

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
26 August 2010 (26.08.2010)

(10) International Publication Number
WO 2010/094993 A1

(51) International Patent Classification:
H01F 29/14 (2006.01)

(21) International Application Number:
PCT/IB2009/000378

(22) International Filing Date:
23 February 2009 (23.02.2009)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant (for all designated States except US): **KHERPY LIMITED** [CY/CY]; Georgiou Markidi, 2, 1st floor, Flat/Office 1, P.C. 1066, Nicosia (CY).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **MATSANOV, Roman Ionievich** [RU/RU]; ul.Nikitinskaya, d. 75, kv. 79, g. Samara, 443041 (RU).

(74) Agent: **SALMINA, Olga, Borisovna**; a/ya 1, Moscow, 121096 (RU).

AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

(54) Title: PULSE GENERATOR (VERSIONS)

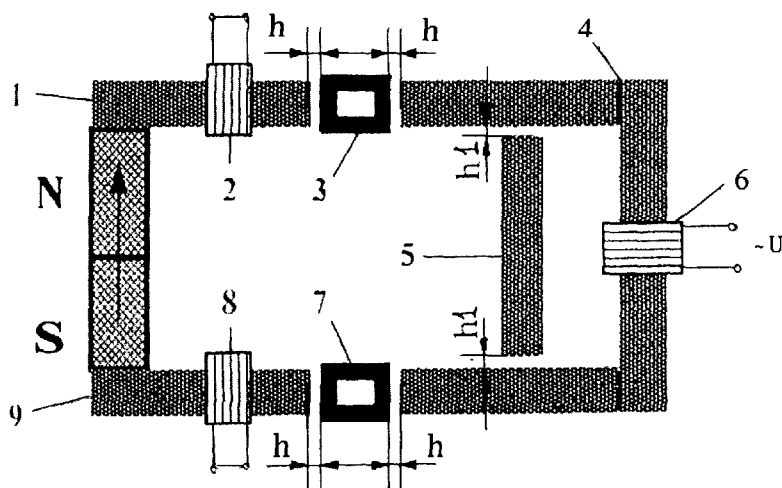


Fig. 1

(57) Abstract: The invention relates to converter equipment for electric power generation by means of converting constant magnetic field into alternating current without mechanical moving parts. The technical result is the increase of efficiency- output due to decrease of the response from the generator output to the input and improvement of output waveform. The technical result is achieved due to the fact that the input magnetomotive force supply is, for example, the permanent magnet connected to the input cores 1 and 9 at two opposite poles. The short-circuit windings 2 and 8 are wound on the input cores 1 and 9, and in the core break the variable resistors 3 and 7 are inserted, which have nonmagnetic gaps with the input cores 1 and 9 and with the output core 4. The output core 4 has the output winding 5. According to the first version the output core 4 is wrapped with the additional core 5, which has higher resistance as compared to the output core 4 and forms with it nonmagnetic gaps.

PULSE GENERATOR (VERSIONS)

Art

5 The invention relates to converter equipment, namely to the pulse generators.

Background art

10 Currently in use is the trancegenerator (patent JSTe 2282914, the RF, published on 27.08.2006) containing the core of three paths. A primary and a short-circuit winding are installed on the one of the paths. Out-paths are made in form of circle parts, inside of which a rotor is installed connected to a drive motor. A secondary is installed on the core path. The primary circuit contains an inductor, a switch, a storage battery, a d.c. generator. The secondary path circuit contains a
15 load motor and a three-phase alternator. The above trancegenerator makes possible reduction of feedback effect, however it is necessary to enlarge device dimensions, which results in increase of device specific quantity of metal and in presence of mechanical moving parts.

20 Currently in use is the electromagnetic generator (patent 6362718, USA), which consists of a permanent magnet and a magnet core, forming the first and the second magnetic tracks, and coils. The first input coil and the first output coil are located in the area of the first magnetic track, whereas the second input coil and the second output coil are located in the area of the second magnetic path. The
25 input coils have alternating pulsation providing inducing pulse current

in the output coils. The current passing through every input coil reduces the level of the magnet magnetic flux, around magnetic track of which the input coils are located. The magnet core is a laminated core stack with spacers and permanent magnets between the laminations. The output coils are located around these spacers. The input coils are located around the part of laminations and initiate pulses, which induce current in the output coils.

However the above electromagnetic generator has strong response from output to input, low specific power and under-efficiency output.

Disclosure of the invention

Technical results of the claimed pulse generator are the increase of efficiency output due to decrease of the response from the generator output to the input and improvement of output waveform.

The invention objective is creation of a pulse generator with advanced capability due to feedback response reduction and extension of number of magnetic electric converters.

To obtain the technical results the engineering solutions are created associated by an integral inventive conception.

The first version of the claimed device is the pulse generator, which is a constant magnetomotive force input supply transformer containing input cores with wound short-circuit winding. At two opposite poles the input cores are broken by the variable-resistance inserts, which have nonmagnetic gaps with input cores and with the

output core. The output core has the output winding and is wrapped with the additional core having higher magnetic resistance as compared to the output core magnetic resistance and forms nonmagnetic gaps with the output core.

5 The second version of the claimed device is the pulse generator, which is a constant magnetomotive force input supply transformer containing the input cores with the wound short-circuit winding. At two opposite poles the input cores are broken by the variable-resistance inserts, which have nonmagnetic gaps with the input cores
10 and with the output core, on which the output winding is wound. The output core is wrapped with the additional core forming on edges integral structure with the output core and in the middle of the additional core there is the insert with the variable resistor, which at two opposite ends has nonmagnetic gaps with the additional core.

15 The third version of the claimed device is the pulse generator, which is a constant magnetomotive force input supply transformer containing the input cores with the wound short-circuit winding. At two opposite poles they are broken by the variable resistor inserts, which have nonmagnetic gaps with the input cores and with the output
20 core, on which the output winding is wound. The output core is wrapped with the additional core, on which a key control winding is wound.

 In contrived engineering solutions generation of constant magnetomotive force can be made by three methods. In accordance
25 with the first method the permanent magnet is used for generation of

constant magnetomotive force. In accordance with the second method for generation of constant magnetomotive force a coil is used, the winding of which is connected to the power supply through the d.c. stabilizer. In accordance with the third method for generation of constant magnetomotive force a coil is used, the winding of which is connected to the direct voltage source through series connected the resistor and the choke.

To obtain the best effect it is preferred to select nonmagnetic gaps between the input cores, the variable resistors and the output cores of the inequality $h \geq 0.1$ mm, for nonmagnetic gaps between the output core and the additional core - of the inequality $h_i \geq 0.1$ mm.

Variable resistors allow to vary magnetic flux passing through the output core and to form output voltage.

The output core with the wrapping additional high-resistance core is used for forming output voltage and diverting magnetomotive force of output winding response when magnetic flux, passing from the magnetomotive force input supply, is cut off.

The output core with the wrapping additional core with the inserted variable resistor is used for forming output voltage and diverting magnetomotive force of output winding response when magnetic flux, passing from the magnetomotive force input supply, is cut off.

Short-circuit windings are used for reducing response from the output winding to the input magnetomotive force supply due to

generation of the magnetic flux neutralizing the magnetic flux of the response from the output winding.

The permanent magnet at input allows generation of constant magnetomotive force.

5 The input winding supplied through the current stabilizer allows generation of constant magnetomotive force.

 The input winding supplied from the d.c. voltage supply through the limiting resistor and the choke allows generation of constant magnetomotive force at the input, where the choke is used for additional pulse smoothing and the resistor is used for limiting Zener
10 current rise in the input circuit.

Embodiments of the invention

 Further on the invention is illustrated with particular cases and
15 drawings, where

 in the Fig. 1 the general view of the pulse generator is shown according to the first claimed version;

 in the Fig. 2 the general view of the pulse generator is shown according to the second claimed version;

20 in the Fig. 3 the general view of the pulse generator is shown according to the third claimed version;

 in the Fig. 4 the constant magnetomotive force supply scheme is shown according to the second version;

 in the Fig. 5 the constant magnetomotive force supply scheme is
25 shown according to the third version;

in the Fig. 6 output voltage, magnetic flux, variable resistance curves are shown if variable resistances vary in compliance with the law close to the cosec law " $\text{cosec } x = 1/\sin x$ ";

5 in the Fig 7 output voltage, magnetic flux, variable resistance curves are shown if variable resistances vary in compliance with the law close to the hyperbola law " $y = 1/x$ ";

in the Fig. 8 permeability- induction curve is shown;

10 in the Fig. 9 magnetic flux through output winding curve and variable resistance curve are shown for the claimed device according to the second version;

in the Fig. 10 magnetic flux through output core curve and winding control magnetic flux through the core curve are shown for the claimed device according to the third version;

15 in the Fig. 11 one of the pulse generator embodiments scheme is shown.

The pulse generator according to the first version is shown in the Fig. 1. In this device constant magnetic field is generated with the help of the permanent magnets with the core to divert response, when
20 the magnetic flux from the magnetomotive force supply is cut off, and with the output winding for load connection. The generator consists of the permanent magnet, the input core 1 with the short-circuit winding 2, the input core 9 with the short-circuit winding 8, the output core 4 with the output winding 6, the additional core 5, wrapping the output
25 core 4, and has nonmagnetic gaps with it. Also the generator contains

the variable resistor 3 and the variable resistor 7. At both opposite poles the input core 1 and the input core 9 are broken by the inserts of the variable resistor 3 and the variable resistor 7, which have nonmagnetic gaps with the input core 1, the input core 9 and the output core 4.

The pulse generator according to the second version is shown in the Fig. 2. The generator consists of the permanent magnet, the input core 1 with the short-circuit winding 2, the input core 9 with the short-circuit winding 8, the output core 4 with the output winding 6, the additional core 5. Also the generator contains the variable resistor 3 and the variable resistor 7. At both opposite poles the input core 1 and the input core 9 are broken by the inserts of the variable resistor 3 and the variable resistor 7, which have nonmagnetic gaps with the input core 1, the input core 9 and the output core 4. The output core 4 is wrapped with the additional core 5, which forms at the edge with the output core 4 an integral structure. In the middle of the additional core 5 there is the insert with the variable resistor 10, which at two opposite ends has nonmagnetic gaps with the additional core 5.

The pulse generator according the third version is shown in the Fig. 3. The generator consists of the permanent magnet, the input core 1 with the short-circuit winding 2, the input core 9 with the short-circuit winding 8, the output core 4 with the output winding 6, the additional core 5. Also the generator contains the variable resistor 3 and the variable resistor 7. At both opposite poles the input core 1 and the input core 9 are broken by the inserts of the variable resistor 3 and

the variable resistor 7, which have nonmagnetic gaps with the input core 1, the input core 9 and the output core 4. The output core 4 is wrapped with the additional core 5, which forms at the edges with the output core 4 an integral structure. The additional core 5 has the winding 11 controlled by the key 12.

The device operates as follows

The device operating principle is based on the Faraday's law of electromagnetic induction, the Lenz's law, the Maxwell's law. The magnetic flux formed by the permanent magnet passes completely through the input core 1 and the input core 9, if the leakage flux is ignored, and the input core resistance determined by the formula

$$R_{\mu} = L / \mu \mu_0 S, \text{ where:}$$

L is the length of the core area,

μ_0 is the vacuum permeability,

μ is the specific permeability,

S is the area of core cross section, is low.

According to the magnetic flux continuity principle the output magnetic flux of the input core 1 is equal to the input magnetic flux of the input core 9. The variable resistor 3 and the variable resistor 7 make it is possible to vary (control) the magnetic flux through the output core 4 and to form the output voltage at the finishes of the winding 6.

While varying the magnitude R_{μ} of the variable resistors 3 and 7 it is possible to vary the magnitude of the magnetic flux through the

output core 4 and the output winding 6, in which electromotive force is induced, while the magnetic fluxes of the input cores 1 and 9 are constant. The magnitude of the variable resistors 3 and 7 varies in synchronism. When the variable resistors 3 and 7 are outside the saturation zone, the magnetic circuit formed by the members 1-3-4-7-9 is completed and there's no response from the output winding 6 as the short-circuit windings 2 and 8 are wound at the areas of the input cores 1 and 9. This can be explained by the fact the areas of the cores, on which the short-circuit windings are wound, easily conduct the magnetic flux from the magnetomotive force supply as it is constant as per both direction and amplitude.

The variable resistors 3 and 7 control the magnetic flux through the output core 4. If instead of two variable resistors 3 and 7 one is used, there'll be an increased magnetic flux d.c. component in the output core 4.

Operation of the variable resistors 3 and 7, as it is clear from the formula $R_\mu = L / \mu \mu_0 S$, is based on dependence of vacuum permeability on induction B (Fig. 8). While varying the magnitude of induction B in the variable resistors 3 and 7 it is possible to vary the magnitude of vacuum permeability μ over wide range and thus also the resistance R_μ itself. In the Fig. 7 and the Fig. 6 dependences of R_μ , variation of the variable resistors 3 and 7 are shown as well as of magnetic flux F variable component in the output core 4 and of voltage U in the output winding 6. In the Fig. 6 in case of R_μ variation according to the law close to the cosec law and in the Fig. 7 in case of R_μ variation

according to the law close to the hyperbola law. The gaps h between the input cores 1 and 9, the output core 4 and the variable resistors 3 and 7 are used for variable resistor control of only external magnetic fluxes through them and for resistor control energy passing in form of internal magnetic flux through only cores of the resistor itself. This makes possible to reduce effect of other cores on the parameters of the variable resistors 3 and 7. For the technical solution according to the first version the magnitude of the additional core 5 resistance and the magnitude of the gaps h_i is selected so, that the magnetic flux, when the variable resistors 3 and 7 are not saturated, passes through the output core 4. When the magnitude of the variable resistors 3 and 7 increases and the magnetic circuit formed by the members 1-3-4-7-9 is near break, the short-circuit windings 2 and 8 in practice do not disable the response from the output winding 6. Magnetic inertial flux of response passes through the additional core 5 decreasing stored energy in the output core 4 forming pulse fronts in the output winding 6.

Two short-circuit windings 2 and 8 decrease response time and transient time. For the technical solution according to the second version the output core 4 is wrapped with the additional core 5 with the variable resistor 10 at the break of the additional core 5. The variable resistor 10 has at two sides nonmagnetic gaps with the additional core 5. The nonmagnetic gaps are used for optimal control of the variable resistor 10. The variable resistor 10 is used for diverting the magnetic flux of the output winding 6. The most part of

the period the variable resistor 10 is in mode close to saturation and doesn't conduct magnetic flux. When the magnitude of the variable resistors 3 and 7 increases and the magnetic circuit formed by the members 1-3-4-7-9 is near break, and the short-circuit windings 2 and 8 in practice do not disable the response from the output winding 6, the resistance 10 is decreased for a short period to pass magnetic inertial flux of the response and to decrease stored energy in the core 4 and to form pulse fronts in the output winding 6. In the Fig. 9 the magnetic flux through the output winding 6 curve and the variable resistor 10 magnitude curve are shown.

For the technical solution according to the third version the most part of the period the controlled winding 11 is shorted, not conducting the variable component magnetic flux. The controlled winding 11 response to the alternating magnetic flux is disabled by the short-circuit windings 2 and 8 and the entire magnetic flux passes through the output winding 6. When the magnitude of the variable resistors 3 and 7 increases, the magnetic circuit formed by the members 1-3-4-7-9 is near break and the short-circuit windings 2 and 8 in practice do not disable the response from the output winding 6, the key 12 is opened and breaks the short circuit of the controlled winding 11 for a short period to conduct magnetic inertial flux of the response from the output winding 6 and to decrease stored energy in the output core 4 and to form pulse fronts in the output winding 6 (Fig. 10).

The pulse generator scheme in accordance with the claimed invention first version is shown in the Fig. 11. The generator contains the constant magnetomotive force supply, which in accordance with the second method of the constant magnetomotive force generation is the core with the winding 13, which is connected to the power supply (not shown in the drawing) through the d.c. stabilizer 14. One of the supply input circuits is connected to the start push button 15. The pulse generator contains control block 16, the input of which through the start push button 15, the converter 17 and the stabilizer 18 is connected to the power supply. The output of the control block 16 is connected to the pilot coils 19 intended for varying magnitude R_{μ} in the first variable resistor 3 and in the second variable resistor 7.

The pulse generator shown in the Fig. 11 energizing is made with the start push button 15. Voltage from the actuating power source is supplied to the d.c. stabilizer 14 for generation of constant magnetomotive force. Simultaneously voltage is supplied through the DC-DC converter 17 and the stabilizer 18 to the input of the control block 16. From the control block 16 the signal in form of voltage is supplied to the windings of the pilot coils 19. After voltage generation in the output windings 6, 20 and 21 it is rectified, stabilized and supplied to the input terminals A and B appropriately and to the terminal A for power supply of the pilot coil 19 windings. After the start push button 15 is released the pulse generator starts to operate in self-contained mode generating energy for consumers from the

winding 6 and for the generator itself supply from the terminals A and B.

Integration of three generators with the control of resistors with time shifts for every generator by $\frac{2}{3}\pi$ makes it possible to have three-phase operation mode. The output winding of every generator is one phase in the three-phase system.

Field of use

The invention can be used in electrical engineering and electronic industry for electric power generation by means of converting constant magnetic field into alternating current without mechanical moving parts. The pulse generator can work with any termination (active, active-reactive).

CLAIMS

1. The pulse generator, which is the transformer, where the input magnetomotive force supply is at least one permanent magnet connected with the cores at two opposite poles, on which the short-circuit windings are wound, and in the core break the variable resistors are inserted, which have nonmagnetic gaps with the input cores and with the output core, on which the output winding is wound, and the output core is wrapped with the additional core, which has higher resistance as compared to the output core and forms with it nonmagnetic gaps.
2. The generator per point 1 characterized in that the input magnetomotive force supply is the core with the winding, which is supplied through the direct current stabilizer.
3. The generator per point 1 characterized in that the input magnetomotive force supply is the core with the winding, which is supplied from the direct voltage source, with in series the resistor and the choke.
4. The pulse generator, which is the transformer, where the input magnetomotive force supply is at least one permanent magnet connected with the cores at two opposite poles, on which the short-circuit windings are wound, and in the core break the variable resistors are inserted, which have nonmagnetic gaps with the input cores and with the output core, on which the output winding is wound, and the output core is wrapped with the additional core, in the break of which the variable resistor is inserted with nonmagnetic gaps.

5. The generator per point 4 characterized in that the input magnetomotive force supply is generated with the help of the winding wound on the core and supplied from the direct current stabilizer.

5 6. The generator per point 4 characterized in that the input magnetomotive force supply is generated with the help of the winding wound on the core and supplied from the direct voltage source, with in series the resistor and the choke.

7. The pulse generator, which is the transformer, where the input magnetomotive force supply is at least one permanent magnet
10 connected with the cores at two opposite poles, on which the short-circuit windings are wound, and in the core break the variable resistors are inserted, which have nonmagnetic gaps with the input cores and with the output core, on which the output winding is wound, and the output core is wrapped with the additional core, on which the key
15 control winding is wound.

8. The generator per point 7 characterized in that the input magnetomotive force supply is generated with the help of the winding wound on the core and supplied from the direct current stabilizer.

9. The generator per point 4 characterized in that the input
20 magnetomotive force supply is generated with the help of the winding wound on the core and supplied from the direct voltage source, with in series the resistor and the choke.

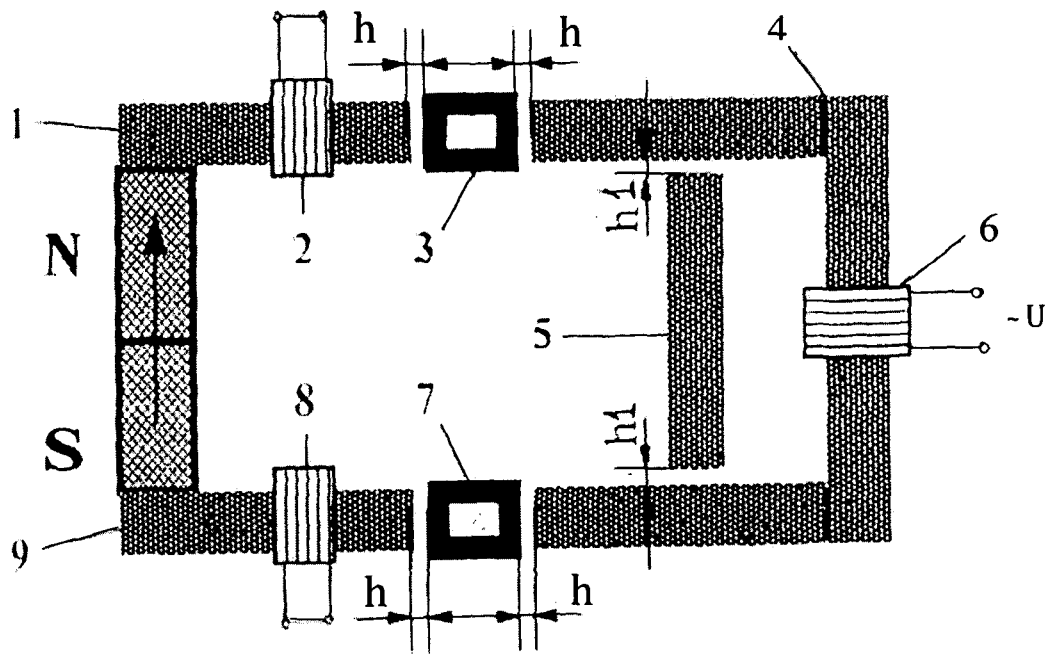


Fig. 1

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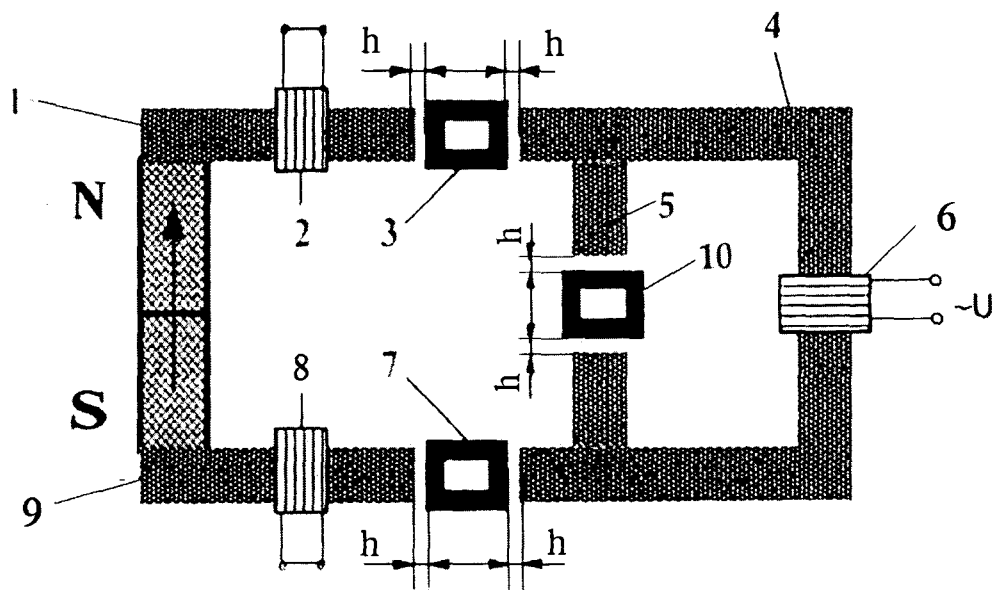


Fig. 2

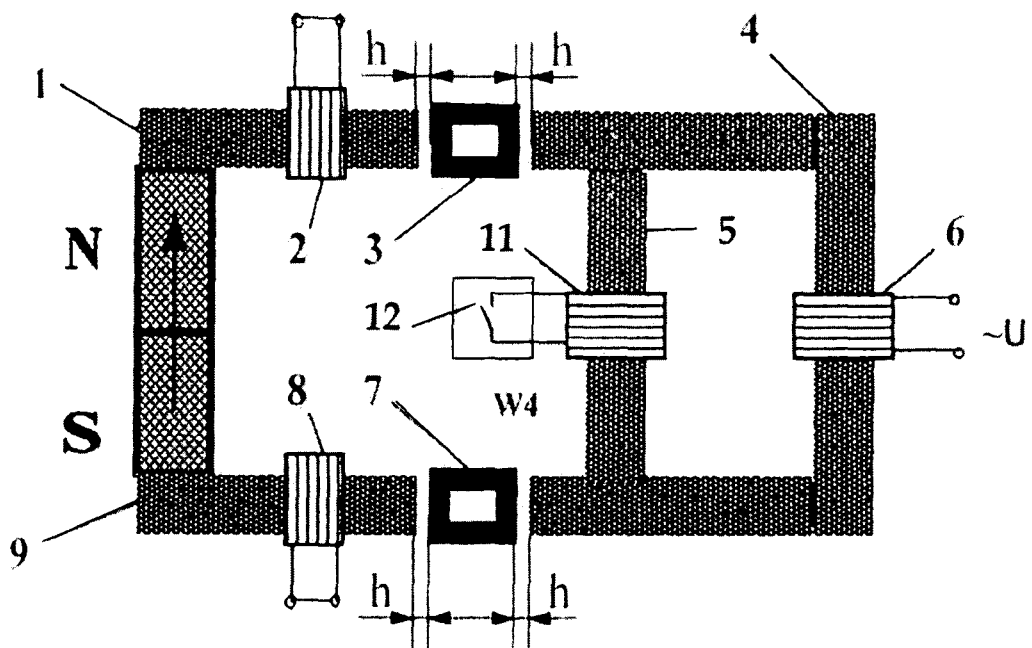


Fig. 3

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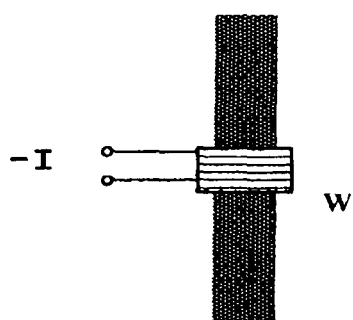
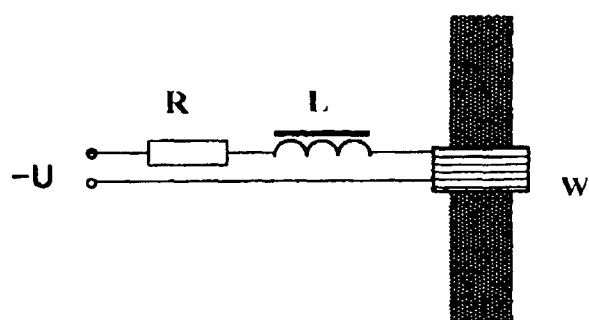
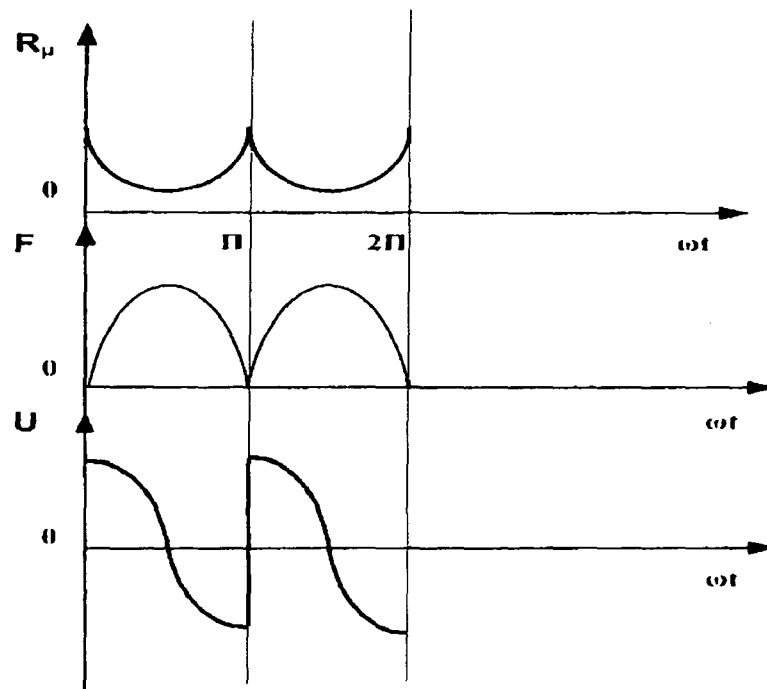


Fig. 4

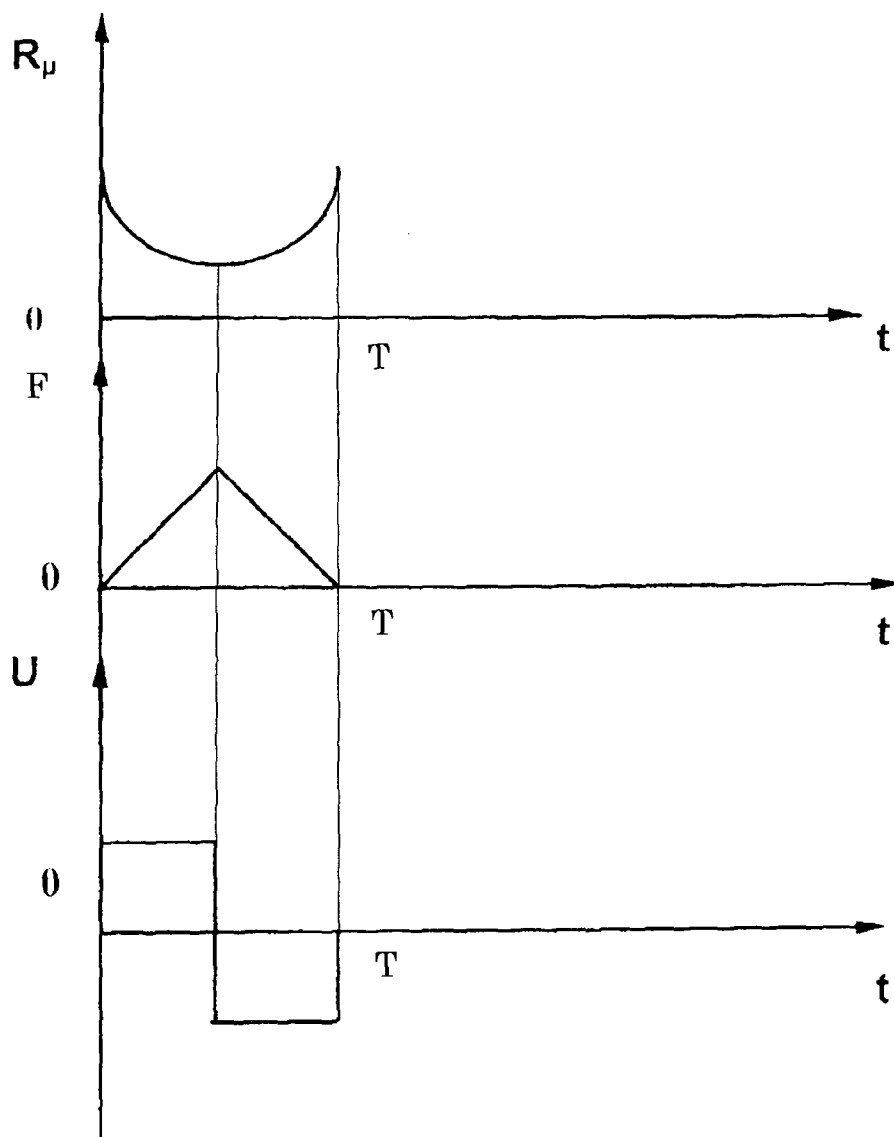
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**Fig. 5**

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**Fig. 6**

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**Fig. 7**

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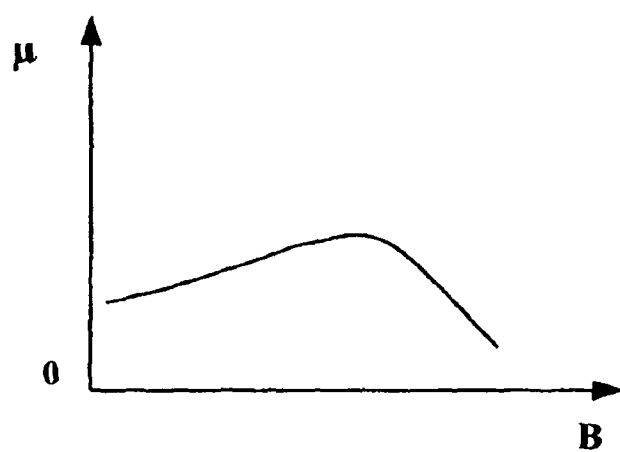
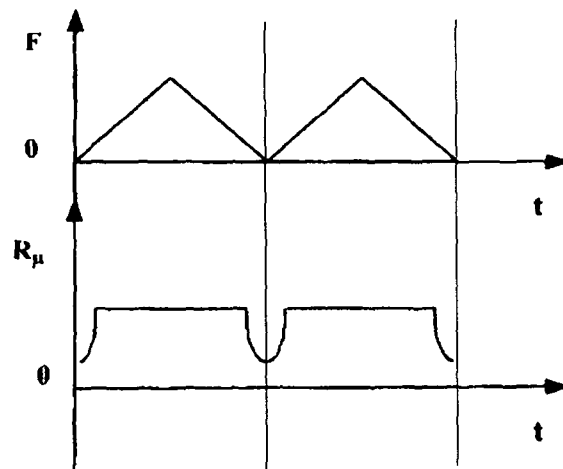
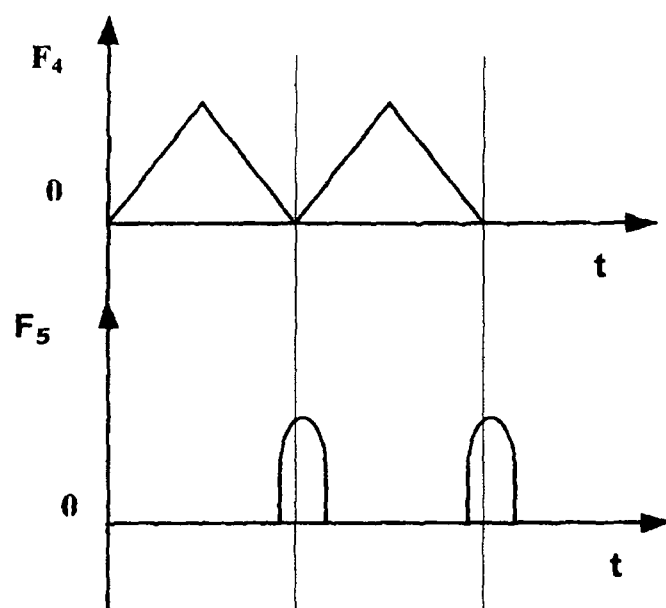


Fig. 8

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**Fig. 9**

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**Fig. 10**

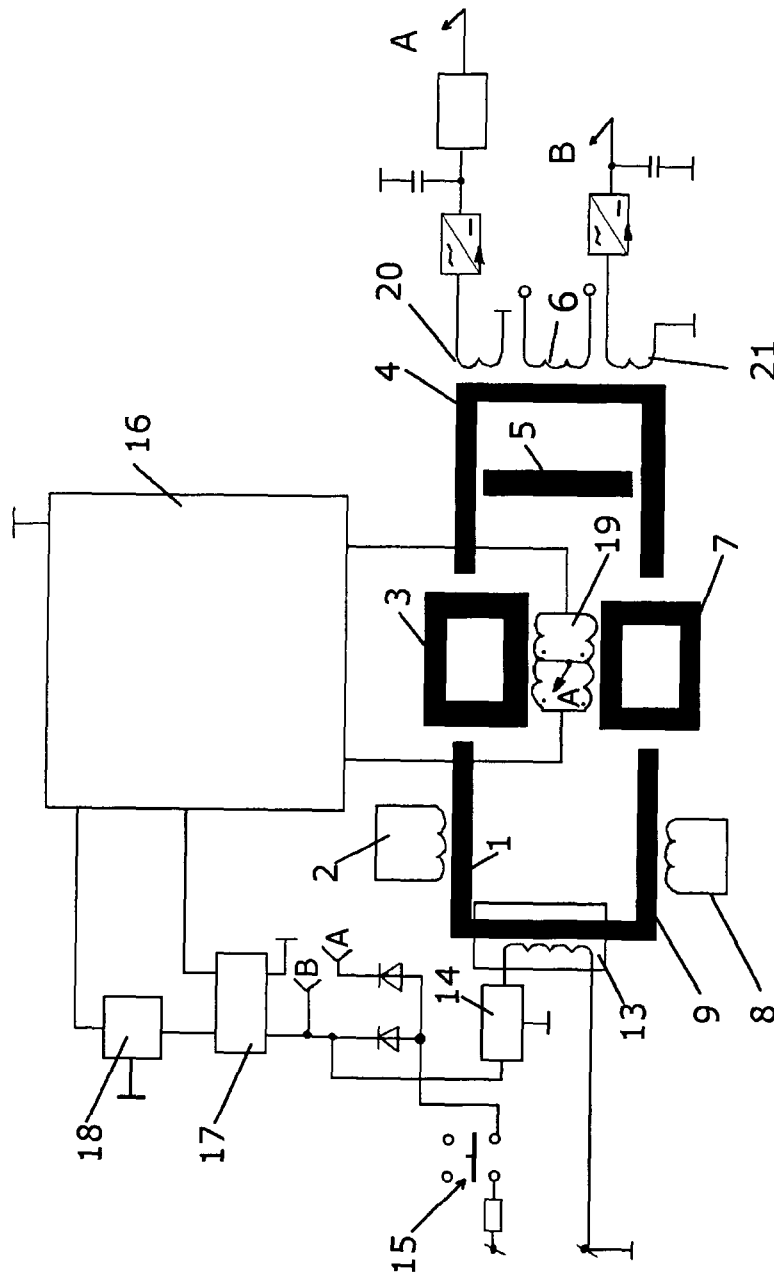


Fig. 11

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2009/000378

A. CLASSIFICATION OF SUBJECT MATTER
INV. H01F29/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
HOIF H02M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal , WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 1 424 986 A (RIVAS R V DE) 11 February 1976 (1976-02-11) page 1, line 10 - line 16 page 1, last paragraph - page 2, line 10 page 2, line 95 - line 121; figures -----	1,4,7
A	DE 198 04 277 A1 (ASAOKA KEIICHIRO [JP]) 13 August 1998 (1998-08-13) column 8, line 40 - column 9, line 15; figures 8,9 -----	1,4,7
A	US 3 087 108 A (TOFFOLO DOMINIC S ET AL) 23 April 1963 (1963-04-23) column 3, line 50 - line 70; figure 2 -----	1,4,7
A	US 6 362 718 B1 (PATRICK STEPHEN L [US] ET AL) 26 March 2002 (2002-03-26) cited in the application -----	

D Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search

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12/10/2009

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Fax: (+31-70) 340-3016

Authorized officer

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2009/000378

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
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