cyclic connection of the capacitors in parallel and series the energy is transferred from the battery to the capacitors and from the capacitors to the battery, thus considerably extending the range of the battery and operation of the motor.

OBJECT OF THE INVENTION

This invention relates to a method and device enabling the electrical energy with which a charge is supplied to be recovered using a self-rechargeable electricity source in which, which by means of a circuit, the current circulating from an accumulator or battery through a load, e.g. a motor, is fully returned to the same energy level, thereby considerably extending its range.

More specifically, two capacitors that are connected cyclically from parallel to serial and vice versa are charged through a motor during the connections in parallel, whilst in series connection, when its voltage doubles, they return the electricity, recharging the battery. This source represents a closed system which does not require an energy supply from the outside, except to compensate for the losses produced, the range of the battery being limited by the number of charges and discharges that the same technically permits.

BACKGROUND TO THE INVENTION

A load, such as an electric motor, is connected to a battery or accumulator with a certain charge, which will be progressively discharged by it, this discharge being directly proportional to the connection time and to the current circulating through the motor. It is therefore necessary to supply fresh energy from an external source to recharge it. Systems that enable the energy consumed by the load to be reused are not known in the state of the art.

DESCRIPTION OF THE INVENTION

A first aspect of the invention relates to a method for supplying a load with recovery of electrical energy, which comprises supplying a load with electrical energy deriving from the first electrical energy accumulator, and returning at least a proportion of that electrical energy after it passes through the load to the first accumulator for the purpose of recovering the energy supplied.

The electrical energy, after passing through the load, is recovered by second electrical energy accumulator, from where it is transferred to the first accumulator, giving rise to cyclic transfer of electrical energy between the first and second energy accumulators.

The recovery of energy from the second accumulator and transfer to the first accumulator may be achieved without passing the energy through the load. In another alternative implementation, the energy is recovered from the second accumulator and passed to the first accumulator through the load, in which case the polarity of the load is reversed during the recovery of energy through the load.

The transfer of energy is brought about by cyclically connecting two or more electrical energy accumulators between parallel and serial connections.

A second aspect of the invention relates to a device for supplying a load with recovery of electrical energy, which comprises a first electrical energy accumulator and a second electrical energy accumulator, where the load is connected between the first and second accumulators. The device may be provided in one embodiment with a unidirectional connection device, for example, a diode which is connected in parallel to the load, causing circulation of the electrical energy recovered after passing through the load, and via which the electrical energy is returned to the first accumulator.

The first electrical energy accumulator may be a battery. The second electrical energy accumulator might be two or more capacitors with switching to cyclically connect them between parallel and serial connection configurations.

The invention constitutes a self-rechargeable source of electrical energy which enables the range of a battery to be considerably extended so that the current circulating from the same through a motor charges two capacitors connected in parallel, up to the voltage level of the battery, by means of contacts. These capacitors, once charged, are connected in series, producing double their voltage, and they then return the energy to the battery, thereby extending its range. Once the losses have been compensated for, the duration of the extended range depends on the charging and discharging properties of the capacitors.

The existence of the difference in voltage between the battery and the capacitors connected both in parallel and in series, and which give rise to the displacement of energy from the battery to the capacitors and vice versa, is used to supply the motor connected between the battery and the capacitors, comprising the self-rechargeable source of electrical energy.

When connected in parallel, the capacitors are charged through a motor and a diode, and when connected in series, they are charged through another diode, the voltage of the motor being half that of the battery. On the other hand, if the motor is connected between the battery and the serially-connected capacitors, the latter, which are charged in parallel through a diode and are discharged by means of the motor and the other diode, will supply the motor with a voltage equal to that of the battery, whilst a capacitor connected in series to the winding of the motor guarantees its operation without loss of power.

Instead of the two capacitors, two batteries connected in series and another two connected in parallel may be used, between which batteries a motor is connected, the current circulating in this case from the batteries connected in series through the motor to the batteries connected in parallel. The serially-connected batteries are then connected in parallel, by means of switching contacts, and the other two parallel-connected batteries are then connected in series, reversing the direction of the current, whilst the connections of the motor are inverted by means of the simultaneous switching of other contacts in order to maintain the polarity and direction of rotation of the motor.

In one possible embodiment of the invention, another two capacitors and a transformer with two primary windings, or a motor with two windings are added to the device previously described, each pair of capacitors cyclically switching from parallel to serial connection and vice versa so that during the parallel connection cycles, two of the capacitors are charged through one of the windings up to the voltage level of the battery at the same time that the other two capacitors are connected in series, double their voltage and are discharged by means of a second winding to the battery.

The reduced level of energy losses brought about mainly by the dissipation of heat and in the capacitors, as well as by the charge factor of the batteries, is compensated for from an external source, and because the sum of the current circulating through a winding of the motor or transformer charging two of the capacitors and the current simultaneously circulating from the other two capacitors through the second winding, recharging the battery, plus the current which is supplied from the external source, is equal to zero, because of the work carried out by the motor or the loads which are connected to the alternating voltage induced in the secondary of the transformer, no discharge of the battery takes place.

DESCRIPTION OF THE DRAWINGS

In order to supplement the description now being given, and with the aim of contributing to a better understanding of the characteristics of the invention, according to a preferred practical embodiment, a set of drawings is attached as an integral part of this description, in which, for informative and non-restrictive purposes, the following is shown:

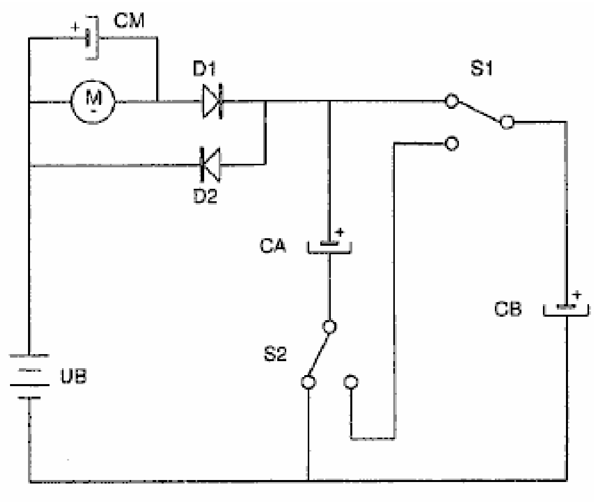


FIG.1

Fig.1 shows a practical circuit in which, by means of switching, two capacitors connected in parallel are charged from a battery through a motor and a diode, and after the contacts are switched, they are connected in series, thereby discharging the battery through another diode.

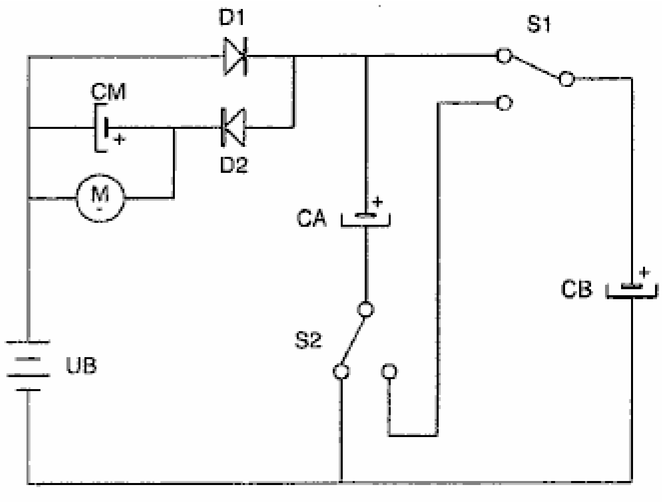


FIG.2

Fig.2 shows a practical circuit in which, through switching, the two capacitors are connected in parallel and are charged from a battery through a diode, and after the switching of the contacts they are connected in series, thereby charging the battery through the motor and the other diode.

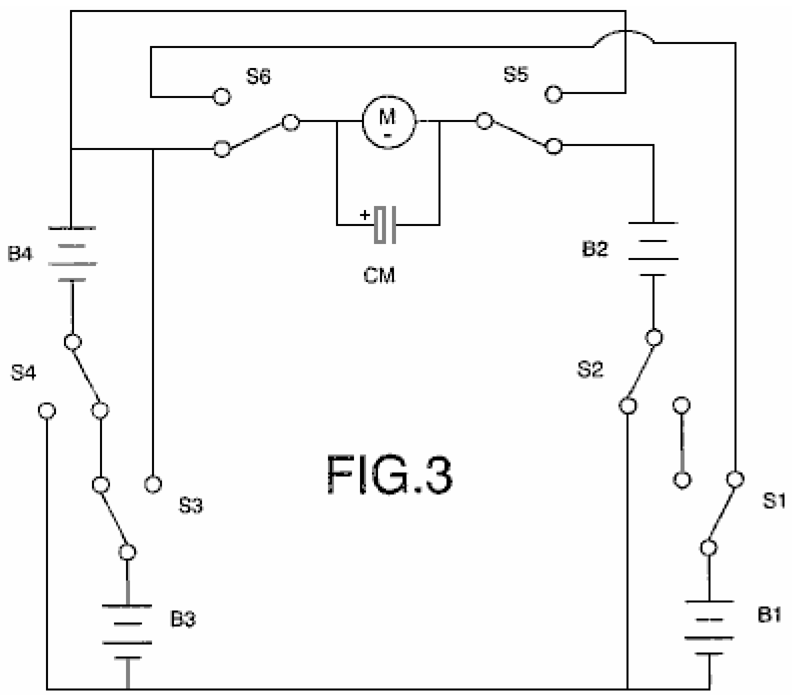


FIG.3

Fig.3 shows the connection of the two batteries in series, connected through a motor to another two batteries connected in parallel, and which, by means of contacts, switch alternatively, this giving rise to effects similar to those described in relation to the use of the capacitors.

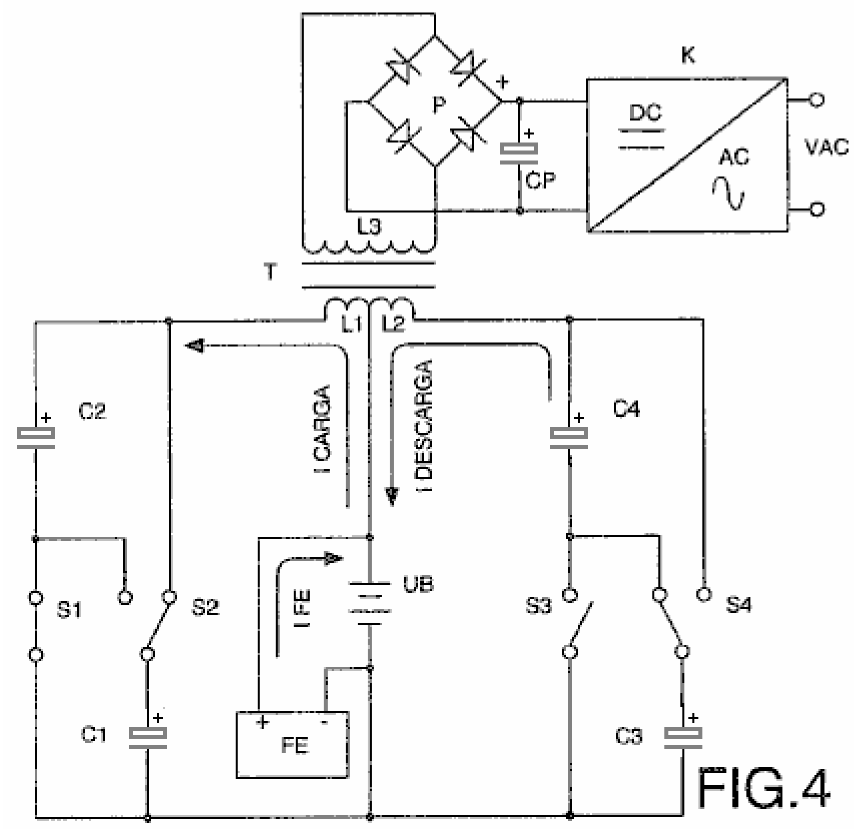


FIG.4

Fig.4 shows the electrical diagram corresponding to the connection between the battery and the two pairs of capacitors of a transformer with two primary and one secondary winding, in which an alternating voltage is induced which is rectified, filtered and converted to a sinusoidal voltage.

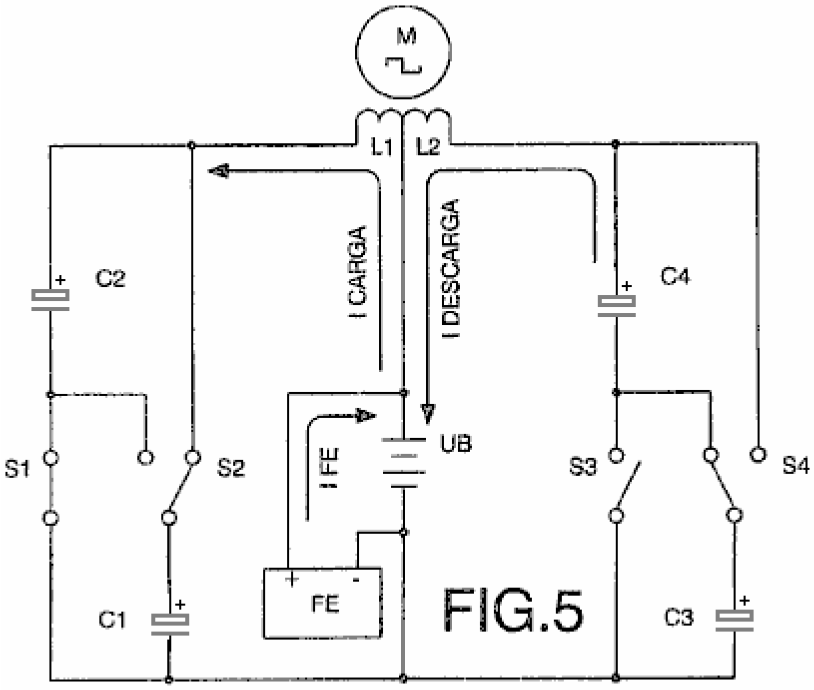


FIG.5

Fig.5 shows the electrical diagram of an alternating current motor with two windings connected between the battery and two pairs of capacitors.

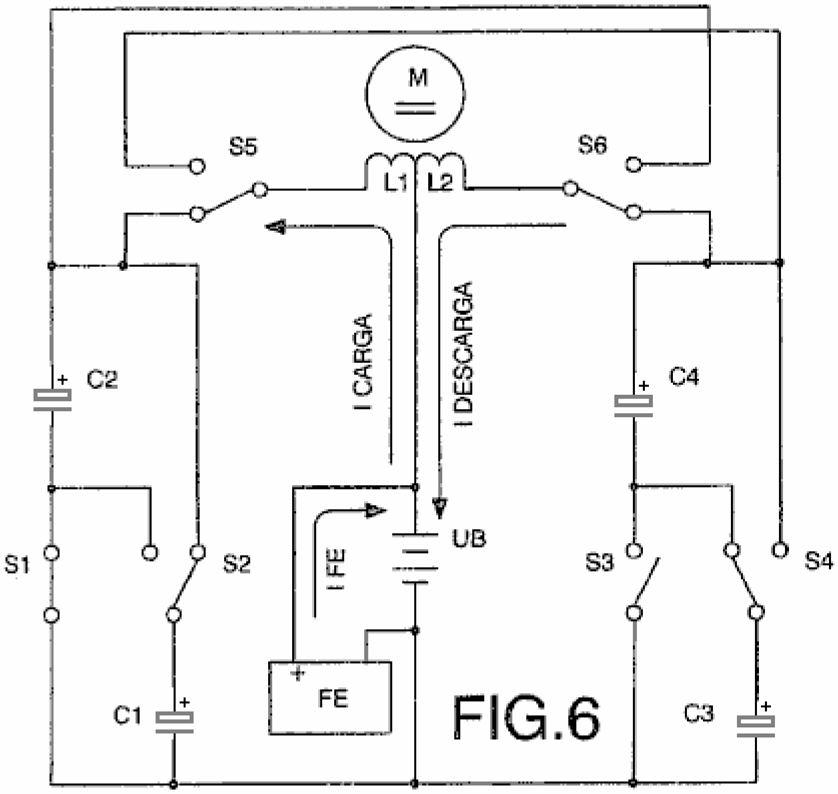
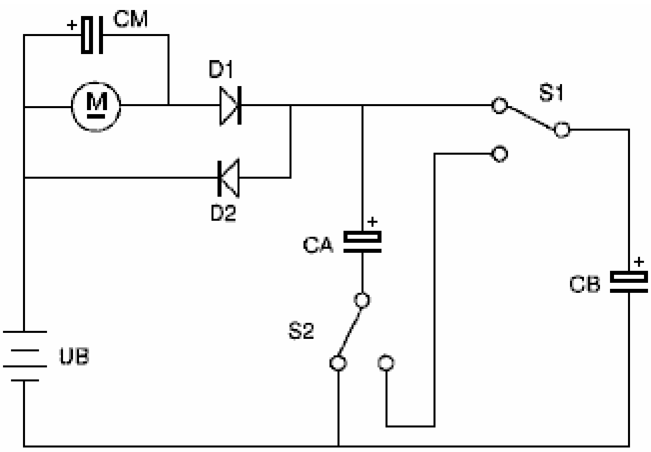


FIG.6

Fig.6 shows the electrical diagram of a direct current motor with two windings connected between the battery and two pairs of capacitors, in which two switch contacts ensure their correct polarisation and direction of rotation.

PREFERRED EMBODIMENT OF THE INVENTION

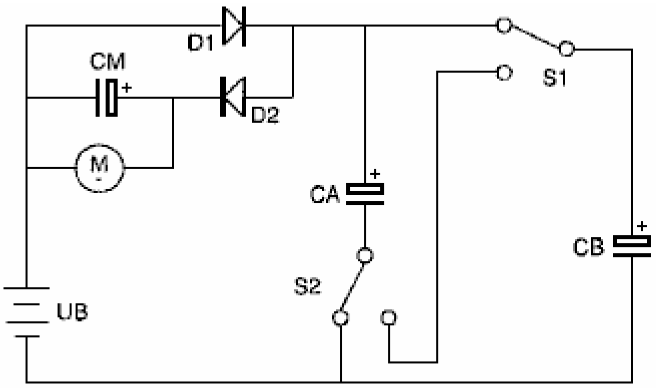
In a preferred embodiment shown in **Fig.1**, the load consists of a direct current motor **M**, the battery **UB**, and the second accumulator which consists of a pair of capacitors **CA** and **CB**. The capacitors **CA** and **CB** are connected to each other in parallel by means of two switches **S1** and **S2**. These capacitors are charged through the motor **M** and diode **D1** to a voltage level equal to that of the battery **UB**, the charge being Q = (CA+CB)UB, and while these capacitors are being charged, the motor **M** is rotating.



When both capacitors are fully charged, they are connected in series by the switch contacts **S1** and **S2**. This produces a voltage which is twice the value of the voltage of the battery **UB**, resulting in the charge which is given by Q = 2 x UB x (CA+CB) / 2 which is Q = (CA+CB)UB, which shows that once charged, the charge Q of both capacitors is identical both in parallel and in series.

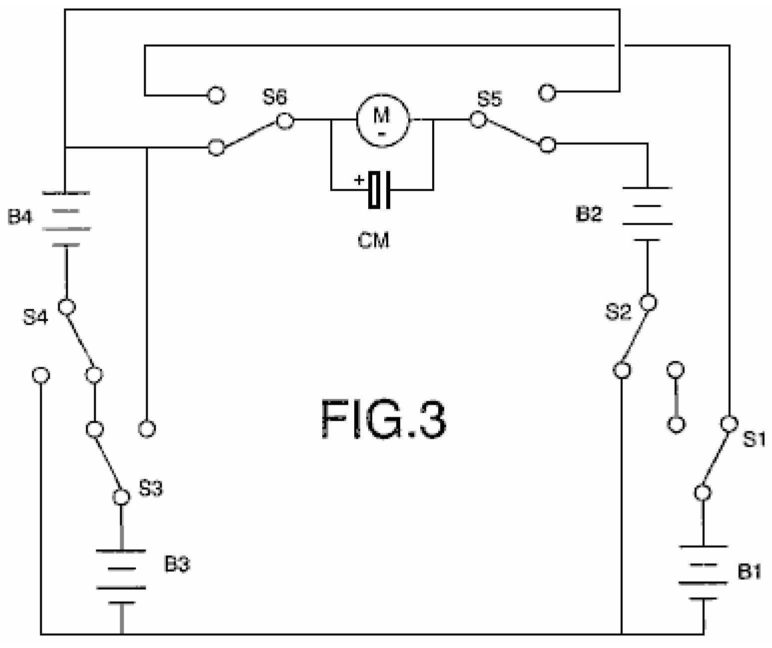
Diodes **D1** and **D2** ensure that current flow through the motor **M** is only ever in one direction. Immediately after capacitors **CA** and **CB** are connected in series, they return half of their charge through diode **D2**. Switches **S1** and **S2** then connect the capacitors **CA** and **CB** in parallel. In this arrangement, they start off with half of the battery voltage. They charge immediately, regaining the battery voltage through the motor **M** and the diode **D1**.

By means of repeated cyclic switching of the capacitors **CA** and **CB** from parallel to serial connection mode, the current circulating from the battery **UB** through the motor **M** to the capacitors, and from these to the battery, recharging it and extending its range, constitutes a self-rechargeable source of electrical energy.



In a second practical embodiment shown in **Fig.2**, the motor **M** is connected between the battery **UB** and the capacitors **CA** and **CB** by means of the diode **D2**. The capacitors are charged directly through the diode **D1** and are discharged through the motor **M** and the diode **D2**, the values of the charges on the capacitors **CA** and **CB** previously described in the example shown in **Fig.1** remain unchanged, the difference in this circuit is that the voltage applied to the motor **M** is the full battery voltage in this case.

The charging rate of the capacitors **CA** and **CB** is determined by the intensity of the current flowing through the motor **M**, to which is connected in parallel, the capacitor **CM** which guarantees that the operation of the motor is maintained at maximum power. It is possible to substitute a battery, preferably a rapid charge battery, for capacitor **CM**.



In another embodiment shown in **Fig.3**, the first and second accumulators consist of pairs of batteries **B1**, **B2** and **B3**, **B4**. Therefore, in this embodiment, two pairs of batteries are used instead of the capacitors **CA** and **CB**. Batteries **B1** and **B2** are connected to the switches **S1** and **S2**, and the pair of batteries **B3** and **B4** are connected to the switches **S3** and **S4**. The switches **S1** to **S4**, connect the pairs of batteries with which they are associated, into series or parallel configurations, depending on the position of the switches.

While the batteries **B1** and **B2** are connected in parallel, the other two batteries **B3** and **B4** are connected in series, and the motor **M** rotates as a result of the difference in voltage between the batteries, as it is connected between both pairs of batteries. At the same time, the current circulating through the motor from the serial connected batteries recharges the two parallel-connected batteries. The switches **S1** to **S4**, which connect the batteries **B1** and **B2** in series and the batteries **B3** and **B4** in parallel then switch, thus reversing the direction of the current flow, and at the same time, the switches **S5** and **S6** change positions in order to maintain the correct polarity for the motor and its direction of rotation.

The two capacitors and the batteries may be switched by means of any mechanical, electromechanical, electrical, electronic or other element that meets the conditions described with the purpose of obtaining a self-rechargeable electrical energy source. These switching operations may be controlled by any known method, for example, a programmable electronic circuit.

In the preferred embodiments previously described, the load consists of a direct current motor, but as an expert in the field may understand, the load may also consist of any type of resistive (?) and/or inductive load.

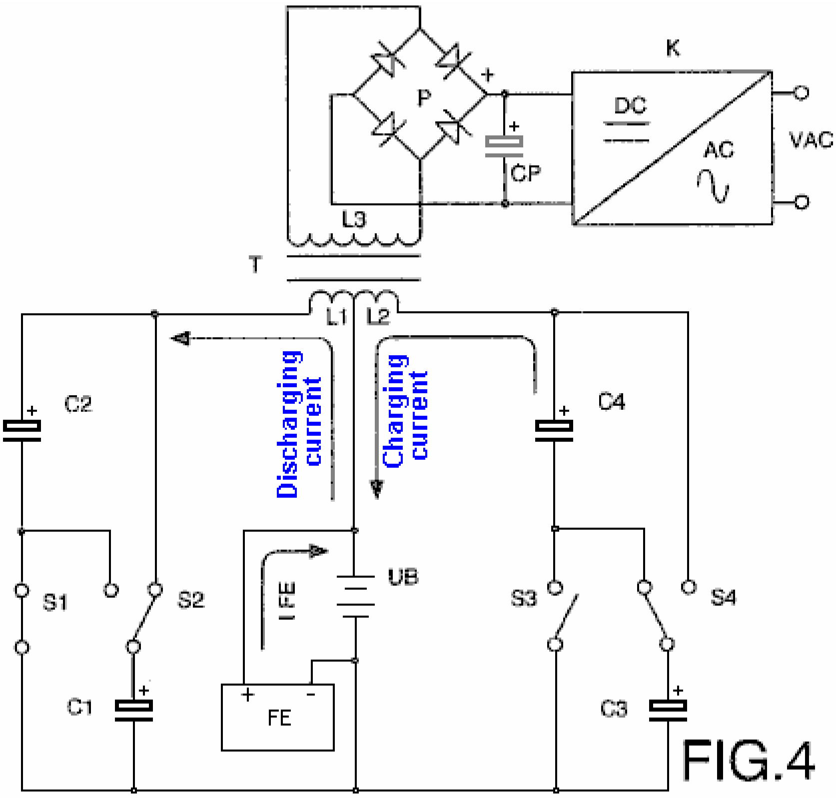


FIG.4

Another preferred embodiment is shown in **Fig.4**, where a transformer **T** with two primary windings **L1** and **L2** is connected between the battery **UB** and the two pairs of capacitors **C1** and **C2**, plus **C3** and **C4**, causing the two capacitors **C1** and **C2** to switch their connections from parallel to serial and back again by means of the contacts **S1** and **S2**, and causing the capacitors **C3** and **C4** to switch by means of contacts **S3** and **S4**, so that during the cycles of connection of the capacitors **C1** and **C2** in parallel, the latter are charged via the winding **L1** up to the voltage level of the battery, whilst at the same time the capacitors **C3** and **C4** are connected in series and provide double their voltage, the battery being discharged by means of the winding **L2**, in which case the charging and discharging currents to circulate in the same direction. On the other hand, during the cycles of connection in parallel of the capacitors **C3** and **C4**, which are charged through the winding **L2** up to the battery voltage level, the capacitors **C1** and **C2** are connected in series to provide double their voltage and are discharged into the battery through the winding **L1**. The direction of the charging and discharging current therefore changes, thus inducing in the secondary winding **L3** an alternating voltage whose frequency depends on the speed of switching of the contacts mentioned, and after being rectified by means of the bridge of diodes **P** and filtered by the capacitor **CP**, the resultant DC voltage is converted to a sinusoidal voltage by means of a circuit **K**.

The connection in parallel of one pair of capacitors and the connection in series of the other pair take place at the same time. Therefore the sum of the current circulating from the battery through one of the windings, charging two of the capacitors, and the current circulating from the other two capacitors through the other winding to the battery, is approximately zero.

From an external energy source **FE** the minimum energy losses caused essentially by dissipation of heat and in the capacitors, as well as by the charging factor of the battery, are compensated for, with the result that the sum of the current circulating from this source external to the battery and the charging and discharging currents of the capacitors is equal to zero. Therefore the battery is not discharged and its range does not depend on the work developed by the motors or the loads connected to the secondary winding **L3** of the transformer **T**, since the greater the power of the loads, the higher the intensity of the charging and discharging currents of the capacitors.

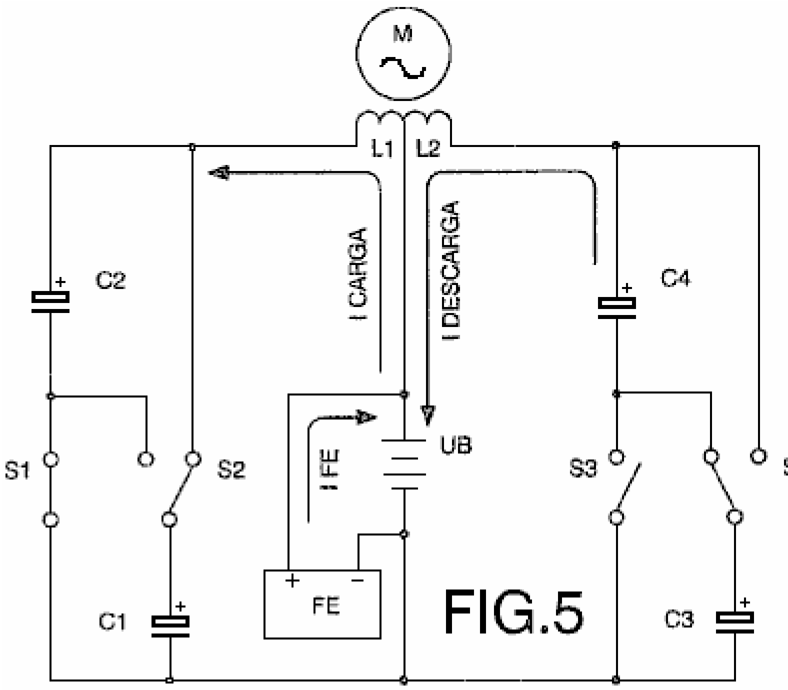


FIG.5

Fig.5 shows another embodiment in which an alternating current motor **M** is connected to two windings **L1** and **L2** so that during the connections in parallel of the capacitors **C1** and **C2**, the latter are charged by means of the winding **L1** at the same time that the capacitors **C3** and **C4**, connected in series, are discharged by means of the winding **L2** to the battery **UB**, the charging and discharging current circulating through the windings in the same direction. The capacitors **C1** and **C2** are then connected in series and the capacitors **C3** and **C4** are connected in parallel. The direction of the charging and discharging current of the capacitors is therefore reversed, thus producing at terminals of the motor an alternating voltage with a frequency that depends on the speed of switching of the contacts. The energy losses caused are compensated for from an external source **FE**, the sum of the current circulating from this source to the battery and the currents circulating through the two windings during charging and discharging of the capacitors being equal to zero. The battery is therefore not discharged as a result of the work developed by the motor.

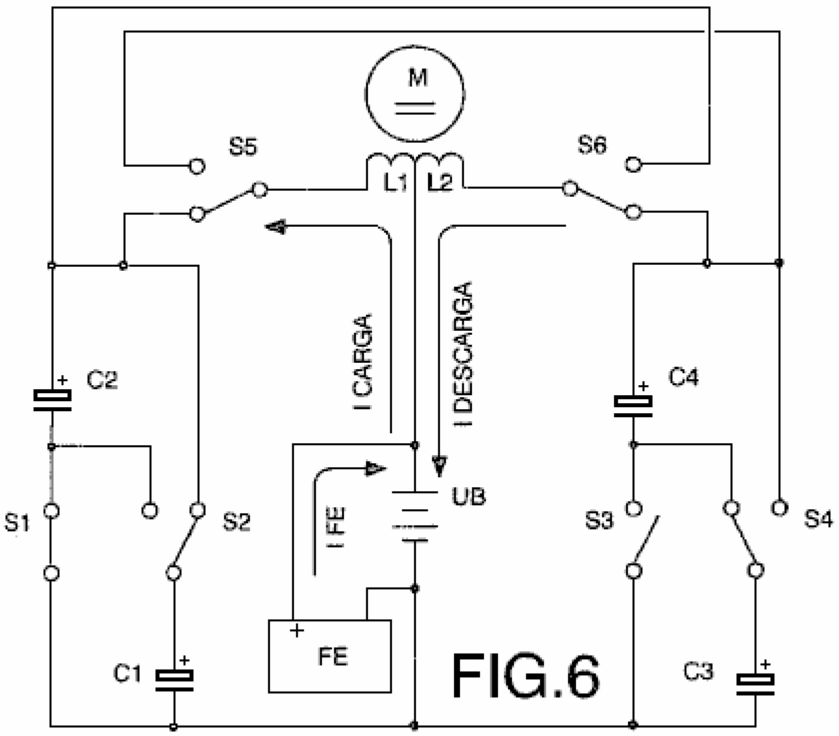


FIG.6

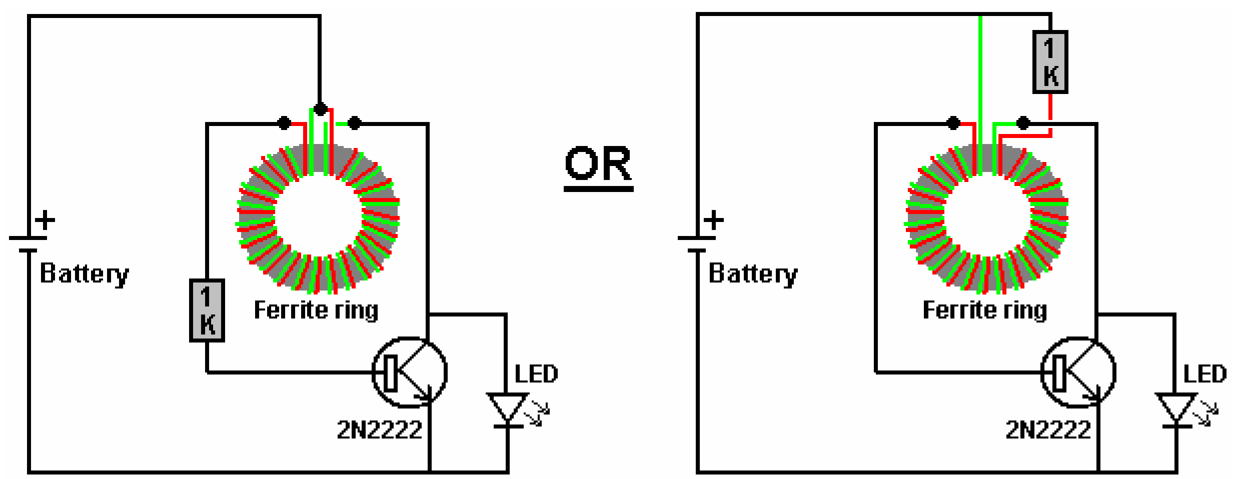
Fig.6 shows the connection of a direct current motor **M** to two windings **L1** and **L2** between the battery **UB** and the two pairs of capacitors **C1** and **C2** plus **C3** and **C4**, so that during the connections in parallel two of the capacitors are charged by means of the winding **L1**, and during the simultaneous connections in series, the other two capacitors are charged by means of the winding **L2** to the battery. Coinciding with the switching of the contacts **S1**, **S2**, **S3** and **S4**, which connect to each pair of capacitors from parallel to serial and vice versa, the contacts **S5** and **S6** switch, polarising the windings of the motor so that the charging and discharging currents of the capacitors circulate in the same direction, producing a direct voltage. The sum of the current supplied from the external source **FE** and the charging and discharging currents of the capacitors is equal to zero, and thus there is no battery discharge.

Lawrence Tseung's Self-Powered "FLEET" Generator.

The "FLEET" ("Forever Lead-out Existing Energy Transformer") device is a self-powered electrical generator which has no moving parts and which can be constructed cheaply. It has been developed by a Hong Kong based team of people: Mr Lawrence Tseung, Dr. Raymond Ting, Miss Forever Yuen, Mr Miller Tong and Mr Chung Yi Ching. It is the result of some years of thought, research and testing and it has now reached an advanced stage of testing and demonstration and is nearly ready for commercial production.

Mr Tseung has applied his "Lead-out" theory to the category of low-power circuits known as the "Joule Thief" circuits. These circuits originated with an article by Mr Z. Kaparnik, in the "Ingenuity Unlimited" section of the November 1999 edition of the "Everyday Practical Electronics" magazine.

The initial circuit allowed the very last energy to be drawn from any ordinary dry-cell battery, and used to light a white Light-Emitting Diode ("LED") for use as a small torch. It allows a battery which is considered to be fully discharged, to drive the circuit until the battery voltage drops right down to 0.35 volts. The initial circuit uses a bi-filar coil wound on a ferrite ring or "toroid". Bi-filar means that the coil is wound with two separate strands of wire side by side, so that each adjacent turn is part of the other coil. A coil of that type has unusual magnetic properties. The Joule Thief circuit is like this:



It is important to notice how the coil is wound and how it is connected. It is called a "toroid" because it is wound on a ring. The ring is made of ferrite because that material can operate at high frequencies and the circuit switches On and Off about 50,000 times per second ("50 kHz"). Notice that while the wires are wound side by side, the start of the red wire is connected to the end of the green wire. It is that connection which makes it a "bi-filar" coil instead of just a two-strand coil.

This "Joule Thief" circuit was then adapted by Bill Sherman and used to charge a second battery as well as lighting the Light-Emitting Diode. This was achieved by adding just one more component - a diode. The diode used was a 1N4005 type because that was to hand at the time, but Bill suggests that the circuit would work better with a very fast-acting Schottky-type diode, perhaps a 1N5819G type.

The circuit produced by Bill is: