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Notice

DESCRIPTION WO2022075876A1

[0001]

13 POWER GENERATION DUE TO PARTIAL SEPARATION OF THE MAGNETIC FIELD

[0002]

17 The field of technology.

18 Electrical engineering, power engineering, converter technology.

[0003]

22 The level of technology.

23 There are no analogues and no prototype.

[0004]

27 The essence of the invention.

28 The method of generating electricity due to the partial separation of the magnetic field of a ferromagnet from the magnetization coil is that the magnetic field of the ferromagnet closed outside the magnetization coil is not included in the cost of electricity for the magnetization itself and is not included in the general transformer connection. The magnetic field of a ferromagnet, partially inductively not connected with the magnetization coil (inductor) and with the primary winding of the transformer, is not included in the operation of the current source for magnetization and does not form a reverse transformer connection with the inductor. This separation of magnetic fields is achieved by the fact that the magnetization coil itself only partially, and then with a large gap, covers the ferromagnetic volume or is generally simply placed next to it. The magnetic field of a ferromagnet is mostly closed by a vortex outside the

inductor coil. The inductor does not waste electricity on this magnetic energy of a ferromagnet, since it does not affect the current in any way and does not affect the transient process of current growth in the coil during magnetization.

41 But at the same time, with the help of a special removable winding (secondary) on the ferromagnet itself, it is a free ferromagnetic field and the entire field of the ferromagnet and its magnetic energy is converted into electricity when the ferromagnet is demagnetized or remagnetized.

[0005]

48 The transformation of the energy of a ferromagnet can be both in reverse during demagnetization and with alternating current of any form.

50 But the important condition is that this ferromagnetic field is not suppressed by demagnetization from the current in the winding at ferromagnet, which is achieved by a number of special methods of generation and transformation. Energy is removed from the winding either during the demagnetization phase and the decline in the magnetic field induction (reverse conversion mode) and when the current does not have a demagnetizing effect, or the current in the winding on a ferromagnet is phase-shifted and does not have a demagnetizing component, or it is insignificant in effect.

[0006]

60 Separation of magnetic fields is achieved by two factors.

61 The first is because the magnetization coil itself (inductor) is only partially inductively connected to the ferromagnetic field of the core or cores due to the topology of the device. The second is that the cores themselves in the common magnetic circuit of the device separated by non-magnetic or weakly magnetic dielectric gaps are quite sufficient for there to be a partial separation of the magnetic fields of ferromagnetic volumes. This is necessary for the fact that there were several magnetic vortices of the field of ferromagnets not connected by most of the energy of the magnetic field with the magnetization coil. In turn, there is also a gap and a gap between the magnetization coil and the ferromagnet to separate the magnetic field of the ferromagnet from the wires with the magnetization current.

[0007]

73 For generation, a weak mutual bias of each other of ferromagnet cores through gaps is also used as an addition to the magnetic field of the magnetization coil.

75 This is necessary to reduce the cost of current and electricity for magnetization and as a factor that enhances the magnetic induction of ferromagnets in the system. But a simple device may consist of just one ferromagnetic volume and one inductor coil.

[0008]

81 Devices may consist of one or more magnetization coils and one or more ferromagnetic volumes located partially inside or completely outside of the plane and volume inside the magnetization coil.

84 Coil sizes and their the location relative to ferromagnetic volumes is such that a significant or large part of the magnetic energy of ferromagnets is closed outside these coils. Magnetizing coils can be called simply an inductor or inductors for short. Several coils can be considered and considered simply as separate sections spaced apart, but still one common magnetization coil. Ferromagnetic volumes can be called cores, although they may not be inserted inside the magnetization coils. The cores can be inserted coaxially into the coil and be displaced in height by their middle part from the plane of the coil, if it is viewed horizontally.

[0009]

94 The simplest version of the device is one magnetization coil (inductor) and one ferromagnetic core with a removable winding on it.

96 The inductor coil can surround the core coaxially, but due to a specially increased diameter, it does not cover a significant or large part of the magnetic field of the core. For example, the diameter of the coil is almost equal to the length of the core plus its width if the coil is considered round and the core is approximately round or square. The coil can be both square and rectangular. The dimensions of the core and the shape of the core, as well as their number, can be any. But the dimensions of the coil are chosen so that a significant part of the magnetic energy of the ferromagnet is closed inside the coil without the coverage of the turns by inductive coupling. This is achieved by selecting the distances from the wires of the inductor coil to the surface and sides of the core.

[0010]

108 The coaxial arrangement of the core in the coil is the simplest technical option.

109 For generation, it is enough to divide approximately two-thirds of the energy of the magnetic field of a ferromagnet from the coil and inductor. This is achieved by selecting the dimensions of the diameter or sides of a rectangular coil, taking into account the length and width of the core itself and the distances from the wires to the surface of the core. If the core is made in the form of a wide pack narrow steel plates, then the width of the coil is taken into account where the greatest magnetic scattering of the field occurs along the steel charge. On top of the coil or in layers interspersed with turns of the inductor, if necessary, according to the scheme, a winding is wound to regenerate magnetic energy into capacitors. The width of the winding on the core itself is also taken into account, since space and volume are needed for the formation of a ferromagnetic stray field inside the coil.

[0011]

If a long core is inserted into the inductor coil partially and with only one end, then its ferromagnetic field is a vortex and its magnetic equator is shifted closer to the middle of the core.

The magnetic field of a ferromagnet is, as it were, taken out of the coil by its vortex, which sharply weakens its magnetic coupling. Since any coil is a magnetic dipole, two long cores can be placed along (and across) the axis of the coil. In the axial position, it is optimal to insert two relatively long cores into the coil with their ends and bring out the main magnetic vortices of the ferromagnet. Open free ends can be closed with magnetic shunts or narrow corner and end protrusions can be made, which sharply reduce the demagnetizing factor.

[0012]

A variant of the device can be in the form of a pair of cores that enter with their two end parts into the magnetization coil.

Between them is a gap or a small auxiliary magnetizing core with two gaps from the main cores. These gaps are needed to partially separate the magnetic fields of ferromagnets. Magnetic energy is removed from two or three cores of this system at once with the help of removable windings on each such core.

[0013]

The cores can be either straight or have end and corner protrusions on the parts protruding outward from the middle of the coil. The shape of such cores can be straight or T-shaped in profile, as well as W-shaped or E-shaped.

The shape of these cores it can also be in the form of ordinary or special-shaped ferrite cups to enhance the generation effect. To do this, the area of the central core can be increased several times greater than the area of the side parts, and this applies to both cups and E-shaped cores of all transitional shapes from round ferrite cups to flat E-shaped cores. The side branches in such cores are needed to reduce the distance of the magnetic field of the ferromagnet through the air and to reduce the demagnetizing factor. This greatly increases the magnetic induction and the energy of the free magnetic field of ferromagnets outside the inductor and at large relative gaps in the magnetic system. E-shaped cores can be made not with two, but with four side branches at once to close the magnetic field of the core from all four sides between the branches and the central core. This shape more effectively closes the magnetic field of the core through the air between the central core and side branches and with a minimum non-magnetic air gap.

The cross-sectional shape of such cores can be flat or strongly or additionally elongated rectangular for maximum magnetic field dissipation around the core and around the perimeter of the core. In the form of ferrite in the form of round cups with or without cutouts, there may be a different shape of the side parts, in contrast to the sectional shape of the central core itself.

[0014]

The magnetic field in W-shaped or as they are marked in E-shaped cores is closed between the central core and side branches and parts through the air at the shortest distance.

With properly selected gaps, a large or significant part of the magnetic flux of these two or three cores is not closed through the turns of the inductor and this reduces the cost of magnetization. It should be noted that the auxiliary core can have a smaller area cross-section and can be made both in the form of a tablet or a rectangular insert, and from a ready-made ordinary ferrite or steel ring. The magnetic field of such a short core almost does not interact with the magnetization coil due to its size, and the inductor practically does not spend electricity on its magnetization. But with its magnetic field, this auxiliary core sharply increases the magnetic field in the gap and the magnetic induction of the main cores. The auxiliary core with gaps is applicable to almost all magnetic topologies of devices where there are more than one core in the device. The separation of the magnetic fields of the cores between inductors and cores and the magnetic separation of the field of ferromagnets between the cores themselves are used due to gaps made of a dielectric or a weakly magnetic material.

At the same time, the magnetic material of ferromagnetic cores may differ in one device and in its different parts. There may be different grades of ferrite or different grades of electrical steel, which is almost never used in general electrical engineering. This allows the use of weak magnetic fields in the inductor and the combination of different materials with a very non-linear and steep magnetization curve and high magnetic induction in the cores.

[0015]

The magnetic connections of the cores and the inductor can be sharply weakened due to the fact that the magnetic vortices of the cores and their magnetic equators are sharply displaced from the plane or volume of the inductor coil.

[0016]

The two main cores can protrude significantly beyond the volume of the magnetizing coil, and this only sharply weakens the magnetic field of the cores associated with the inductor.

The cores can also be placed across the axis of the coil when the magnetic fields of the cores along the main axis are closed at an angle of ninety degrees and across the axis of the magnetization coil.

Axial systems create separation of fields due to the displacement of the core along the axis to the plane of the coil and due to the size and diameter of the inductor coil itself compared to the cross section of the core. At the same time, it is necessary to take into account both the form and smaller and larger size of the core section if it is an elongated rectangular shape of the core. The shape of the inductor coils can be both round and rectangular, repeating the cross section of the core.

[0017]

207 The direction of stray magnetic fields must take into account both the direction of the steel charge and the magnetic axis of anisotropy.

209 You can also use anisotropic steel specially made for increased magnetic dispersion not along, but across the axis of the core with the highest magnetic permeability. For this, the axis of maximum magnetic permeability and susceptibility is made at an angle to the axis or across the geometric axis of the core itself, which sharply increases the transverse component of the magnetic field of the core across its axis. The stray magnetic field across the core axis through its side surfaces increases sharply due to the fact that the magnetic anisotropy of the steel does not coincide in direction with the geometric axis of the core. This factor of the magnetic anisotropy of the material can be used to increase the energy of the free magnetic field of ferromagnets and the generation efficiency. This is most applicable in electrical steel and high power applications and where steel grades with pronounced magnetic anisotropy can be used. This anisotropy of the steel across the axis of the cores can increase the energy of the stray magnetic field outside the inductors by several times.

221 The direction of the anisotropy axis is chosen at an angle or generally almost across the axis of the core.

[0018]

226 The core itself can be prefabricated and consist of packs of steel with different anisotropy and different magnetic magnetization curve both in length and in sheets in one charge pack.

228 Closer to the inductor there can be one steel grade, and then another or different steel grades in one pack The core itself can be split vertically into many segments with small gaps, and with a small or large fraction of its own magnetic field around each core in the stack. Such a system can be closed in a torus or in the form of a rectangular magnetic circuit, or several such stacks of cores are closed by magnetic shunts, and the cores are magnetized according to. At the same time, each such core and magnetic shunt must have its own removable winding to convert the entire magnetic field of each core.

[0019]

238 Of course, in all devices there is also a common axial magnetic field of a ferromagnet, and which is always associated with an inductor coil.

240 But the share of the magnetic energy of the core of this general magnetic field is small and much less than the magnetic energy of a free magnetic field with a correctly made topology of the device. The main essence of the invention lies in the selection of the shape of the fields and the device, where there is a fairly effective magnetization, but the minimum magnetic feedback of the ferromagnet with the magnetization coil as an inductor. The cutoff of the demagnetizing component of the current in the removable winding is also important in order to have a strong enough induction of the magnetic field of the ferromagnet to convert its magnetic energy. Although the cores are referred to as cores below, they can be partially and even

completely removed from the volume of the inductor coil. In this case, the term simply ferromagnetic volumes can also be introduced, where the cores are simply actually located next to the inductor coil both along the axis of this coil and across the axis of the magnetization coil. At the same time, the cross section in size and area of these volumes of a ferromagnet can even be much larger than the cross section of the magnetization coil itself, which is not found in conventional electrical engineering and in converter technology.

254 Or the dimensions of the magnetization coil are made many times larger than the cross section of the core. For devices with a special shape, it is possible to use cores and their parts of different shapes and different cross-sectional areas along the length of the core for more efficient magnetization. For example, the end parts of the core included in the inductor coil have a small cross section. But the central part of this core has an expanded cross-sectional area, and this is necessary for the formation of large magnetic energy and a large magnetic flux.

[0020]

264 If the shape of the core is U-shaped or E-shaped, then their shape and the area of their ends can have a several times smaller area than the cross-sectional area of the closing jumpers of these cores.

267 The inductor coils can be of smaller size and area and are inductively coupled with less magnetic flux. And the useful cross-sectional area of the ferromagnetic volume and from which additional energy is removed increases by several or more times. Also, this form sharply increases the magnetic dispersion, since the entire large magnetic flux of the central part of the core cannot close through a small section. And this is especially pronounced with strong or almost complete magnetic saturation of the ferromagnet. Therefore, it is possible to use the shape and the very variable cross-sectional area of the core for stronger magnetic dissipation of the magnetic field and more efficient generation with a strong direct magnetizing magnetic connection with the inductor.

[0021]

279 All cores can be divided into ordinary and simple in shape, as well as cores already of a special and special shape and already created for more efficient magnetization and strong magnetic dissipation.

282 Such special forms of individual cores can be either monolithic or solid, or prefabricated and composed of separate parts assembled together or from different segments for ease of manufacture and assembly. This is especially true for complex forms or those forms where there are different protrusions or different cross-sections and different cross-sectional shapes of cores. Such shapes are not commonly used in electrical engineering and are unique. These special core shapes and magnetic circuits and assemblies are all designed for generation only and are not needed in conventional electrical engineering.

[0022]

292 Magnetic dissipation is understood as the magnetic field of the ferromagnetic volume and its magnetic energy, which are not magnetically connected at all by inductive feedback with the coils of the inductor and are not included in the cost of electricity for the magnetization itself.

295 This is what I call the free magnetic field or the free ferromagnetic field of a magnet. This field is closed only around the core and does not create an EMF with an increase in current in the magnetization coil or in the inductor, if you call it shorter.

[0023]

301 Single core or dual core systems allow the use of longer cores with low demagnetization factor and preforms.

303 If this form can be closed in a magnetic circuit with small gaps, then the action of the inductor can be used immediately on both ends of the core. For example, ready-made U-shaped or arc-shaped and horseshoe-shaped cores made of ferrite and amorphous iron can be easily used right away. This topology can be easily applied if the cores are made with double-sided magnetization. For example, if the cores are U-shaped, then two such cores and two coils can be used to assemble a magnetic circuit with two gaps. Each magnetization coil covers the gap and ends of two cores. The magnetic fields of the cores themselves are closed with a symmetrical magnetization of the ends approximately around their middle part, where the removable winding is located. In this case, each core is magnetized from two ends at once, which enhances the magnetic induction. If two W-shaped cores and three magnetizing coils are used, then such a paired E-shaped magnetic system can be considered an already branched flat magnetic circuit.

315 In such The system uses the magnetic field of the inductor coil closed in all directions from the coil axis more efficiently. This magnetic field of the inductor can be used more fully in a three-dimensional magnetic system consisting of a central core and four side branches of a magnetic circuit.

[0024]

322 Several pairs of such cores can be closed with two magnetic shunts for more efficient magnetization.

324 Magnetic energy can also be removed from the magnetic shunts themselves using special windings. If in the device three pairs of such cores work magnetically according to that there are magnetic shunts, then you will get an already branched magnetic circuit of six cores and a pair of shunts that close the ends of these cores outside the coil.

[0025]

331 A variant of the device can be a magnetic circuit in the form of a pair of U-shaped or U-shaped

cores separated by gaps and one or two magnetization coils covering these gaps. Each coil (or it can be considered two sections of one magnetization coil) magnetizes two ends of the U-shaped cores at once. Each such U-shaped or U-core is magnetized on both sides. Removable windings are located on the middle part of the cores or along their entire length. The device may also have small auxiliary cores in the gap (and separated from the main gaps) in the form of a tablet or an annular core. Such devices can be made from ready-made ferrites or amorphous iron.

[0026]

The development of this topology can be considered two magnetization coils (or two sections of one coil can be considered) on both sides of a long massive core. But this increases the energy costs for magnetization due to the magnetic stray fields of the inductor coils themselves. The core can be of a simple straight shape and of various cross-sectional shapes and have, for example, a spindle-shaped shape to reduce the magnetization coils by ends and increase the magnetic dispersion around the magnetic equator in the middle of the core. The shape of the narrowing can be either smooth or stepped.

[0027]

If this core is mentally closed to the gap, then we will get a torus or a rectangular core with a gap around which the inductor coil is closed. In this case, only one coil magnetizes one core, as it were, from two sides. We get the topology of the device in the form of a closed magnetic core, but with a gap sufficient to dissipate a larger magnetic field of a ferromagnet outside the gap. The shape of the magnetic core can be both in the shape of a torus and a rectangular shape with a gap. The core cross-section in the equator region (in the middle part and opposite the gap) can be several times larger than the core cross-sectional area in the gap region.

[0028]

This type of topology can be both in the form of a simple and branched complex magnetic circuit (both flat and volumetric) of two, three, four or more side branches, but with one common gap in the central core. The device has only one inductor coil which (around the common gap) which acts with all its magnetic field on two, three, four or more cores in this complex magnetic circuit.

[0029]

For more efficient interaction of the inductor coil with such a branched magnetic circuit, it is optimal to make it low-profile and with a wide part of the cores that directly interact with the magnetic field of the flat inductor.

374 And increase the width of the magnetic circuit window for greater dispersion of the magnetic field.

[0030]

379 One magnetization coil can immediately cover two gaps of two cores or three or even four or more.

381 This branched magnetic circuit is made up of a composite structure of separate simple magnetic circuits with gaps.

[0031]

386 The displacement of the core in height from the plane of the coil increases the magnetic flux not connected with the coil inductively and this can be used.

388 The core may be type-setting in the form of a pack of individual narrower cores and a stack of shorter cores. For example, a core consists of a pack of narrow cores (with their own separate windings or a common one) and separated by a dielectric or gaps for stronger magnetization.

[0032]

394 Narrower cores in cross section at least in one plane have a lower demagnetization coefficient and have a stronger magnetic induction at the same magnetizing magnetic field.

396 The very breakdown of the section or pack of sheets of charge steel cores into narrower individual rods or packs of steel sheets gives a greater effect on magnetic energy. At the same time, removable windings can be either common to the entire pack or have their own winding on each narrower core in the assembly.

[0033]

403 Another option is to divide the core and in height into shorter cores with dielectric gaps between them to significantly separate their magnetic vortices and magnetic energies.

405 With this separation, the magnetic field of the cores is closed in a closer zone in distance and the common magnetizing coil can be made much narrower than with a longer core or cores. The total magnetic energy removed from such an assembly is several times greater than from one longer core, since each core in a stack has almost its own separate magnetic energy. In such a device, each core in the stack must already have its own separate removable winding to convert its own magnetic energy.

[0034]

414 For better magnetization, each such core in a stack is additionally divided into separate narrower cores in cross section.

416 Removable windings can be on each such core or stack of steel sheets. Eddy current losses are also reduced by dividing a common steel sheet bundle into narrower and shorter steel bundles. At the same mass flow rate of the ferromagnet material, the total the magnetic flux and magnetic energy of such an assembly of shorter and narrower cores can be tens and hundreds or more times greater than a large whole core of the same mass of material and volume.

[0035]

425 The device can have one common magnetization coil and inside there are many small and microcores made of ferromagnet up to the size of ferromagnet microparticles.

427 Each microcore has its own removable winding. All windings are already combined into common chains, parallel and series with diodes and switches for a common load or for different storage units. The cores separated by gaps are assembled into separate series chains separated by dielectric gaps, and the chains themselves are separated by gaps to close the magnetic stray fields. The cores can be assembled into plastic cases and the cases themselves together form a prefabricated core convenient for assembly.

[0036]

436 Ferromagnetic microparticle cores, like ferromagnetic microcores, are separated by gaps and can be in the form of ferromagnetic particles embedded in resin or plastic along with windings.

438 There are different options for the arrangement of particles. The first is many parallel chains of cores with gaps between them. The second option is a kind of mixed or almost staggered (in section) arrangement of cores, when each core interacts with its corners with eight other cores through small gaps between them. It is also possible to have a mixed arrangement (along the rows and a shift between them) of the cores in the rows, both vertically and horizontally, and when the cores mutually magnetize each other at the ends or through the corners through small gaps. The gaps are selected so that most of the magnetic energy of each microcore is closed only in the near zone around the core and is not inductively coupled to the magnetization winding. On the formation of this free magnetic energy of each volume of a ferromagnet, the inductor coil does not consume electricity. But when demagnetized, this internal magnetic energy is converted into useful additional energy using removable windings on each core.

450 Removable windings are connected into groups of series and parallel connections of winding chains to operate on a common load or different loads and energy storage devices.

[0037]

455 The total total magnetic energy of such an integrated ferromagnetic dielectric core of individual particles of ferromagnet microparticles can be thousands or more times greater than the magnetic energy of a large ferromagnetic core of the same mass of material.

This allows you to create devices for generating reverse motion with a common magnetization coil and microcores in a dielectric with their own windings on each such microcore. The arrangement of microparticles in a dielectric can be any in structure and topology. The only important thing is the presence of internal dielectric volumes between the cores for closing the free magnetic field around each microcore and for windings on the cores and microcores themselves. All windings are combined into common chains, both parallel and serial, to work on a total or total load from individual loads or output diode-capacitive adders and storage devices in the form of capacitors and diodes. For more efficient magnetization, it is better to make ferromagnetic microcores of an elongated shape and pointed like iron filings, and when the plastic filler solidifies, structure the axes of the cores along the axis with an external magnetic field.

[0038]

In the role of microcores and a kind of acoustic domains of a ferromagnet, there can be particles and microparticles made of a permanent magnet and capable of freely rotating in a dielectric from an alternating external magnetic field of a coil (as when magnetizing an ordinary ferromagnet from an inductor).

A dielectric is needed for exclusion of magnetic force adhesion of magnets or particles in the form of micromagnets into a common stable conglomerate. It is necessary that the magnets could rotate in an external magnetic field. In the absence of an external magnetic field, the magnets in parallel circuits occupy an opposite anti-ferromagnetic position, and in an external magnetic field they line up in chains and create a common external magnetic field, like the domains of a ferromagnet by nature. Such a magnetic metastructural material of permanent magnets in a dielectric can also be used as an ordinary ferromagnet core with a common winding. At the same time, each such micromagnet can have its own separate winding for converting all internal magnetic microfields around a particle from a permanent magnet.

[0039]

The simplest devices can be of varying degrees of complexity and consist of both simple forms and special forms of a ferromagnet adapted for a greater generation effect.

Strengthening the generation effect can be achieved by increasing the magnetic permeability and magnetic induction and the energy of the ferromagnet with a smaller magnetic connection with the magnetization coil itself and with less energy of the current source for magnetization. In this case, the lower the cost of electricity for magnetization in the inductor at a higher magnetic energy, the greater the generation efficiency. The topology of the devices is specially selected and modified for this purpose using various techniques and changes in design and magnetic topology. It is important to simultaneously increase the magnetization and, at the same time, weaken the magnetic coupling of the ferromagnet with the inductor. For this reason, it is important to close most of the magnetic energy of a ferromagnet outside the turns of the inductor. Therefore, the shape of such ferromagnetic cores can be different from the usual shapes in electrical engineering, where it is often important to close the magnetic along a closed magnetic circuit. The magnetizing coil does not wind directly to the core and therefore it cannot be called literally a winding.

503 But on the ferromagnetic cores themselves, the usual removable winding is used, which is adopted in converter technology and electrical engineering. Energy is removed from the removable windings only or mainly during demagnetization and during demagnetization with a change in the polarity of the magnetic field partially (in the presence of bias) or remagnetization of the core and does not participate in the main magnetization. The simplest version of the operation of the device is the so-called reverse stroke or flyback mode of operation.

[0040]

513 With a flyback conversion, the demagnetizing current on the core is simply blocked by a diode, and all energy is removed from the core only when the induction falls and during demagnetization.

516 The magnetic field induction drops to zero or has the effect of a partial reversal of the magnetic field polarity if the power source has a small current pulse polarity reversal or is powered by alternating current with a constant current component. Reversing the polarity of the magnetic field dramatically reduces the transient process and the time of current decay. This gives both a sharper induction decay front and an increase in the EMF in the winding on a ferromagnet, which reduces the cost of wires.

[0041]

525 With a counter current, a special magnetization of the core by permanent magnets, magnetic induction can change the polarity in a ferromagnet to the opposite.

527 But energy is removed from it only when the current in the primary magnetization coil is turned off or the current in the inductor drops. The use of permanent magnets for magnetization can give the effect of remagnetization of the core and this can give almost the full amplitude of magnetic induction. This makes it possible to increase almost four times the total power of the core at a given frequency with the full swing of the magnetic induction amplitude. This effect is applicable to all devices with unipolar operation to increase generation efficiency. Flyback generators can operate with a secondary winding independent of the inductor and for common and different loads and one or common circuit. For example, the magnetic energy from the inductor and from the winding of the ferromagnet is converted into different storage batteries or capacitors (or battery-capacitor units or diode-capacitor) voltage adders and then all the energy is switched back to the input or goes to a common storage. It is possible to charge different batteries or capacitor banks independently and in parallel and switch them back to a parallel or summing voltage input.

[0042]

543 With a coaxial cable of the inductor coil or the presence of a winding for recuperating the accumulated magnetic energy back to the source, it is possible to turn on a removable winding on a ferromagnet in series with the regeneration turns.

546 In this case, only the energy accumulated in the magnetic field of the inductor is converted back into the current source, but also all the free magnetic energy of the ferromagnet. This means that the power source (or intermediate capacitive accumulator during transit recovery) already receives additional additional electricity.

[0043]

553 It is possible and simply to convert all the accumulated magnetic energy in the inductor and in the winding on a ferromagnet into one or different active resistive or storage loads in the reverse mode.

556 With this mode of operation, free additional active power or accumulated energy is obtained due to the free ferromagnetic field. On this type of energy conversion, you can make active power amplifiers for the operation of an electric heater or an uninterruptible power supply on blocks of capacitors and batteries. The input power will be less than the output power if the energy of the additional free ferromagnetic field is much greater than the losses in the device. You can also do just the mode of a simple power amplifier on a resistive load when consumption decreases and output power increases. Additional energy and power is provided by a free ferromagnetic field, and more precisely by its energy, and which is not included in the cost of electricity in the inductor during magnetization. But which we can convert during demagnetization using a special removable winding on a ferromagnet.

[0044]

569 And if all the energy received at the output is again sent to the input, and so on, then the auto-cascade power amplification mode is possible in a degree, and this effect is much more effective than just direct power amplification in one cycle.

[0045]

575 A simple conversion of the energy of magnetic fields can be simply implemented in the flyback mode in different connection schemes.

577 Both the inductor and the secondary winding can work and in series for a common load (or storage) during demagnetization.

579 For example, in an inverting or chopper (understanding) connection, the inductor winding and the removable one on a ferromagnet (through a diode) can be connected in series to a common load. To do this, the secondary winding is included in the diode circuit and when the current is turned off, the inductor coil and the secondary are all connected in series to the total load.

[0046]

587 In a step-up or in the so-called booster type of converters, the secondary winding of a ferromagnet is simply connected in series with the inductor to a common load as a step-up winding.

590 The same type of connection is applicable to other pulse converters such as an oblique half-bridge with energy recovery from the inductor and series connection of secondary winding diodes in the circuit. In this case, not only the magnetic energy of the inductor is converted to the current source, but also the magnetic energy from the ferromagnet and the input capacitor unit is sequentially charged. If the total energy is greater than losses and load power, then capacitors can be charged without an external source. This allows you to create an independent power source such as a backup power source. In the so-called oblique diode-transistor half-bridge, the ferromagnet winding is connected in series with the diode circuit to the input capacitors in the energy recovery mode.

[0047]

602 The autonomous mode of operation is also realized due to the fact that the energy of the magnetic field of the inductor and the ferromagnet during recuperation is returned either immediately to the input power capacitors or is used to charge individual capacitors and which are then switched to the input.

606 This is a transit recuperation of magnetic energy through an intermediate energy storage in the form of capacitors or capacitive voltage adders in the form of diodes and capacitors. This type of energy recovery is convenient in that it is possible to make an independent charge of capacitors from the inductor and from the ferromagnet and then sum this voltage.

[0048]

613 In a bridge circuit to produce alternating current, the secondary winding can be connected in parallel with the inductor along with the capacitor.

615 When the key is opened, the inductor windings and the secondary are connected in series and form an oscillatory circuit with the generation of additional energy from the conversion of the energy of the ferromagnet. All windings, both serial and parallel, all boil down to the fact that when the current is opened, the inductor and the secondary winding are connected (for example, in series) to some common or combined load through a voltage adder or to a common oscillatory circuit of a resonant inverter.

[0049]

624 You can also use the repeatedly accumulated magnetic energy of the magnetization coil due to the energy recovery system back to the power source.

626 To do this, several techniques are used. The simplest is a special power recovery circuit in the form of an oblique diode-transistor half-bridge (oblique transistor-diode half-bridge) with two switches and diode circuits for the recuperation current. My invention lies in the fact that a removable winding from a ferromagnet is introduced into the diode chains and not only the recuperation of the magnetic energy of the coil, but also additional additional magnetic energy of the free field of the ferromagnet goes to the input.

[0050]

635 In this case, the magnetization coil and the removable winding (windings) from the ferromagnet are connected in series during recuperation and their voltages add up and the EMF voltage of the current going back to the power source increases.

638 And not only the magnetic energy from the magnetization coil goes to the DC power source, but also the magnetic energy of the ferromagnet as additional energy not associated with the inductor coil .. This additional energy increases the energy of the input capacitors during regeneration much more than it was before the discharge into the inductor coil. This additional energy gives the effect of generation and there is an autonomous operation mode without current consumption from an external power source. In this case, a mode of self-generating auto-cascade energy amplification arises when each additional received portion of energy again passing through the generator is amplified in a circle in degree and there is a sharp jump in the energy of the input storage from the capacitors. This self-oscillating cascade generation mode and principle of operation makes it possible to enhance the generation process itself to the extent of the number of cycles of magnetization and demagnetization and recuperation of additional energy at the input and again amplifying energy.

[0051]

653 The process of energy growth is limited by the magnetic saturation of the core and the growth of losses in the system.

655 And the breakdown voltage of the capacitors themselves and the switching keys. The payload is connected directly to the input capacitors through a filter and current regulator and voltage regulator. In order for the input voltage on the drive to capacitors did not grow more than the limiting breakdown and dangerous for the load and did not fall below a certain limit, a special current regulator and energy extraction from capacitors operating in automatic mode or controlled by microcontrollers are needed. As soon as the voltage reaches the upper limit, the current in the load increases or the current is dumped into other loads or into its separate special reserve storage, which is not part of the recovery system. When the voltage drops to a certain lower limit, the current is turned off or the current in the load decreases and the voltage rises to the nominal average. The voltage on the load itself is smoothed and stabilized by its controls and filters. The regulation of energy extraction from the storage device allows you to stabilize the voltage and the generation process itself at a certain power level and protect the device from breakdown and destruction, and at the same time prevent the input voltage from

falling below the generation start limit and below the load rating.

[0052]

Self-generating mode and auto-cascade power amplification and stabilization and regulation of voltage and current of the storage device and load are components of an autonomous power supply device.

Self-generator automatic chain cascade amplification of power and energy makes it possible to sharply increase the efficiency of generation in the degree of amplification of cascades in the cycle of accumulation-generation of work.

[0053]

Another way of autonomous operation is the use of a regenerative winding with a removable ferromagnet winding connected in series with it.

The regenerative winding is wound either directly on top of the inductor coil or mixed with it in turns and layers, and through the diode it is connected back to the input plus to plus and minus to minus of the voltage polarity. A coaxial power cable can also be used in the inductor when the cable sheath is connected to the power source at the input to the capacitors, but the core of this coaxial cable is already used as a regenerative winding. A coaxial cable is essentially a bifilar coil ready for energy recovery. It is better to use the shell to power the coil, and the cable core for energy recovery through diodes back to the source and taking into account the polarity of the reverse voltage. This is technically applicable especially to high powers at high currents and blocking thyristors. Regeneration is also applied directly back to the current source or through an intermediate storage in the form of a capacitor, and then which simply switches back to the input. This is a transit recovery through an intermediate separate storage tank, in general, a part of the cycle that is not permanently connected to the input circuits.

This makes charging the capacitor more efficient since it does not have an input supply voltage before charging. Capacitors can be in the form of voltage adders. You can also use capacitors standing directly at the input, but blocked from the input voltage by diodes and working for charging only from recuperation.

[0054]

It is possible to connect the regenerative winding and the winding on a ferromagnet in series during regeneration and add the voltage of two magnetic energies in the input or transit capacitive storage.

In this case, during recuperation, additional power from the free magnetic energy of the ferromagnet will go back to the input capacitor unit or to the intermediate storage device, and the charge of the capacitors at the input will be greater than it was before the current was discharged into the inductor. And this makes it possible to create an autonomous power source without current consumption from an external power source. In this case, the removable winding of the ferromagnet is connected in series with the recovery coil or residential cable, and their voltages during recovery are summed up. Not only the accumulated energy of the magnetic field of the magnetization inductor coil, but also the additional energy of the free magnetic field of ferromagnets goes to charge the input storage capacitors during recuperation. This gives an additional increase (over the cost of electricity in the inductor) of the energy of the input capacitors and the ability to have an autonomous generation mode without power consumption from the initial input current source after start-up.

717 You can use both capacitive adders with diodes and a switchable charge of capacitors independently of each other, which can then work both in parallel and in series for a common load or generally for different loads. For example, independently charge two or more batteries or capacitor banks with batteries and switch back as they are discharged with the specified parameters. When the magnetic energy of the inductor and ferromagnet is recuperated into the power source, the energy distribution can be controlled by microcontrollers so that the total power in the load does not fall and does not exceed the nominal value. And the voltage in the energy storage device and its charge current did not exceed the maximum allowable. To do this, either the generation power is reduced or an additional load is connected or another backup or additional energy storage device is connected.

[0055]

730 The schemes of operation of generation devices on the return stroke can be different in terms of recuperation from the schemes of generation and energy recovery on alternating current.

732 But all of them are united by the fact that the magnetic energy from ferromagnet and galvanically or through a transformer (or autotransformer) connection is introduced back into the resonant oscillatory circuit or through diodes or a diode bridge goes back to the inverter power source. For example, the current rises only through the inductor, and when the current drops, the winding on the ferromagnet is already connected in series with it and additional magnetic energy is introduced into the circuit, which creates generation. This can be used on both sinusoidal AC and pulsed current. For example, if the winding of a ferromagnet (possibly together with a capacitor) is connected in parallel with the inductor coil, then when the current breaks in the supply circuit, only one inductor is formed. a closed circuit with a series connection of an inductor coil and a removable winding on a ferromagnet and a capacitor. In such a circuit, additional alternating current energy is already being generated. There are circuits with serial switching and amplification of the EMF due to winding on a ferromagnet.

[0056]

747 There are also transformer operating modes of alternating current generators without regeneration back to the input and with regeneration back to the input through transformers.

[0057]

752 You can also use the principle of a booster transformer when an alternating current (albeit sinusoidal) from an external source is already flowing through the core winding, and the magnetic field of the inductor coil demagnetizes and biases the core in the desired phase with its pulsed or alternating current so that the power of the current passing through the core winding is amplified.

757 The phase of the current in the inductor should be such (essentially leading) that its magnetic field (as in a voltage booster transformer) will, as it were, modulate the oscillations of the core induction so that the power in the core winding will increase.

760 In this case, the inductor coil is almost not connected inductively with the main field of the core, but acts by its magnetic field on the entire core of a ferromagnet. This reduces transformer feedback and active power costs in the inductor. The energy consumption for power amplification will be less than the power amplification itself due to the separation of the magnetic fields of the ferromagnet and the inductor coil. This makes it possible to use alternating current with alternating current, including industrial frequency and sinusoidal current.

[0058]

770 The advantage of this type of generation is that switching keys are not needed and you can directly use the current from the network and receive alternating current without shape distortion and harmonics.

773 The disadvantage of this type of generation in the power amplification mode is that you need to have another current source supplying the winding on the core to amplify the power and the phase shift of the supply current in the inductor with respect to the current in the core winding is needed. There are also purely transformer operating modes of generators, but with the effect of generation due to the free magnetic field of a ferromagnet. This free magnetic field is not inductively coupled to the inductor and does not give a transformer feedback to the inductor coil and gives active power consumption in the inductor.

[0059]

783 An analogue of this type of generation is the alternating current generation mode, when the demagnetizing current in the winding on the core is eliminated due to the fact that the secondary load is active-capacitive (due to the series addition of capacitors) and the current reaction in the removable winding is even biasing without demagnetization.

787 At the same time, a special capacitor (capacitance) at a nominal value is included in the secondary winding in series with an active load, or as another option, a compensating parallel connection of a group of capacitors to an active load is used.

[0060]

793 To amplify the alternating current in the core winding, you can also use the pulsed flyback

mode of the inverter in the inductor during the phase of current decay in the inductor and in the core winding.

In this case, there is a kind of buildup of alternating current (by reverse pulses in the inductor) in the circuit of the removable core coil. In principle, the reverse stroke is the simplest way to generate when separating magnetic fields in the device.

[0061]

Reverse operation is the simplest single-cycle mode of operation with the forward demagnetization current cut off by a diode or transistor (controlled rectifier) in the secondary load circuit.

A transistor or a controlled lockable thyristor is usually used as a switch. The current is removed only during the demagnetization phase. When the inductor coil is powered by single pulses, but alternating current, but separated by pauses of time, much more than the duration of the pulse itself, you can use the phase of current decay and magnetic field induction.. In this case, although the polarity of the pulses changes, the reverse course of the pulses is also used, but not a diode is needed, but a controlled current switch in the winding on the cores. All this works approximately like in welding inverters with PWM current regulation, where pulses of different polarity come with a pause between them in time. There you can also use the current decay and demagnetization phase and connect the load using a controlled transistor switch or thyristors as a switch. This is essentially the same reverse stroke, but with a change in the polarity of the current pulses themselves. The current in the secondary winding on a ferromagnet flows only during the demagnetization phase and does not give a drop in induction.

At the inductor input, there is alternating current in the form of separate current pulses separated by significant time intervals. This makes it possible to use alternating pulsed current from ordinary ready-made or special bridge inverters to power the inductor, but without demagnetizing the ferromagnet due to cutting off the demagnetizing current components in the secondary winding. In fact, this is also a reverse move and the same type of transformation.

[0062]

It is important to understand that the inductor itself can be powered by current pulses with a constant component and with a change in the reverse polarity of the current itself and a reverse demagnetizing current that is small in polarity of the voltage and the direction of the magnetic field.

In this case, you can also use the reverse mode and cut off the demagnetizing current due to diodes or a controlled rectifier on the keys.

[0063]

It is also possible to simply cut off the demagnetizing components of the current in the secondary winding and with ordinary alternating current in the form of a pulsed or industrial sinusoidal current with the help of keys and leave only the magnetizing components of the current.

839 This applies to sinusoidal current of any frequency. The current in the secondary winding will go only less than a quarter of the period. In this case, only less than a quarter of the period of the current of the secondary winding is used.

[0064]

845 Another option to block the demagnetizing current is to use an active capacitive current at the output in the secondary winding on a ferromagnet.

847 At the input, power in the form of alternating current of any form in the inductor and an active-capacitive load in the secondary circuit of the winding on a ferromagnet. An active-capacitive load is created by adding a capacitor in series with the active resistance, so that the capacitance would be greater than the active resistance and the current would be magnetizing or weakly biasing with respect to the primary current in the inductor. In essence, this is an AC transformer with magnetic field separation, but almost no demagnetization current in the secondary winding. In such a device, unlike a transformer, there is also a power component from the free magnetic field of a ferromagnet in the secondary winding, but which is not inductively connected to the inductor and does not give feedback to the primary circuit of the inductor. The advantage of this method at high power is that it is possible to use alternating current of industrial frequency and form, or use ready-made inductor generators for generation, designed to power induction furnaces and induction heating systems.

[0065]

862 Switching current in the primary circuit can be transistors or gated thyristors.

863 It is also possible to switch mechanically with a collector and brushes or through a vacuum lamp or a gas discharge in a plasma or gas discharge lamp.

[0066]

868 The magnetic field of a ferromagnet, inductively not connected at all with the circuit and current or magnetization coil (having no magnetic flux linkage), can be called a free magnetic or ferromagnetic field, which is more accurate from the standpoint of physics.

871 This ferromagnetic field creates induction and useful EMF and currents and power, but it does not has a magnetic connection with the inductor and does not create a magnetic feedback and reaction as in conventional transformers.

[0067]

877 Partial separation of the magnetic field of the ferromagnetic volume and the main magnetizing

currents can be done due to the fact that the current-carrying wires are located next to the ferromagnet and do not cover it tightly, as in conventional chokes and inductors with cores.

A device of a simple type can simply be an inductor adjacent to the side close to the end of the core or with a diameter of the magnetization coil of such a size (several times the cross section of the ferromagnet) that at least partially covers the end of the core, more precisely, part of the ferromagnetic volume, but is weakly connected with its ferromagnetic field. At the same time, a significant and large part of the magnetic flux and, most importantly, the magnetic energy of a ferromagnet is not associated with this magnetization coil (inductor) and magnetization currents. Although individual current-carrying coils may have a formally strong flux linkage with a ferromagnet, this refers to the main effective magnetization currents themselves, and not the formal magnetic flux linkage of only some individual current-carrying coils. This is important since only the most effective magnetization from the main current-carrying turns plays a role in the generation process. On the ferromagnet itself, there is its own removable winding, which covers almost all of its magnetic field and energy and is needed only to convert the fluctuations of its magnetic induction.

In reverse mode, it does not participate in magnetization.

[0068]

The ferromagnet may be in the form of a ferrite or an amorphous alloy, or in the form of electrical steel sheets or a mixture of ferromagnetic powder or sawdust and a dielectric in the form of a plastic polymer or resin and other materials.

A ferromagnet can be both in the form of separate acoustic domains and ferromagnetic particles in dielectric or in the form of small permanent magnets located in a matrix of dielectric and in which they can rotate in an external magnetic field. This is a kind of meta material imitating a ferromagnet from domains.

[0069]

A simple device of the most simplified level consists of one or more magnetization coils or sections and just one ferromagnetic volume.

The magnetization coil can be of such a diameter (about the length of the core or so, taking into account the thickness of the core) that most of the magnetic energy of the ferromagnet inside the coil is simply not associated with the magnetization turns. The value of the magnetic connection can be any, but it is technically more convenient to separate more than half of the magnetic energy of a ferromagnet from the magnetization currents. The core or, more precisely, the volume of a ferromagnet can be located both in the center of the coil or circuit and at the edges of the magnetization coil. The ferromagnetic core can be located both strictly symmetrically with the middle part and vertically in the plane of the coil and along the axis to it, or be partially removed from the plane of the coil, which sharply weakens the magnetic connection with it. The displacement of the core by the middle part relative to the plane of the coil can be used to reduce the magnetic coupling and reduce the diameter of the magnetizing coils. The magnetization coil can be round, oval and rounded or square or rectangular in shape with straight or rounded corners.

922 The cross-sectional shape and the general shape of the ferromagnets themselves and their parts can be different and different in cross section. The cores can be straight, simple, or ribbed, or T-shaped or 111-shaped. Cores with a branching of the magnetic field and an E-shaped cross-sectional profile in the section can be in the usual W-shaped or in the form of ferrite cups or any transitional shapes from ferrite cups to an E-shape. Only the shape of the side cutouts in the cup and the shape of the top are excellent. To increase the magnetization and magnetic field scattering, the central core of the E-shape can be much larger in cross section (several times) than the total sum of the cross section of a pair of lateral branches. This is only necessary to reduce the demagnetizing factor and partially close the magnetic field of the ferromagnet in the near zone between the central core and the side branches. Also, the length of the central core itself can be increased compared to the side branches in order for the core to partially enter the magnetization coil. A device of this type can have W-shaped cores in profile and not only with two side branches, but also with three or four side branches for better closing of the magnetic field of the ferromagnet from all sides.

936 The magnetization coil is located in the region of the gap between the cores and, as it were, covers the gap between them. Between the main cores, you can insert (through the gaps) and a small auxiliary ferromagnetic core for better magnetization. At the same time, the magnetization coil spends almost no electricity on the magnetization of this small core, since, due to its size and topology, its magnetic field is closed inside the coil without magnetic flux linkage enveloping the turns of the inductor.

[0070]

945 The magnetic field of a coil or a flat coil with current is essentially a magnetic dipole.

946 For this reason, it is more convenient to magnetize two cores with one magnetization coil or inductor from two sides or from the sides or partially inserted with their ends or ends into the volume or entering the plane of a conventional or flat magnetization coil. The cores are necessarily separated by a non-magnetic gap to separate most of the magnetic field energy of the cores. The inductor coil can be simply inserted into the gap if it has a diameter close to the cross section of the cores. Either the inductor coil has a much larger diameter than ferromagnets and in fact simply covers the gap between the two cores. The open ends of these cores can be closed magnetic shunts (with or without gaps) and then two pairs or three pairs of such cores can be combined together into a common magnetic circuit. Magnetic shunts may have their own removable windings. Two such pairs of cores, together with magnetic shunts, form a kind of U-shape and the usual simple magnetic circuit. Three pairs of cores with two common magnetic shunts form a branched 111-shaped or E-shaped magnetic circuit with three magnetization coils or with three sections.

959 With a large cross-sectional area of such magnetic shunts (and especially a low profile of the magnetic circuit), magnetic shunts become the main cores working on magnetic energy. The cross-sectional area of the magnetic side shunts can be several times smaller than the cross-

sectional area of the main cores located across the axis of the magnetization coils. All devices can be divided into two types with axial and transverse to the coil axis of the main working cores made of ferromagnet. The shape of the shunts and all the magnetic field vortices in the magnetic circuit will also depend on the gaps and their location.

[0071]

To reduce costs and noise and vibration losses during magnetostriction, rubber of different densities can be used as a dielectric in the gaps.

In this case, the rubber is compressed and this is already an additional form of accumulated magnetic-elastic energy in devices. Rubber inserts dampen vibrations and accumulate the energy of magnetoelastic oscillations during magnetostriction and during magnetic ponderomotive force interaction of ferromagnets during magnetization. This is due to the force magnetic attraction of ferromagnetic volumes through gaps in devices and is especially strong in electrical steel with high magnetic induction and massive steel packs. Rubber and other elastic elements create conditions for the accumulation of magnetic-elastic energy in devices. Magnetic-force mechanical effects can be used in the separation of magnetic fields and to obtain free electromechanical energy in the form of linear oscillations or rotor rotation. The inductor coil magnetizes or remagnetizes the core with alternating current, and the core (or cores) itself creates linear or rotational forces with its magnetic field on another core made of a magnetically soft ferromagnet or in the form of a permanent magnet.

At the same time, the cost of magnetization reversal is much less than the magnetic energy of the core due to the fact that its ferromagnetic field is almost not connected or mostly not connected with the inductor coil. The resulting electromechanical power can be many times greater than the cost of electricity in the inductor. The magnetic field of a ferromagnet core inside the inductor (or next to it) can create both linear forces and movements of another core or magnet and give a rotational component to another core or magnet in the role of a rotor.

[0072]

You can remagnetize the core with a coil, and it will move its field to another core and through the rod and a permanent magnet or electromagnet and generate current in the coil around the magnet.

It is also possible to have a radial arrangement of cores with coils and axial magnetization. It is possible to make axial magnetization and change the rotor core and it will rotate in the magnetic field of the magnets. The location of heavy massive and overall fragile magnets on the stator is more profitable and easier to remagnetize the rotor itself without contact with different types of topology. You can also use a linear version of the motor in the movement of the core in the field of permanent magnets, which is mechanically simpler and stronger. In this case, the steel core is remagnetized by alternating current and moves in the field of magnets from both sides or rotates if it is a rotary version of the device.. The linear version is simpler and more efficient in terms of magnetic attraction.

[0073]

1007 In principle, the shape of the devices can be made in the form of an annular or rectangular core and when its two ends of one (annular or rectangular) monolithic ferrite or prefabricated core enter from both sides into one magnetization coil.

1010 The inductor coil, as it were, covers the ends and the gap between the ends itself.

[0074]

1014 In fact, one magnetization coil works immediately on two ends of the same core.

1015 The core of a ferromagnet is essentially a torus or a rectangular magnetic circuit with a gap in which the inductor coil is located. The window of such a magnetic circuit can be enlarged and a gap of such a value can be selected that is necessary for closing most of the magnetic energy of a ferromagnet outside the gap region. Windings for energy removal are located in the region of the magnetic equator of this core in the middle part or along the entire length of the ferromagnet.

[0075]

1024 The middle part of such an annular or rectangular core can have a larger section by several times or more in area to obtain a larger useful magnetic flux and lower costs in the inductor coil in the gap area.

1027 This is a special-shaped core and it must have a sufficiently large volume of the magnetic circuit window and its size, and to close the stray magnetic field outside the gap and the inductor coil, there is a place for the inductor coil of the desired diameter and a place for the windings on the ferromagnet itself.

[0076]

1034 The toroidal core of the torus shape and other core shapes can be divided into two or three or more segments with gaps between them and the formation of separate magnetic fields around each segment of the prefabricated core.

1037 The number and location of the coils can be different both on the segments and in the area of the gaps between them. Coils can be wound on the gap area to reduce the magnetic coupling with the cores and reduce the size of the coils.

[0077]

1043 It is possible to use an open magnetic system of the inductor coil and from two straight or T-shaped cores or with a more complex shape of external end projections.

1045 These cores, with their inner ends, enter one common magnetization coil, which, as it were, covers the gap area between them and partially their end part. Between such cores there can be an additional small core (through dielectric gaps) of a ferromagnet in the form of a plate, tablet or ring of ferromagnet. Several, two or three or more pairs of such cores can also be closed with external magnetic shunts (with or without gaps) for more efficient magnetization. Cores can also be made from ready-made U-shaped or E-shaped or cup forms of ferrite, for example, and a device with an almost closed magnetic circuit along the contour can be made from a pair of such cores. The magnetization coil is a magnetic dipole and it can work two such cores at once. For example, a flat or disk coil inductor between two ferrite cups or planar or low profile E-shaped ferrites. Removable windings are located on the central cores of these ferrites and can be connected in series for a common load.

1056 Unlike the usual shape of a ferrite cup and other forms, the area of the central core of such a ferrite can be several times larger than the sum of the side branches and parts. In this case, the task is not to close the magnetic flux, but first of all, it is necessary to obtain the maximum magnetic flux of dispersion through the air around each such ferromagnetic volume.

[0078]

1063 Ferrite and amorphous iron cores can be both special and any finished traditional shape.

1064 For example, a simple core of two U-shaped or U-shaped cores can have both magnetization coils in and around two gaps and just one magnetization coil around one of the gaps. This reduces energy costs and allows the use of a magnetic circuit with a narrower magnetic circuit window where there is no space to place two coils. It is possible to combine together two and three and even four pairs of such cores and get an already branched magnetic circuit of a W-shaped or cruciform (in the projection from above) not only not only a flat, but a volumetric branched form of a magnetic circuit. The magnetization coil covers only the central gap of the assembly of four or six and eight ends. Removable windings are located on all or part of the ferromagnetic cores.

[0079]

1076 Cores can be made from a mixture of plastic and iron filings and the mixture structured so that the axes of the elongated filings are along the axis of the working magnetic field.

1078 This is achieved simply by placing the melt in a strong external constant magnetic field and solidifies after the axes of the sawdust are extended along the field. Such a magnetic metamaterial is much cheaper than amorphous iron, but it has very low eddy current losses due to the plastic between the ferromagnetic particles. In fact, it is a kind of magneto-dielectric made of plastic and iron particles.

[0080]

1086 If a pair of W-shaped cores is used, or as they are also called two E-shaped cores, then only one magnetization coil can be made around the gap in the area of \u200b\u200bthe central

cores.
1089 And you can make and make three magnetization coils

[0081]
1093 A core in the form of a torus or a rectangular magnetic circuit can be divided into any number of segments and coils on them.
1095 For fastening such a prefabricated core of segments and dielectric gaps, special one-piece or split plastic cases can be used. These plastic cases can be made of two identical or different parts in the form of a base and a kind of cover and have grooves for mechanical fixation of the cores and gaps between them. These plastic pencil cases may have grooves slots for ventilation and perform the function of noise reduction and are applicable both for assemblies made of ferrites and amorphous iron and for massive magnetic circuits in the form of cores from bundles of electrical steel for tens of kilowatts. The canisters themselves can also be detachable to accommodate the coils during assembly.

[0082]
1106 A magnetic circuit with a gap can be branched as in an armored or three-phase transformer and have a gap in the central rod around which the inductor coil is located.
1108 The location of the gap and the shape of the central core can be different, and the core itself in the central part can be made in the form of inserts or monolithic in the form of a slot. In fact, it can be topologically an armored transformer with a gap in the central part of the central core of a regular or low profile with an enlarged window in width for the location of the inductor coil. The window width should be sufficient both to locate a magnetization coil that is wider (than the core itself) in diameter and to close the magnetic fields of the ferromagnet stray outside the inductor coil. In this case, removable coils are located either on the side branches of this core or on its side arms.

[0083]
1119 The simplest device consists of two straight cores in the form of a cylinder or rectangular section.
1121 Cores can also be T-shaped with two or three or four narrower protrusions (monolithic or overhead) on the sides or corners to reduce the demagnetizing factor at the end of the core remote from the inductor. The shape of the end of the core facing the inductor can be made specially narrowed to reduce the diameter of the inductor coil. The reverse side is made straight or a special shape with narrower ledges. The protrusions can be either on the sides or corners. The number of protrusions is two or three or four and their shape is any to increase the induction of the core. Cores can be W-shaped or E-shaped The core or main working core can be and generally is located simply across the axis of a flat or disk magnetization coil, in which case the magnetic field of the core turns out to be almost all

turned ninety degrees to the axis of the coil. This allows you to use the entire plane of the magnetization coil and increase the cross section and even make the cross-sectional area of the core itself larger than the area of the coil.

1133 This topology is applicable to both simple magnetic circuits and branched magnetic fields in the core. Essentially one, two and three flat coils are sandwiched between two massive ferromagnetic cores. For better magnetization, side attached and other magnetic shunts made of ferromagnet (with or without gaps) or small own or overhead small protrusions as in W-shaped cores can be used.

[0084]

1141 Small auxiliary cores inside flat coils and separated by gaps from the main transverse cores can also be used.

1143 In essence, this is the same as two or three coils with cores, but shunted with massive magnetic shunts through the gaps. At the same time, the magnetic shunts themselves become the main working cores in the system, and removable secondary windings are located on them in the magnetic circuit. If three coils and two transverse cores are used, then the secondary coils need four sections and are located taking into account the branching of the magnetic flux. If two flat or low profile inductor coils are used, then two secondary coils are needed. You can also use three transverse cores and then you will need four or six (with a branching of the magnetic flux) secondary coils between them. In this case, two pairs or three pairs of coils work to magnetize together on a common core in the center on the core in the middle, and this enhances their overall double magnetic effect. The device may be of a pair of parallel massive straight cores and two flat disc magnetizing coils between them and working in accordance with the magnetization.

1155 This is a transverse arrangement of the axis of the cores to the axis of the coils, and at the same time the magnetic field of the cores is actually deployed ninety degrees along the axis of the coils, which weakens the magnetic connection. In this case, the removable windings on the cores are located in the middle part between the inductor coils. The device may have small auxiliary cores and magnetic shunts with gaps at the ends. You can use three parallel cores and four inductor coils between them, while all four inductor coils work simultaneously on the central core, which enhances the induction. And three removable windings are located on the middle part of the cores.

[0085]

1166 The device may be in the form of a pair of flat or disc coils and a pair of wide and long cores above and below the coils and which cover the plane of the coils.

1168 The cores are located, as it were, transversely to the axis of the coils and, as it were, close the magnetic system. The distance between the cores is chosen so that their magnetic fields form separate magnetic vortices. Removable coils are located in the middle part of each core. A feature of this topology of the device is that the entire magnetic field of the inductor coils acts on the ferromagnetic core, but the magnetic field of the cores is weakly magnetically coupled to the coils. The magnetic field of the cores is located partly across the axis of the coils. In this case, it is possible to make the cross-sectional area of the cores close and even several times larger than the cross-sectional area of the inductor coils themselves. This cannot be done with an axial topology. The transverse arrangement of the core axis to the axis of the magnetization coil is not used in conventional electrical engineering.

[0086]

1181 The device can also be made multilayer, for example, from a pair of coils and three cores.

1182 In this case, the magnetic fields of the coils are added according to the central core between them and mutually reinforce the magnetization. This makes it possible to increase the cross-sectional area of the central core by several times more than the cross-sectional area of the lower and upper core. Such a device would have three cores and four inductor coils between them, and three detachable coils in the middle of each core. The device can be supplemented with auxiliary small round or rectangular cores inside each flat or disk magnetizing coil. Core materials may differ in grade of steel or ferrite in different parts or segments of the magnetic circuit. It is even possible to use sheets of charge of different grades of electrical steel in one pack. This makes it possible to effectively use both weak and strong magnetic fields of magnetization and different levels of magnetic induction of ferromagnets.

[0087]

1196 In fact, this general magnetic topology of devices with transverse (to the coil axis) cores can technically be reached by going from a pair (or three) square or rectangular inductor coils with small rectangular cores (inside the coils) and a pair of magnetic shunts above and below the closing (partially and through the gaps) this pair of coils.

1200 Closing the plane of the magnetization coils (operating according to the magnetic field) across completely to the edges of the coils. In such a device, almost the entire magnetic field of a flat inductor coil abuts against the shunt and acts by magnetization on the magnetic shunts across each coil. This makes it possible to make magnetic shunts with a large area and make them the main working ferromagnetic cores. At the same time, their removable windings are already located on the magnetic shunts in their middle part. Such a system can also be multi-storey vertically from many levels in height. For example, three magnetic shunts and four inductor coils. If there are two magnetization coils in total, then an essentially ordinary magnetic circuit with gaps is formed. If a pair of magnetic shunts closes three magnetization coils working in accordance, but an already branched magnetic circuit is formed with a branching of the magnetic field in the shunts in their middle part. In total, four magnetic vortices of the ferromagnetic field are formed in the magnetic shunts.

1212 Then you will need four removable windings wound from the middle of each magnetic shunt.

[0088]

1216 The device can simply be in the form of two straight long wide rectangular cores that lie (like two sleepers) with their middle part above and below across the flat magnetization coil.

1218 The length of the cores is several times greater than the diameter of a rounded or square coil, and the width of the core is approximately or slightly larger than the size of the coil. The magnetic flux from the magnetization coils branches in the cores in the middle part, and at the same time, four magnetic vortices of the magnetic field are formed in the cores. In such a device, four removable windings are needed, two on each core, and which are wound taking into account the branching of the magnetic field to the left and right of the coil axis. The advantage of this type of device and topology is that the entire magnetic field of the coil acts on the cores and it is possible to increase the cross-sectional thickness of such a core even more than the diameter of the inductor coil itself. From the center of a flat disc coil, you can place a small auxiliary ferromagnetic core (it can be made from a different brand of ferrite or steel), which is several times smaller than the diameter of the coil or its side. Such a core is not inductively connected to the coil and requires almost no magnetization costs and gives the effect of free ampere-turns of magnetization.

1231 The auxiliary core is separated from the main core by dielectric gaps! to separate most of the energies and vortices of magnetic fields and magnetic fluxes, "general transverse cores of steel packs are made taking into account the direction of the charge of steel along the coils. The side ends of these cores can be closed with magnetic shunts through gaps for better magnetization. If the gaps between the ends and magnetic shunts are large, then the system can be considered as a pair of transverse cores and shunts. If the gaps are small, then the so-called armored circuit is formed in which the magnetization coil is, as it were, inside the armored transformer.

[0089]

1242 The device can be in several layers as floors in the form of three horizontally located (conditionally to the vertical axis of the coils) cores and two magnetization coils between them.

1245 At the same time, the magnetization coils give the addition of their opposite and branching magnetic fields in the central core, and its area cross-section can even be increased several times compared to the lower and upper core. In such a device there will be six separate magnetic vortices of a ferromagnet and six removable windings are needed, taking into account the topology of the branching of the magnetic field in each core from the axis of the inductor coils.

[0090]

1254 According to the topology, this device from two transverse (to the inductor) cores without side shunts can also be made from three magnetization coils with one main and a pair of smaller side coils for biasing the end parts.

[0091]

The device can be as simple as two or three coils with short straight cores with inductor coils between them.

The magnetic fields at the ends of these cores can be closed by side shunts with or without gaps, and then the magnetic circuit will look like a three-phase transformer with two slots for flat or disk magnetization coils.

In this topology, there can be as few as two magnetizing coils. If the magnetic system is similar to a pair of W-shaped magnetic cores (separated by gaps) of a low profile and with an increased cross section, then two coils can be used on a common central groove in the gap or three coils (can be of different sizes and windings) of magnetization on each pair of protrusions. Such systems may have a low profile and additional small cores in the gap between the E-shaped cores to enhance the magnetization effect.

[0092]

The cores can also be transverse along the axis to the axis of the magnetization coils.

For example, two massive long parallel cores lie across the axis of the magnetization coil. If the axis of the coil is considered vertical, then the cores lie across horizontally. The magnetic field in them branches from the axis and center of the coil to the left and right, and to remove the magnetic energy, four windings wound from the middle part of the cores are already needed. The ends of these massive two cores can be closed with magnetic shunts through the gaps for more efficient magnetization. In this case, magnetic energy can also be removed from the magnetic shunts themselves with the help of two more removable windings on the shunts. But the main cores are transverse and their cross section can be sharply increased in area and, taking into account the four vortices of the magnetic field, the total cross section and magnetic flux can be obtained over an area larger than the area of the magnetization coils. This is a very unusual technical and generation-efficient design solution in electrical engineering.

[0093]

Simple coils with cores can be different in the shape of the closure of the total magnetic flux, but different in the shape of the cores themselves assembling them into a common magnetic circuit.

For example, a pair of U-shaped cores with two magnetization coils in the region of gaps (covering gaps) can be converted into a device of four U-shaped cores forming a branched magnetic circuit with a common increased magnetization coil that immediately covers four ends of four U-shaped cores. One common wide magnetization coil can immediately cover (in the gap area) eight such U-shaped cores forming a branched already in not in plane, but a magnetic circuit branched, as it were, in volume. The cores can also have an 11-shaped form of a ferromagnet.

[0094]

1303 Consider a technically simple version of the device in which a small or large magnetizing coil simply adjoins the end of the core or partially covers it.

1305 But not tightly due to the diameter of the coil, and so that most of the magnetic field of a ferromagnet is not inductively coupled to this magnetization coil. The ferromagnetic volume can be in the form of a straight rod and one magnetization coil from the end. Either the magnetization coil coactally covers the core as in a conventional inductor, but due to its diameter it is weakly connected with its magnetic energy, which is closed inside this coil without magnetic connection with it. The core can be as simple as a straight shape or have small side protrusions like the teeth of electrical machines to reduce the demagnetizing factor and increase the magnetic induction. The protrusions can be like the core itself or made in the form of a transverse ferromagnetic lining) for example, in the form of a pack of plates on the ends of the core and protruding on the ends, which is convenient for ease of manufacture of the core. The coil itself can be of the usual cylindrical shape like the core itself, or made in the form of a rectangle or with straight sides and slightly rounded edges.

1317 The ferromagnet itself in the form of a ferrite or a pack of steel plates can be made to increase scattering in the form of a narrow elongated rectangle in cross section, which increases the magnetization and the scattering surface in relation to the cross-sectional area of \u200b\u200bthis core. These are already coils and cores of a special shape to increase magnetic scattering and magnetization.

[0095]

1325 The core made of plates of electrical steel, taking into account the direction of the charge of steel, must be made from a pack of narrow plates and have a main scattering field across the plane of the plates.

1328 This is due to eddy currents in the steel plates. Such a core made of relatively narrow steel plates is better magnetized than a square core of the same section in area and has more magnetic scattering in the near zone around this core. The magnetizing coil is better than a rectangular shape or a round shape with straight sides and rounded corners.

[0096]

1335 The dimensions of the magnetizing coil (inductor), such as the distance of the wires from the core and taking into account its height and thickness, are selected so that a large magnetic energy of the ferromagnet closes without inductive coupling with the turns of the coil.

1338 Rectangular coils and rectangular cores are more efficient in terms of magnetic scattering and magnetization with a smaller length or height of this core. The bundle of steel plates or ferrite can be further divided into separate narrower bundles or ferrite rods with dielectric gaps between them for better and more efficient magnetization.

[0097]

The magnetization coil can be sort of divided into two separate sections that are shifted to the ends of a long ferromagnet for more efficient magnetization or to reduce the diameter of the coils when using a longer core.

Essentially it can be thought of either as two separate coils or as two magnetizing coil sections. The core can be of a simple straight shape or have a narrowing at the ends in the form of a spindle for a sharp reduction in size and magnetic connection with the magnetization coil. The narrowing can be smooth or stepped and in the form of a composite or attached narrower core. Also, magnetization coils can have their own small auxiliary ferromagnetic cores that are separated by gaps from the main large core. It should be noted that the material of the ferromagnet may be different in this case. One magnetization coil can act immediately on two ends of the core if this core is not straight, but in the form of a torus, an annular or rounded shape, or in the form of a rectangular magnetic circuit with a gap. In this case, the coil covers the gap or the end parts of the ferromagnet in the area of the gap. The window of such a magnetic circuit with a gap is made enlarged to accommodate the magnetization coil around the gap and for the removable winding and for the magnetic dissipation itself.

The gap is selected so that most of the magnetic field goes into dispersion, bypassing the gap. And the dimensions of the magnetization coil and its location in the gap are calculated so that most of the magnetic field of the ferromagnet would not be associated with this coil. The magnetic circuit can be simple or branched, including in volume, and then one magnetization coil can act on two, three, or even four or more cores with one common or combined gap. The winding for picking up ferromagnetic energy is located in the region of the magnetic equator between the poles of the magnetic field or along the entire length of each core.

[0098]

In a magnetic circuit with a gap, there can be one section in terms of area and shape of the section or a special shape with an increased section of the magnetic circuit in the region of the magnetic equator and a reduced section in the region of the ends and the gap.

This is necessary to reduce the cost of magnetization and to reduce the size of the magnetization coil. The magnetic circuit can be in the shape of a torus or a rectangular shape with a gap. In fact, this is one core with one gap and one magnetization coil. The winding for converting the magnetic energy of a ferromagnet is located on its middle part or is distributed along the entire length of the magnetic part of the ferromagnet. The device can be in the form of a magnetic circuit of an armored transformer or in the form of a magnetic circuit approximately like a three-phase transformer and with a gap in the central core, and around which the magnetization coil is located. The magnetization coil partially covers the ends of the core in the gap, but is not wound on them, but is much wider. The entire topology and gap, and the window of the magnetic circuit are chosen so that most of the magnetic field of the magnetic circuit is closed outside the magnetization coil without inductive feedback from it.

1386 With this topology, almost the entire magnetic field of the magnetization coil is successfully used with a low-profile window of the magnetic circuit and its small height relative to the width of the core. The central core can also be in the form of a separate insert core as an auxiliary inside (with gaps) flat or disk coil in the window of this rectangular magnetic circuit without a central core.

[0099]

1394 The magnetic system can also be in the form of two U-shaped or U-shaped parts and two gaps and two magnetization coils in the area of the gaps.

1396 In such a system, two gaps are chosen so that, in fact, almost two separate ferromagnetic volumes and two magnetic energies of a ferromagnet are almost unrelated to each other.

[0100]

1401 The device may be simply a long straight current-carrying wire, or a closed coil of current-carrying wire and one or many individual ferromagnetic volumes separated by gaps around the current.

1404 The cores can be both inside the coil or coils of this circuit, and only outside around the circuit. In this case, the cores can be around the wire or in the form of cores with a gap.

[0101]

1409 Separate types of devices are volumetric branched magnetic circuits where one inductor coil acts immediately through the central core with a gap of three or four (or more) side branches.

1411 At the same time, to reduce the cost of magnetization in the inductor and its size, the cross-sectional area of the central core can be made several times smaller than the total area of all side branches. This is the main difference between generators and conventional branched magnetic circuits. Also, for more efficient magnetization, the inductor coil can be almost flat (or disk), and the entire magnetic circuit is low profile with a low magnetic circuit window. Such an inductor coil acts on the U-shaped segments of the side branches with all its magnetic field over the area. One inductor coil magnetizes immediately through the central core three or four U-shaped side branches in the shape of a cross (top view). The central core only partially closes the magnetic fields of the side branches. The cross-sectional area of the parts of these U-shaped lateral branches may be several times or more greater than the area of this central core. The central core either has a gap or is made in the form of an insert (through the gaps) in the form of a small auxiliary insert core inside a flat magnetization coil.

1424 Gaps are needed for magnetic energy dissipation. Most of the magnetic field of the side branches of such a flat or three-dimensional branched magnetic circuit is closed outside the central core only around the side branches. The role of the central core is only auxiliary for the magnetization of the side branches from the inductor coil. Each side branch has its own removable winding. The magnetizing current is supplied only to the inductor coil, and the electric power is already removed from the inductor and from all three or four side branches of the ferromagnet. In fact, the horizontal and lateral parts of each U-shaped core are the main carriers of free ferromagnetic energy.

[0102]

1435 The magnetic circuit can also be pseudo-branched from closed (with or without a gap) cores simply attached to one side.

1437 But to reduce the cost of magnetization, it is better to make the cross-sectional area of the central core several times smaller than the sum of the cross-sections of the side branches. In this case, the size or diameter of the inductor coil itself can be reduced several times. This is different from conventional branched magnetic chains (for example, flat ones) where the sum of the cross sections of the two side branches is usually equal to approximately the cross sectional area of the central core. The number of side branches can be three or four or more. The optimal number is four side branches in the shape of a cross when viewed from above. The magnetic system of the side branches of ferromagnets in such a volumetric branched magnetic circuit of ferromagnets in the device simply, as it were, repeats the shape and topology of the magnetizing magnetic field of the inductor coil itself. If the coil is flat, then the magnetic system is also low profile in height if the axis of the inductor coil is considered vertical. When manufacturing a ferromagnet from electrical steel charge sheets and joining and laying packs of the central part at an angle of ninety degrees, this technical parameter must also be taken into account.

[0103]

1454 In such volumetric branched magnetic circuits, it is possible to make the maximum amount of volume of magnetizable cores from a ferromagnet magnetized from just one common inductor coil around and in the region of the central core.

1457 In fact, the cores of a ferromagnet are magnetized both through transverse magnetization to the axis of the inductor coil and through the central core from the entire magnetic field of the inductor. According to the law of full current, the circuit also works to bypass the magnetic circuit around the inductor coil. In low-profile magnetic circuits, the transverse magnetization (point-blank) of all horizontal parts of U-shaped ferromagnets by the magnetic field of magnetizing part of the area of a flat or disk inductor coil also works. In this case, the magnetizing magnetic field of the inductor coil works on ferromagnetic cores directly from the plane of the coil and almost point-blank with the strongest magnetic field in the plane of the coil. This allows you to significantly increase the cross-sectional area of all both horizontal and vertical parts of these side branches of this branched magnetic circuit and to a large extent times compared with the cross-sectional area of the ferromagnet of the central core in the central part (in the center of the coil) of the inductor.

[0104]

1472 It is possible to make such a composite volumetric branched magnetic circuit from eight ready-made U-shaped cores (for example, from ferrites) with a common inductor.

[0105]

1477 All topologies of devices in the form of a ferromagnet must take into account and, as it were, repeat the topology and shape of the magnetic field of the flat magnetization current around a flat magnetization coil as a form with the highest magnetic field strength with the same number of turns with current.

1481 Therefore, the optimal shape is a kind of armored core with a massive ferromagnet and a wide and low magnetic circuit window to accommodate a flat or disk inductor coil.

1483 Inside this coil there may be a small auxiliary core made of a ferromagnet. The thickness of the horizontal parts of this armor core and their cross-sectional area may be greater than that of the side parts. As the magnetic saturation of the magnetic induction can be magnetized, a very large cross section of the horizontal parts located across the axis of the magnetization coil.

[0106]

1491 The magnetic field branches approximately in the middle part of the horizontal parts of this armor core.

1493 Removable windings can be wound in different topologies both on the horizontal arms of this magnetic core and on its side parts. The coil is inserted directly into the window of this armor core. The width of the window and the height of the window of this rectangular magnetic circuit and the width of this very disk, flat or low-profile magnetization coil are chosen so that most of the magnetic field of the ferromagnet is closed in the window and outside the inductor coil without inductive coupling with it. This form of device is most suitable for massive ferromagnetic cores made of sheets of transformer, electrical or dynamo (generator) steel and for high power of tens and hundreds of kilowatts and megawatts. In this type of devices, almost the entire magnetic field of the coil acts on iron, and in this case, the maximum cross section and mass of the ferromagnet can be used for a given inductor area. Devices can have two grooves for inductors and resemble three-phase transformers in shape if (for clarity of form) they are placed on their side for the vertical axis of the coils.

1505 Two inductor coils are placed in the grooves of this device and their magnetic fields in the central rod are added and branched in opposite directions and their magnetic fields of magnetization are summed up. In fact, these are two armored cores stacked on top of each other. Removable windings are located on the vertical and horizontal parts of this magnetic system.

[0107]

1513 In devices with a transverse arrangement of cores, the magnetic field and magnetic vortices of a ferromagnet are actually partially and significantly deployed ninety degrees with respect to the coil axis and parallel to its plane.

1516 This greatly enhances the effect of magnetic field dissipation, from the magnetization circuit. This type of topology can be used both with a simple magnetic circuit and with a branching of the magnetic flux in the middle part. The system may be of several layers of such parallel cores and flat inductor coils between them. You can use end magnetic shunts and small auxiliary cores between them in the inductor coils.

[0108]

1524 All devices differ in ferromagnets only by the number of cores or its shape of the core, or only by the shape and cross section of its various parts, both individual and the general magnetic system of fields in the magnetic circuit and in the air around the cores.

1527 According to the location and number of magnetization coils and removable windings. Switching circuits and current forms in the inductor and free conversion circuits ferromagnetic energy differ in keys and connection schemes of the inductor and removable windings and the type of conversion of all magnetic energy and its use in electrical circuits.

[0109]

1534 All the described physical and technical effects of generating additional additional electricity due to the separation of magnetic fields are very successfully and experimentally fully confirmed in numerous research pilot installations and in industrial prototypes of experimental devices.