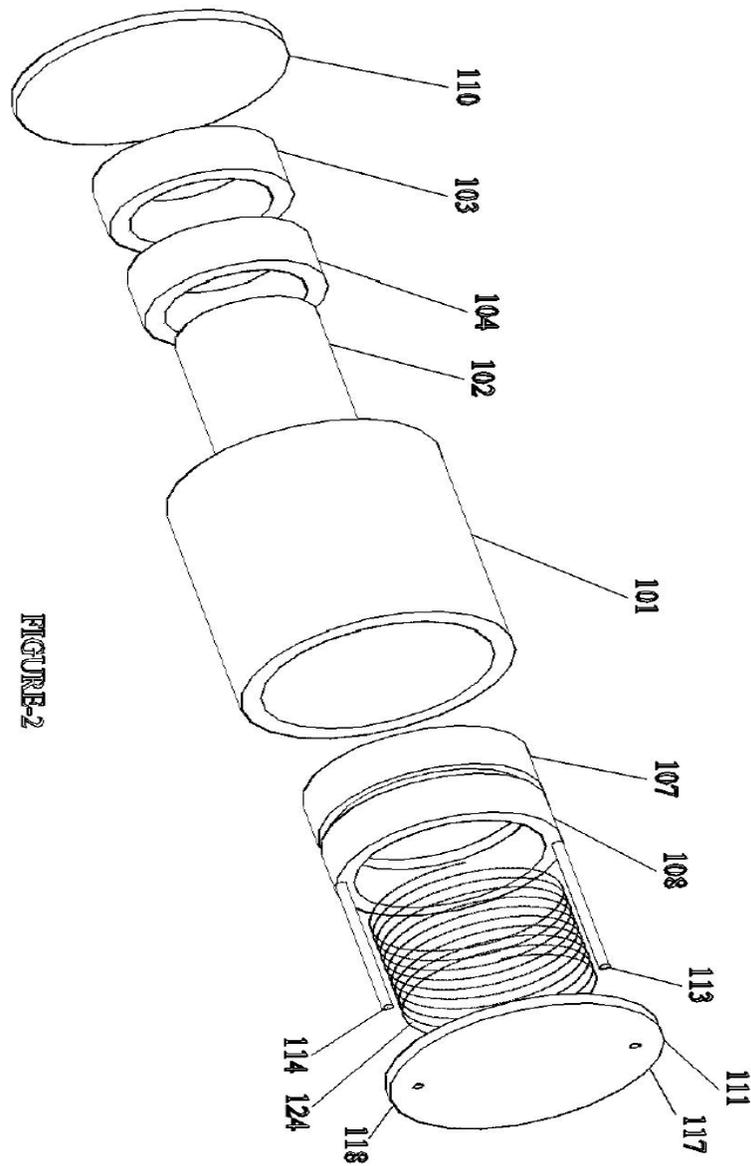


FIGURE-1C



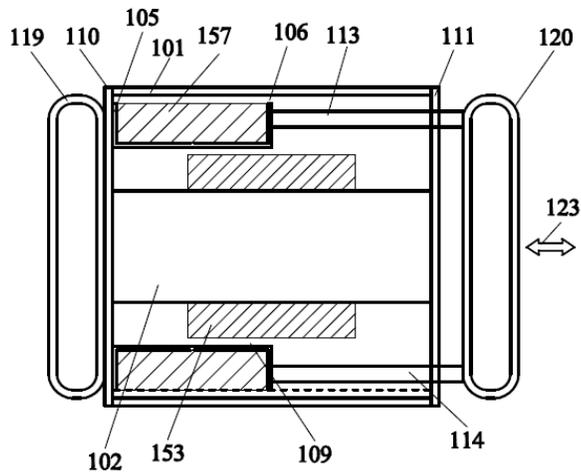


FIGURE-3

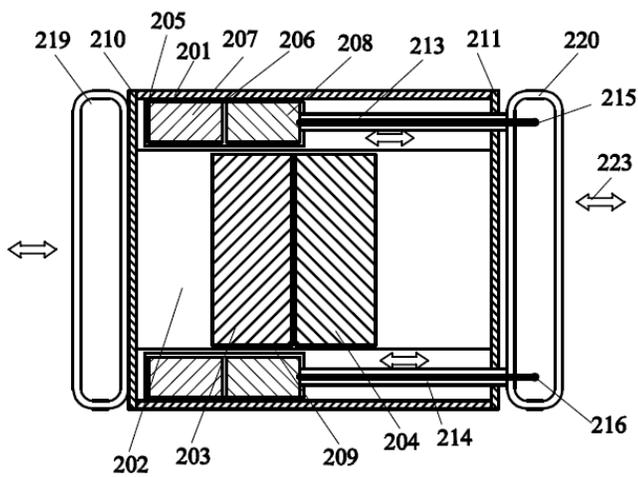


FIGURE-4A

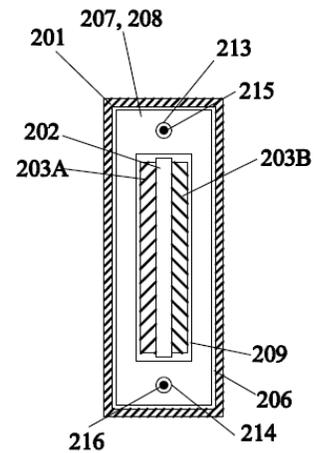


FIGURE-4B

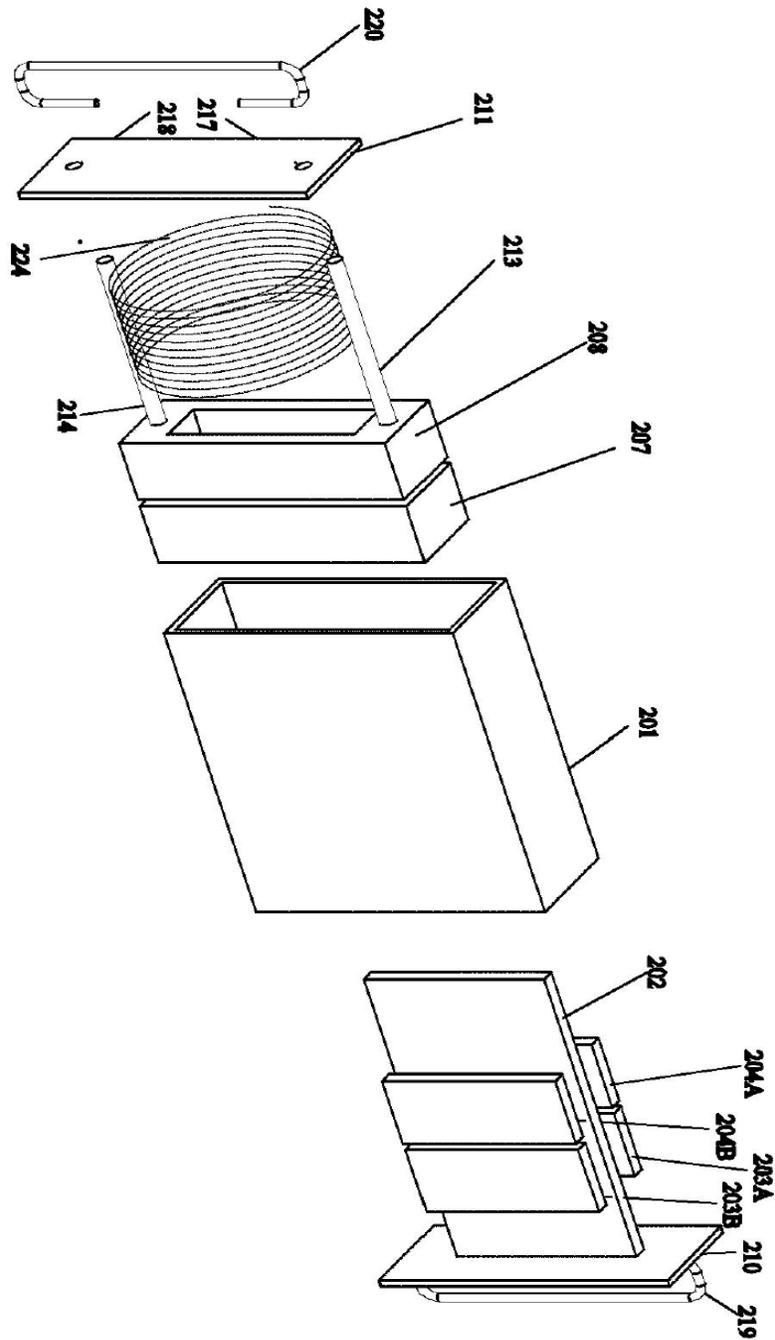


FIGURE-5

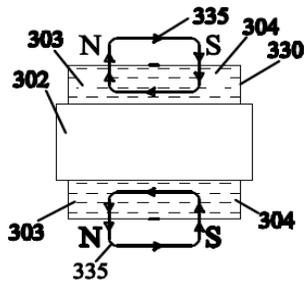


FIGURE- 6A

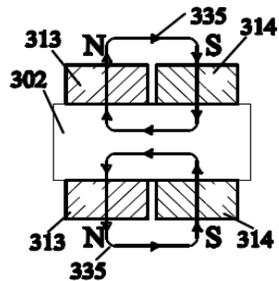


FIGURE- 6B

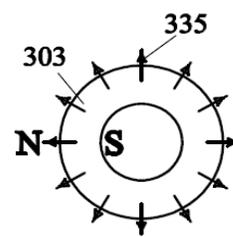


FIGURE- 6C

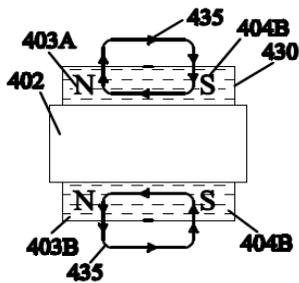


FIGURE- 7A

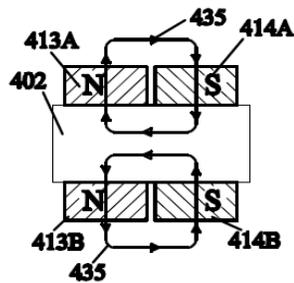


FIGURE- 7B

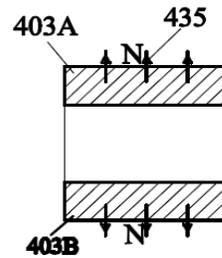


FIGURE- 7C

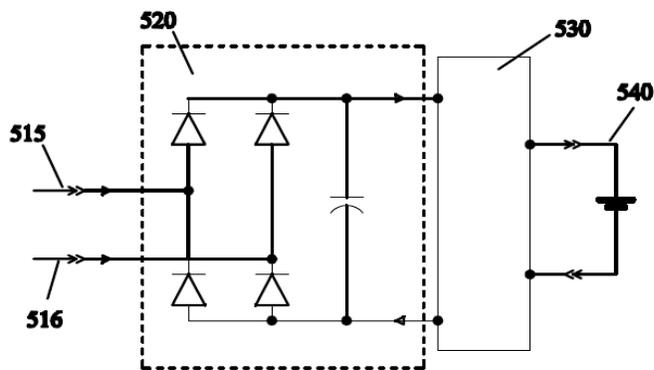


FIGURE- 8

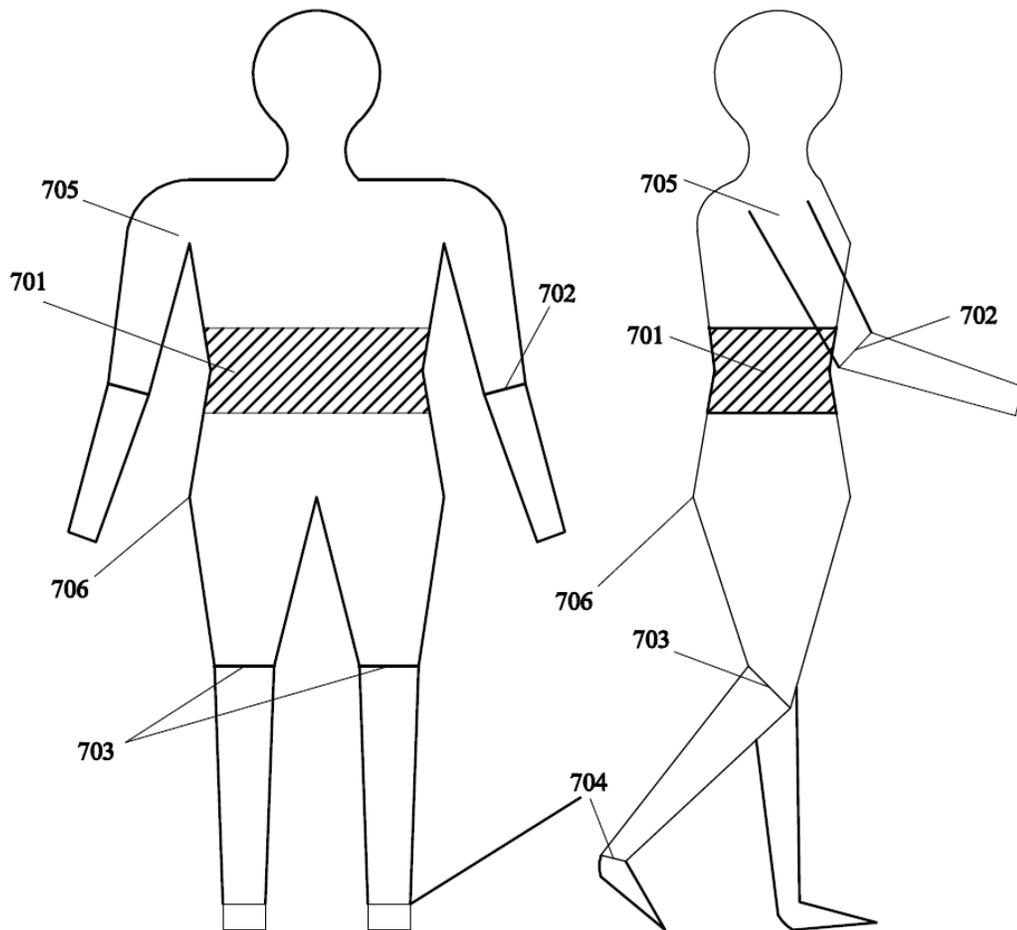


FIGURE-9A

FIGURE-9B