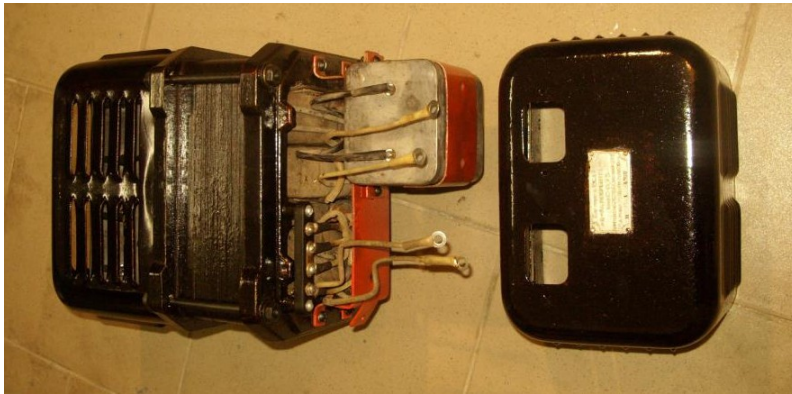


Ferroresonance



Just recently I discovered information from 2010 which for some reason passed by my attention. As an experiment, I made compilation of old info and some related ideas. Hopefully this will be useful for somebody.

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Melnichenko's motor demo on Russian TV

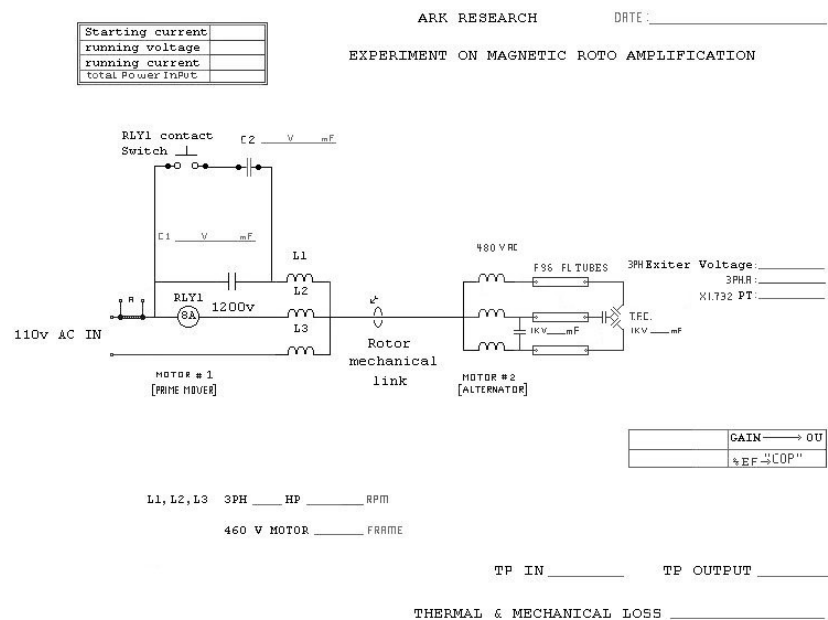
Andrei Melnichenko seems to attracting attention of many researchers. Melnichenko is a legendary person; he can be compared in many ways to H. from EVGRAY. He was one of the first people who talk about FE in late 1990 on Russian state TV and demonstrate RV-like setup with one phase motor. The setup was running a fan from little 9v battery for several hours. I think he was the first from whom I heard about FE.

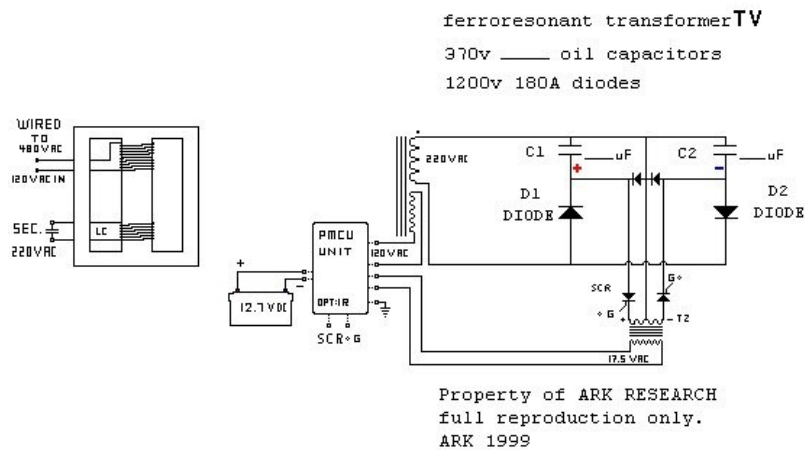
Reference:

1. <https://www.overunityresearch.com/index.php?topic=3683.msg70584#msg70584>
2. https://www.youtube.com/watch?v=EPm_TbwmwU4

Hector's RV and TV

H. brought ferroresonance to attention of FE community. Unfortunately these devices missing “jumper” part and therefore very difficult to reproduce (tune). Actually I haven't seen any documented attempt to make ferroresonance in motor.





References

1. Advanced RV Research and development

<http://www.rexresearch.com/rotoverter/AdvRVRD.pdf>

2. Trans-Verter research and development

<http://www.panacea-bocaf.org/files/Trans-verter%20R%20and%20D.pdf>

Birom messages about Gocha Tabatadze

You still can lookup posts of the person with the nickname Birom on the green matrix. there are not many, here is a link to the first [http://matri-x.ru/forum/index.php?/topic/971-%25D1%2583%25D1%2581%25D1%2582%25D0%25B0%25D0%25BD%25D0%25BE%25D0%25B2%25D0%25BA%25D0%25B0-%25D1%2582%25D0%25B0%25D1%2580%25D0%25B8%25D0%25B5%25D0%25BB%25D1%258F-%25D0%25BA%25D0%25B0%25D0%25BF%25D0%25B0%25D0%25BD%25D0%25B0%25D0%25B4%25D0%25B7%25D0%25B5/](http://matri-x.ru/forum/index.php?/topic/971-%25D1%2583%25D1%2581%25D1%2582%25D0%25B0%25D0%25BD%25D0%25BE%25D0%25B2%25D0%25BA%25D0%25B0-%25D1%2582%25D0%25B0%25D1%2580%25D0%25B8%25D0%25B5%25D0%25BB%25D1%258F-%25D0%25BA%25D0%25B0%25D0%25BF%25D0%25B0%25D0%25BD%25D0%25B0%25D0%25B4%25D0%25B7%25D0%25B5/page__st__12080__p__94312&#entry94312) page__st__12080__p__94312&#entry94312

Birom

Posted on December 27, 2010 - 20:15

Good afternoon, ladies and gentlemen. Stumbled upon your forum. And I was very surprised that it mentions the device of my late friend Gocha Tabatadze. I only mentioned its existence

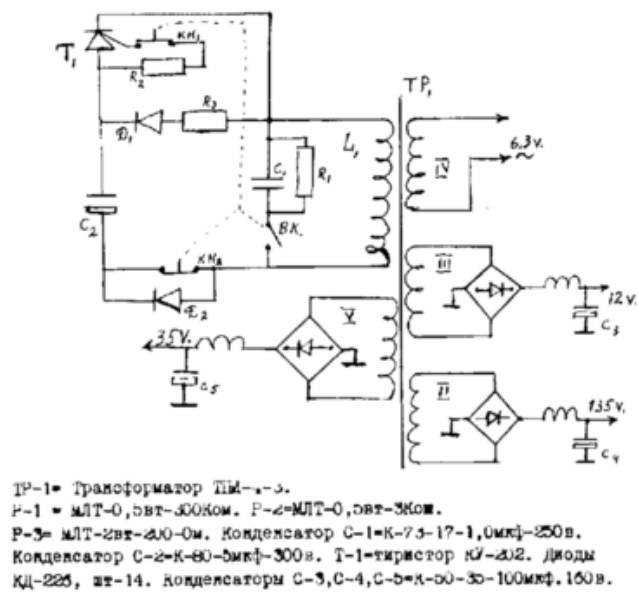
on a specialized electronic forum "Casus" (* <http://kazus.ru/forums/index.php>) and now I saw his name on your forum. Indeed, Gocha assembled a generator with output parameters of 220 volts, 50 hertz and a peak power of 8 kilowatts. This installation was tested at the Kutaisi Aviation Plant, where it worked as a power source for the blower fan for about three days continuously and it was only there determined that its peak power 8 KW, the output transformer and electronic control began to heat up very much. It has nothing to do with the device of Tariel, since it is made according to a different scheme, it does not have grounding, nor any spark gaps, and it uses a standard toroidal transformer with an output of 220 volts. For more than half a year this generator was the main source of electricity in his apartment, and then the entire district of Tbilisi, was disconnected from the network. Tariel spoke about this event in his interview. Gocha also made a generator similar to what Tariel Kapanadze demonstrates - with two grounding, but I did not see any spark gap there. Two transformers were present in the device, and one ground wire departed from each. These were two independent circuits and they had to be grounded, but not at one point. After I saw the video of Kapanadze, I asked Gocha if he had seen it. To which he received the answer: I saw not only Tariel, but also my cousin - after that I do not let him go to my doorstep. As for the principle of energy production - you are not looking there. Still in the textbook on Bessonov's TOE, there is the topic "trigger effect with ferroresonance." It doesn't matter if it is a resonance of current or voltage, it's important that it is a power surge and you need to supply a dosed power sufficient for a surge, but only the "additional" power will be provided to you - remove it, it is yours. Therefore, Tesla talked and did so much with resonant systems, and even today there is a resonant energy storage device "hydro ram pump" in hydrodynamics and it uses the same trigger effect, but only in a wave of water flow. Thank you for mentioning my friend's name in a good way on your site.

Some other messages can be found in Appendix A.

Hmelevski's patent

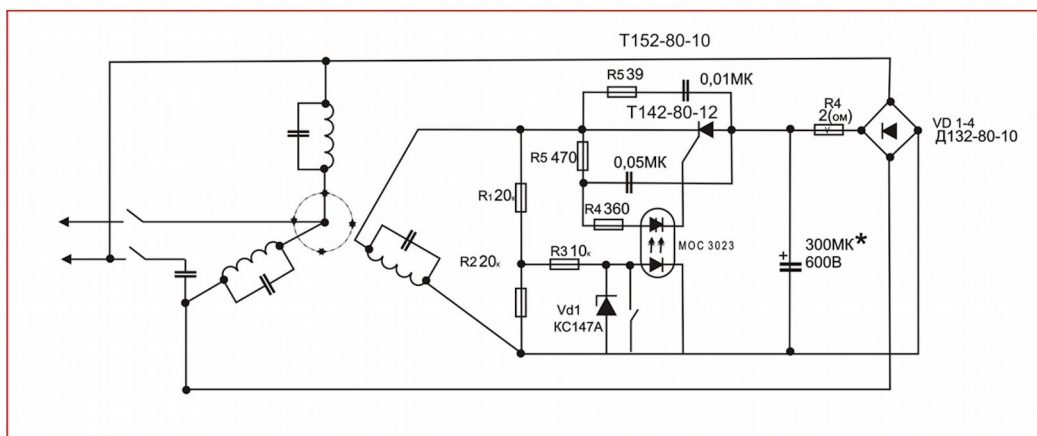
I think everyone knows who is uncle Vasya is *), but I'll remind you of Viktor Maksimovich Khmelevsky and his patent: "Ferroresonant cost-free high-frequency power supply for radio equipment".

-
- uncle Vasya made self running motor, conceptual schematic



Uncle Vasya's self running motor

Similar to other cases this setup was accidentally discovered by a man ("uncle Vasya") making some wood work at his summer house. He was trying run saw with 3 phase motor from a 1 phase grid. He discovered that at particular arrangements of capacitor motor won't stop when disconnected from the grid :)



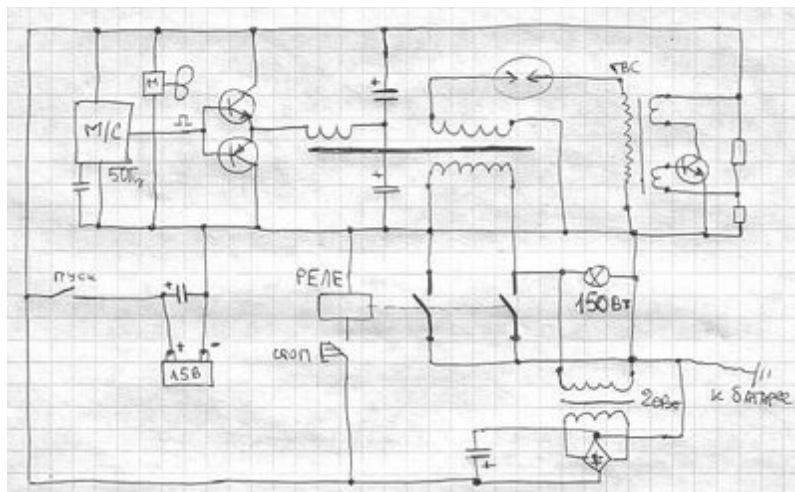
pic. Conceptual schematic

Short summary

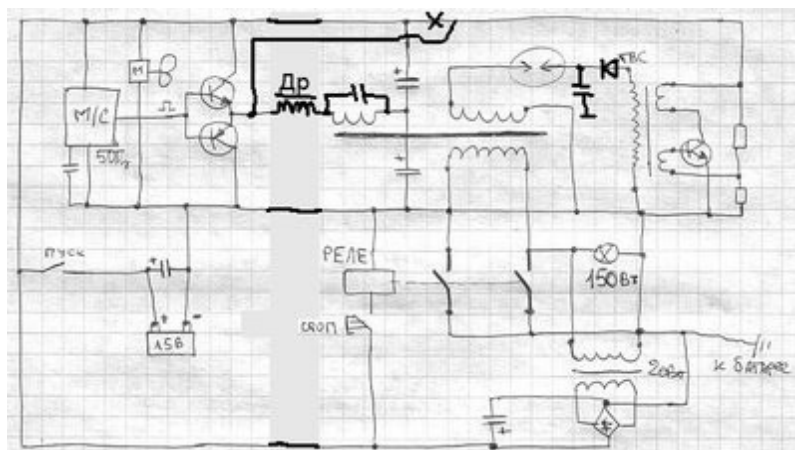
To summarize, what is needed to make an energy source using ferroresonance

1. use parallel resonance
2. feed the circuit from the current source (not voltage source)
3. use the trigger effect
4. Connect the load parallel to the coil

I will explain with an example. Here is a "typical" scheme of SR-like device, pushpool, spark gap, mess which does not make sense :)



A little fix and here it is ferroresonant power source :)



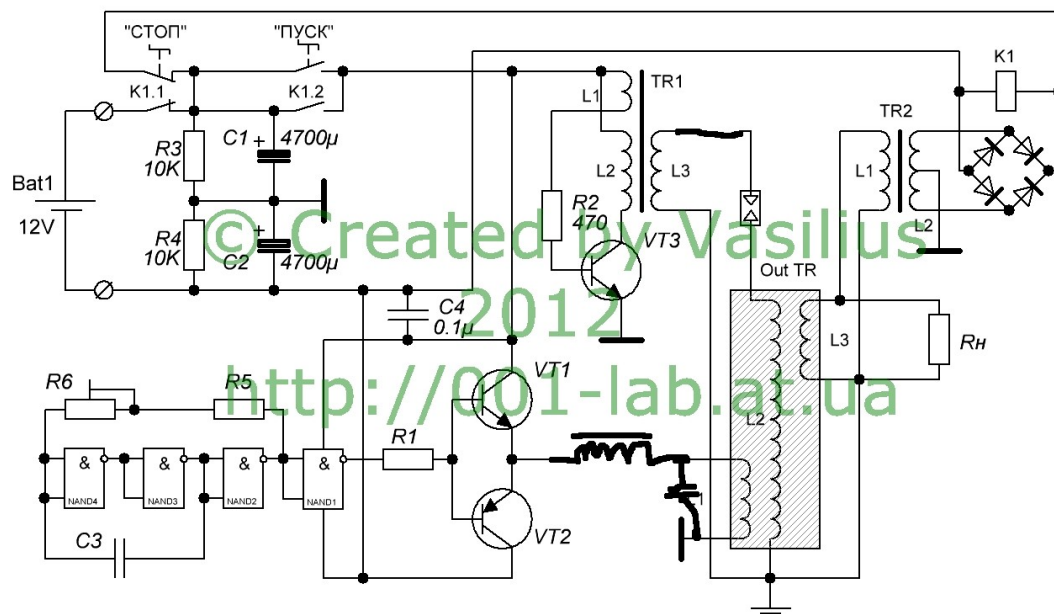
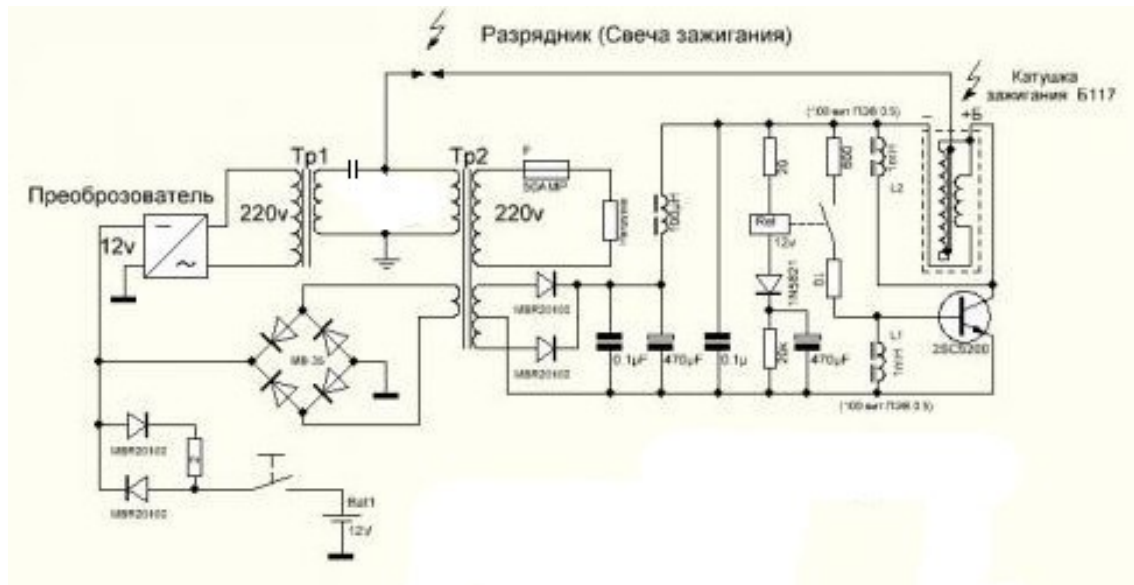
Let me explain: Inductance to get a current source, capacitor for resonance, and you need to spark at the top of the sine wave.

More “corrected” schematics

There are many variations of this arrangement (Akula etc) All of them have resonance circuit subjected to HV discharge.

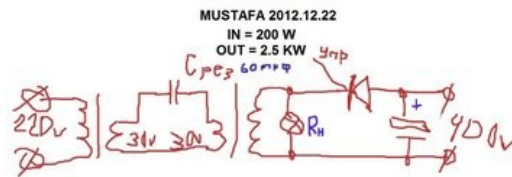
It is probable, like it usually happened, that somebody saw working device and tried replicate it without understanding how it works, just putting together main blocks.

And so we see fakes and obsession with very particular device pattern :)



Mustafa007's device

Do you remember this picture ? ;)



Yes, it's same idea, only no one understood how to tune it (well ... or didn't tell us :)

Some people says - “we tried and it does not work”. Yes, of course, everyone has own opinion. I agree that without understanding it will not work in any way. Why did I still want to talk about this topic -

1. You can build a device that will work according to standard theory, without any “shamanism”. The initial “effect” is easy to see, 100% repeatable.
 2. Many points are clarified, for example, why to use spark gap, where, when
 3. It is clear why people find OU in resonant welders
 4. It is clear how to make a mechanical generator, the same effect only in the motor
- etc. etc

I think it will be appropriate to give a quote from the blue matrix forum (it's a pity that the pictures are not visible, may be someone have them saved?)

<http://matrix.3nx.ru/viewtopic.php?f=12&t=644&st=0&sk=t&sd=a&start=240>

vollov akustik writes:

Lab exercise 12 to help restore memory. I believe it was done by everyone, but long timeago and you do not remember.

Let me remind you:

It is pumped by current. We don't have a current source (I'm repeating this to you Lab 12 here, so I don't need search for it). We have a autotrafo voltage source.

To simulate a current source and its high internal resistance, we connect a voltage source through a resistor. In our case, for an alternating voltage, it will be a capacitor with its reactance.

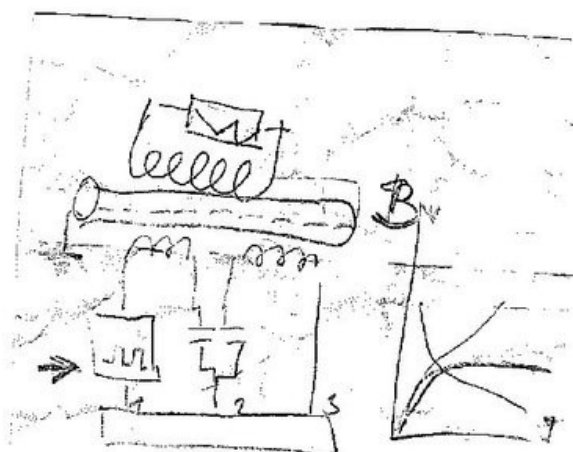
To the point: We raise the current from the "current source" at $I_{\max}$ in the circuit, the voltage is INCREASED with a jump (I gave an oscillogram)

Reducing the current from the current source, the voltage on the ferrocircuit DOES NOT DROP during the passage of $I_{\max}$ - we reduce it still DOES not drop - we lower it still DO NOT drop - we lower it still DO NOT drop, and we reach $I_{\min}$ and the voltage drops.

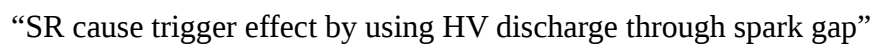
Question to you, WTF force kept oscillations with increased amplitude in a parallel ferro-circuit?

If you answer this question, doubts will fall off by themselves.

By the way, there is such a scheme is even on this forum <https://energyscience.ru/topic1-63.html#p536> (supposingly showing Gocha's T. device)

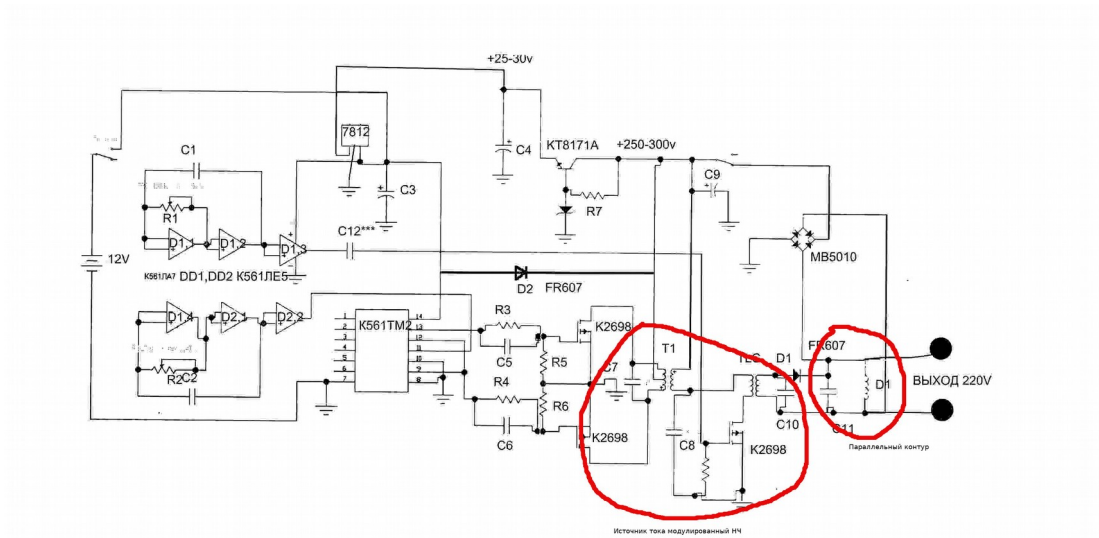


(I think originally this was posted on overunity.com)



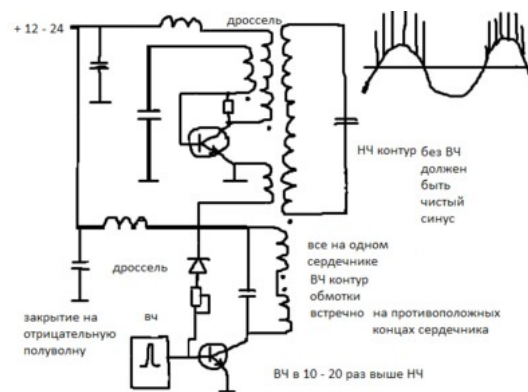
Pantuhov's device

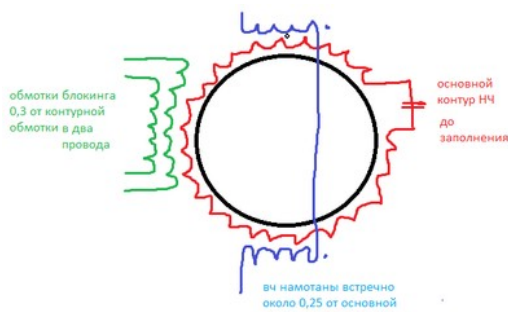
Here one more example, Pantuhov's 200W device



essentially parallel circuit in which ferroresonance is arranged (D1 C11) and everything else is an RF source modulated at 50Hz to pump this circuit.

Tiger2007's setup





Similar to Pantuhov's setup HV biasing used to cause ferroresonance.

Gennadi's ferroresonant transformer

I think that everyone has already seen this schematic many times

АВТОТРАНСФОРМАТОР-ГЕНЕРАТОР

Вниманию читателей предлагается описание схемы устройства и предполагаемое объяснение работы устройства, позволяющего питать лампы накаливания от автотрансформатора, введенного в самоподдерживающийся колебательный режим специальной автоколебательной схемой.

Прототипом послужили публикации в материалах конференций «Алюминий Урала». Подогревали интерес к этому те студенты, которые посещали занятия кружка «Эфир» в 1999-2000 годах в УГТУ-УПИ.

Первоначальный вариант предназначался для облученного зажигания дуги низкого напряжения и поддержания ее горения при отсутствии специальных обкладок по бокам металлических электродов. Дуга действительно легко загоралась, если электроды включались в разрыв между дросселем Др и трансформатором Тр (см. рис. 1). Изображенная на рисунке схема заработала в день студентов - «Татьянин день», 25 января.

В качестве источника питания или запуска применялась батарея щелочных аккумуляторов, включенная параллельно регулирующему выпрямителю. Для аккумулятора питали мультивибратор на транзисторах Т1 и Т2. В качестве конденсаторов С1 и С2 применялись электролитические на 50-100 мкФ. В качестве С3 - батарея электролитических конденсаторов, включенных встречно-последовательно. Лучшие результаты получены, когда эта батарея конденсаторов, разделенная на две части, средней точкой подключалась к средней точке трансформатора Тр1. Тиристоры Т1, Т2 были применены типа КУ203Б, так как позволяют иметь малое время выключения (около 10 мксек) и, кроме того, их можно соединять по три штуки параллельно, что может давать рабочий ток до 50 Ампер. Они позволяют получить в обмотке Тр1 пилообразный ток, линейно изменяющийся, и напряжение прямоугольной формы. Это здесь самое главное! Тогда при подаче напряжения через конденсатор С4, имеющий емкость 5 мкФ (х550 вольт), автотрансформатор «Атр» типа РН0-250-5 выходит в автоколебательный самоподдерживающийся режим, что достигалось перемещением обмотки дросселя, связанных со скользящими роликовыми контактами. Ток, первоначально потребляемый «Атр» вместе с подключенной к нему лампой Л1 на 300 ватт превышал 2А, на после достижения возбуждения автотрансформатора, ток можно было снизить, поднимая вверх, до отказа, верхний по схеме дроссель Атр; снизить до 0,1-0,2 Ампера. То, что лампа горит и то,

что ток, потребляемый от Тр1, существенно снижен, наряду указывает на генерацию, хоть и не очень большой, но существенной электрической мощности ферромагнитным материалом сердечника. Частота линейной силы тока до 400 Гц. Ограничение накладывается из-за применения электролитических конденсаторов.

ракторов, запустить ее от аккумуляторов, затем прирост энергии отправлять как на зарядку аккумуляторов, так и на какое-либо энергоснабжение. Прирост энергии объясняется не только вращением постоянных магнитных моментов, «запасанных» в домены металла, но и вращением дополнительных спиновых частиц, быстро возникающих и исчезающих вблизи ядер железа. Кандидатом на эту роль может быть тяжелый нестабильный «электрон», называемый мюон. Он может быстро возникать за счет процессов слабого взаимодействия из лионов, «прилипших» к ядрам железа из физического вакуума в присутствии в решетке железа микроримесей «гелия 4». Число, вероятно, удалось каким-то образом

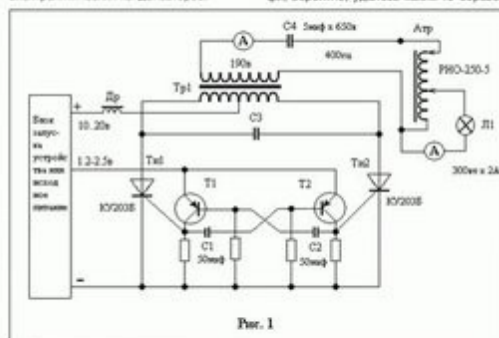


Рис. 1

Предупреждаем тех, кто пожелает повторить опыты, что для снижения вероятности разрушения конденсаторов из-за газонакопления их следует применять в сборке «С3» на напряжение 300-450 вольт. Ведь не всегда «электролиты» имеют ту емкость, которая указана на их корпусе. Следует проверить авометром. Опробовано также охлаждение подобных конденсаторов (в первых опытах) водой, налитой в сосуд. Охлаждение происходит, но это потеря энергии. Лучше подобрать «электролиты» одинаковой емкости. Идея состояла в том, что имея систему автотрансформаторов-генераторов, запустить ее от аккумуляторов, затем прирост энергии отправлять как на зарядку аккумуляторов, так и на какое-либо энергоснабжение. Прирост энергии объясняется не только вращением постоянных магнитных моментов, «запасанных» в домены металла, но и вращением дополнительных спиновых частиц, быстро возникающих и исчезающих вблизи ядер железа. Кандидатом на эту роль может быть тяжелый нестабильный «электрон», называемый мюон. Он может быстро возникать за счет процессов слабого взаимодействия из лионов, «прилипших» к ядрам железа из физического вакуума в присутствии в решетке железа микроримесей «гелия 4». Число, вероятно, удалось каким-то образом

очистить железо от этих примесей и получить гигантскую магнитную проницаемость более одного миллиона. Ясно, что такое железо, высокой степени чистоты, уже не будет давать дополнительное магнитное «хво» в возбуждающей обмотке. Поэтому в качестве ферромагнитного материала можно применять и железную руду - магнетит, имеющую формулу Fe_3O_4 .

Г.И. НИКОНОВ,
старший преподаватель
кафедры металловедения
Филиала УГТУ-УПИ.

Nevertheless, I want to pay attention to the text

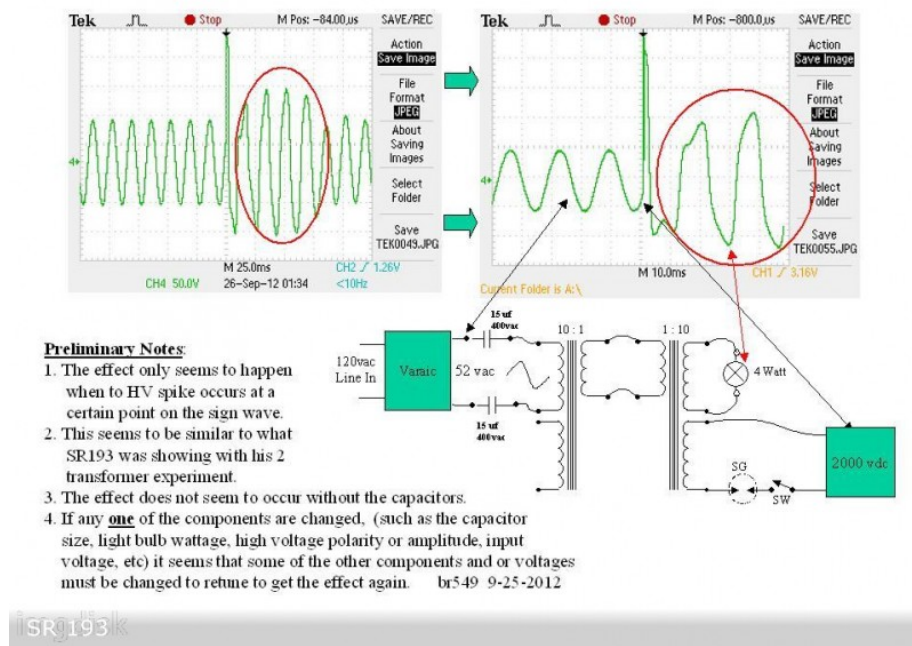
The current initially consumed by Atr, together with the lamp connected to it, exceeded 2A, but after reaching the excitation of the autotransformer, the current could be reduced by

Preva's resonant setup

[illegible]

13

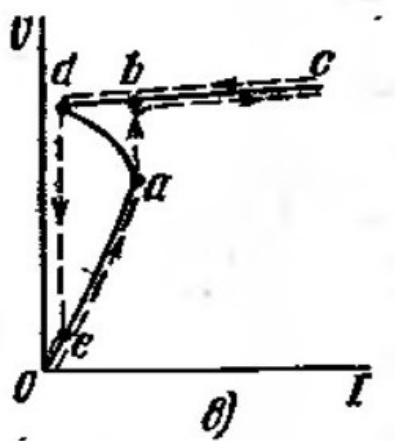
Shorting and link to welding machines



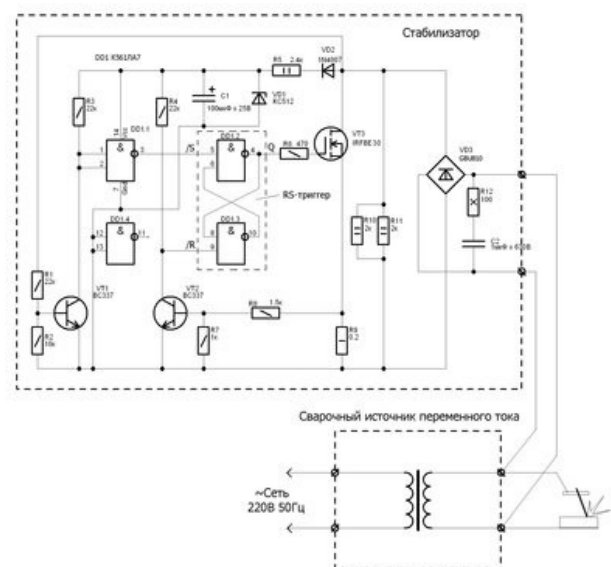
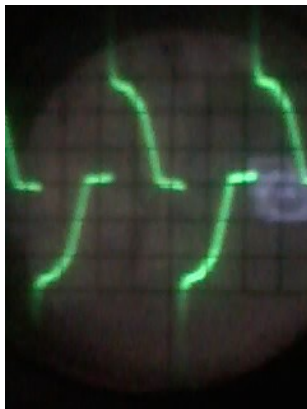
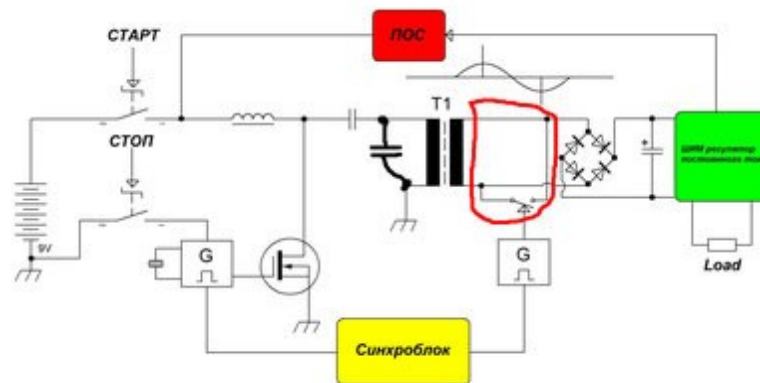
Imagine that the right trafo works as an arc stabilizer, but does not give an impulse to the welding arc, it used to power first trafo as a part of LC circuit. So the circuit should work, in theory.

I agree, a good idea.

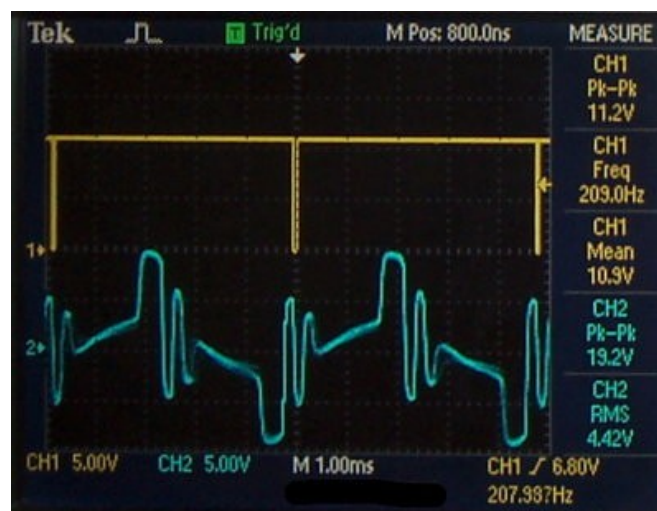
In order to get an “increase” we need to transfer the ferroresonant circuit to point b on the $I - V$ characteristic as quickly as possible and at the lowest cost, and then collect the “increase” while the circuit is in the negative resistance zone (section b-d).



SR type circuits use a spark gap to cause jump up. Another way is to short the output winding for a short time, just what the arc stabilizer does.



Here is an example voltage on the LC circuit (bottom) when it is operating in ferroresonance mode. High-frequency oscillations are clearly visible on the decline of the sine (of what was a sine), this just corresponds to the region of negative resistance. All according to the textbook ;)



Appendix A Some of Birom messages on matri-x.ru

Source: http://matri-x.ru/forum/index.php/topic/971-%d1%83%d1%81%d1%82%d0%b0%d0%bd%d0%be%d0%b2%d0%ba%d0%b0-%d1%82%d0%b0%d1%80%d0%b8%d0%b5%d0%bb%d1%8f-%d0%ba%d0%b0%d0%bf%d0%b0%d0%bd%d0%b0%d0%b4%d0%b7%d0%b5/page__st__12080#entry94312

Birom Sent 27 Dec 2010 - 21:15

Good afternoon, ladies and gentlemen. Stumbled upon your forum. And I was very surprised that it mentioned device of my late friend Gocha Tabatadze. I have only once mentioned its existence on the specialized forum of electronics "Kazus" and then I saw his name on your forum.

Indeed, Gocha assembled a generator with output parameters of 220 volts, 50 hertz and a peak power of 8 kilowatts. This installation was tested at the Kutaisi Aviation Plant, where it worked as a power source for injection fan for about three days continuously and in fact there it was determined its peak power - with a load of 8 KW, the output transformer and electronic control began to get very hot. It has nothing to do with the installation of Taniel, since it was made according to another schematic, has no grounding, nor any spark gaps, and a standard toroidal transformer with a 220 volt output is used in it. For more than half a year this generator was the main source of electricity in his apartment and his own apartment, and then the entire district of Tbilisi was disconnected from the grid. About this event spoke Taniel in his interview. Gocha also made generator variant similar to that shown by Taniel Kapanadze - with two grounding wires, but I did not see there any spark gaps. Two transformers were present in the device and one ground wire ran off from each. It was two independent circuits and they had to be grounded, but not at one point. After I saw the video of Kapanadze, I asked Gocha if he saw him. I received the answer: I saw not only Taniel, but also my cousin - I won't let him on my doorstep after that.

As for the principle of obtaining energy - you are looking at wrong place. Still in the textbook on TOE Bessonov there is a topic "trigger effect with ferroresonance". It does not matter whether the resonance is current or voltage, it is important that there is a power jump and you need to supply power sufficient for a jump, but only the "extra" power will be provided to you - extract it, it is yours. According to this, Tesla did so much and did with resonant systems, and even nowadays hydrodynamics have a resonant device "ram pump" and it uses the same trigger effect, but only in a wave of water flow. Thank you for your site in a good way the name of my friend is mentioned.

Posted from Birom in December 29, 2010 - 19:42 in Free Energy

Oleg68 (December 27, 2010 - 21:34) wrote:
that the installations of Taniel and Gochi are different topics.

I did not write about the fact that they are different or the same, I pointed out that in the installation with grounding, which Gocha showed me, there was no spark gap to which so much attention is paid in this forum. This installation is assembled after the termination of the relationship Gochi with his cousin. What Gocha built earlier and what kind of "inventor" he financed earlier, I don't know. How serious this quarrel was you can be judged by the fact that he was no longer willing to be seen in Gocha's house, even at his funeral.

This is not the only device Gocha built. There were others at 5 volts for a mobile phone, at 12 for a car, and at 220 volts for a house devices. By the way, Taniel mentioned his copyright problems in

Turkey in an interview, I think this applies to patent No. 200701076 filed there on 04/24/2007 on [TR] Ekonomik enerji transformat? R ?, the application was submitted by KAPANADZE TARIEL, GE; METIN TUERK, TR. Before that, Gochi's brother drove his 220 volt generator to Turkey, and something went wrong there. Upon returning to Tbilisi, they tried to steal this generator from an apartment, but failed. These are facts the rest is speculation. A photo of a 220 volt generator is taken on its tests and is attached for a mobile phone (on the side of it supercacitor). I don't have a photo of a generator with a cover, It consisted of two blocks connected by a flat cable.

Sergh (December 27, 2010 - 23:19) wrote:

"and how to apply it? There is abstrusely written, in a simple way the core in the resonant circuit with increasing current or voltage enters saturation, from which the current-voltage grows sharply due to increased consumption from the power source."

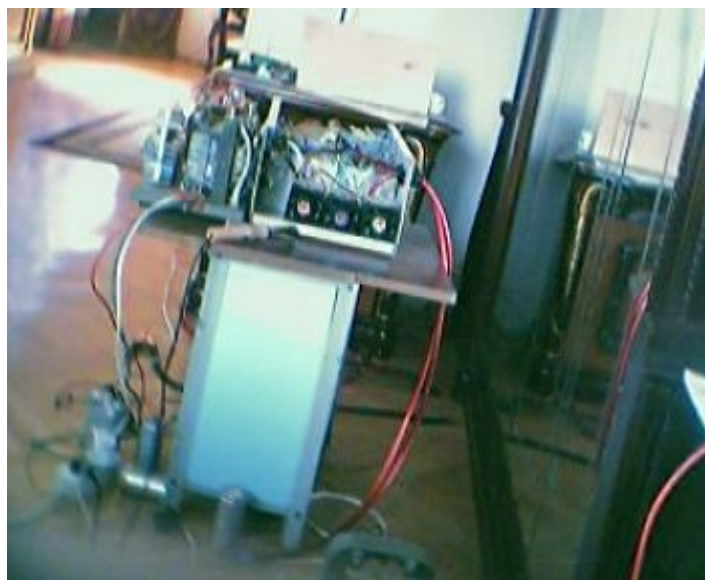
Well, not quite so, in my opinion, but specifically you said, you supply power, in quantities sufficient for the trigger effect to occur, but not for burning something.

"I did not drive in the saturation, what's the point, only burn transistors..."

Well, that's 10 rubles a pity for the transistors, but you want to give you a schematic, and what would you say after spending 200 thousand dollars on it, like Gocha, I don't think that Kapanadze spent less.

And the question arises, "is the game worth the candle" in the pocket version you are counting on, there is nothing for nothing, not even "free" energy.





sent by Birom в 30 Dec 2010 – 12:27

I agree with many of the statements and opinions (if it was not just chatter).

Gocha before he got into the worst car accident for a long time headed the Moscow FIB bank and was well provided for. He got into a terrible car accident and doctors in Moscow practically “put a cross on him”. Nevertheless, he managed to “get out” and thanks only to his sister. He remained sedentary, moved to live in Tbidisi, where he initially invested into work of an inventor who was not known to me, and then he himself began to build a generator.

From his words and by what remains after his death, one can estimate his expenses for the creation of a generator, including the repeated production of samples, at about 400 thousand euros. They must understand that you can’t do anything in this case, and the circuit simulators will not be great helpers because the algorithms are not embedded in them, which is not recognized by official physics. It remains only to experiment, and then it takes a very large part of the money. For example, I remember that only one single-phase transformer for its 220 volt generator with a peak power cost him 500 euros and he burned more than one of them. So it turns out until you reach the finish line will run no small amount. Further, the costs of saving electricity will not pay off until the end of life. So the classic production option for sale, and here a strange situation will await him and you: you will not sell anything without certification, and you will never get certification because this way of energy production is not recognized by physicists. And the “patent” will not help you, because when you make it, you will twist your hands off the essence. This is already my practice. In the last hundred years, when this invention was repeatedly repeated, no one wanted to become Prometheus. Well, start with the “oil industry worker”, the “gas industry worker” and the owner of the gold-bearing or diamond core and offer to give it all to the people “like Prometheus” - it is interesting to see their reaction, and you at this moment.

Actually, there is only one option, as it seems to me, this is the creation of a cooperative that will produce generators for themselves and for themselves to exploit them. Only in this case the law on certification of products sold does not apply - since there are no sales of any generators or energy. Of course, after the Gocha, some generators remained, but they were disassembled by him. You can only redeem them from his heirs and recover. To repeat, we need desires, a long-term program of action and monetary funds. And so relying on what I saw in the picture and estimated at several American rubles: I want remind an old joke about the radio master, ending with his answer: “yes, the resistor cost 5 kopecks, but knowing where to put it costs 50 rubles.

Each of you can easily become a co-owner of a patent for “Hydraulic shock” or “Hydrotrans”, which is called differently. It is necessary to "just" pay their research group 10-15 million euros and in 1.5 years they will provide you with a full package of documents for its production and patenting, and then what is "a suitcase without a handle".

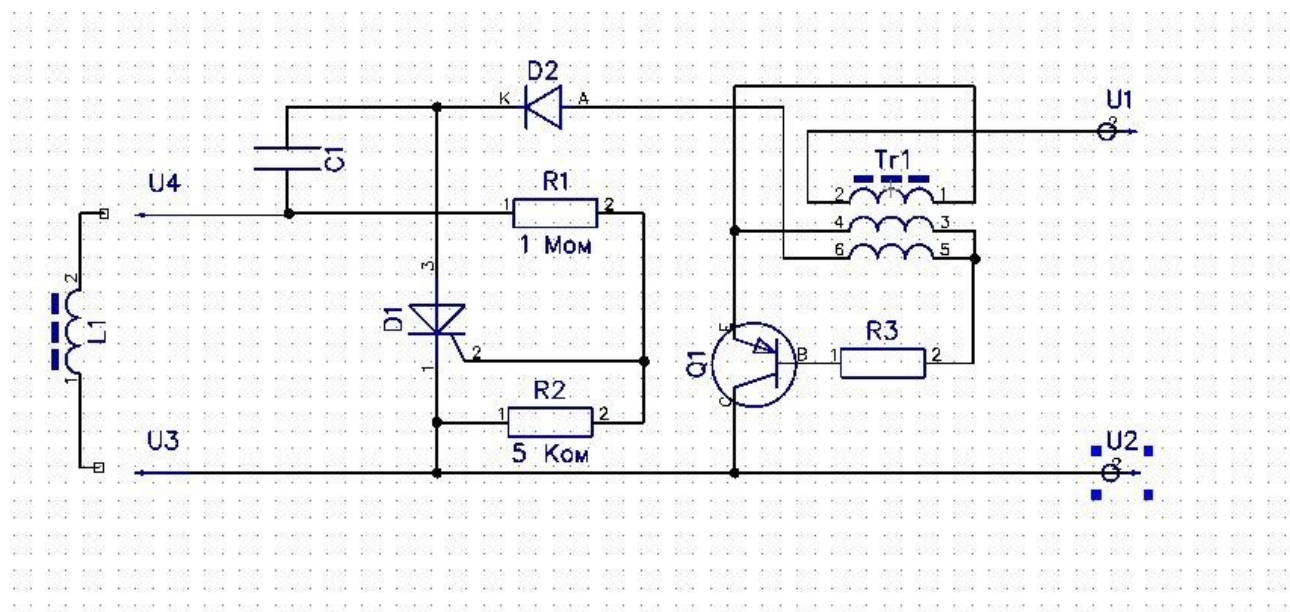
I enclose a copy of Tariel's patent not known to you and the Turkish alumni.

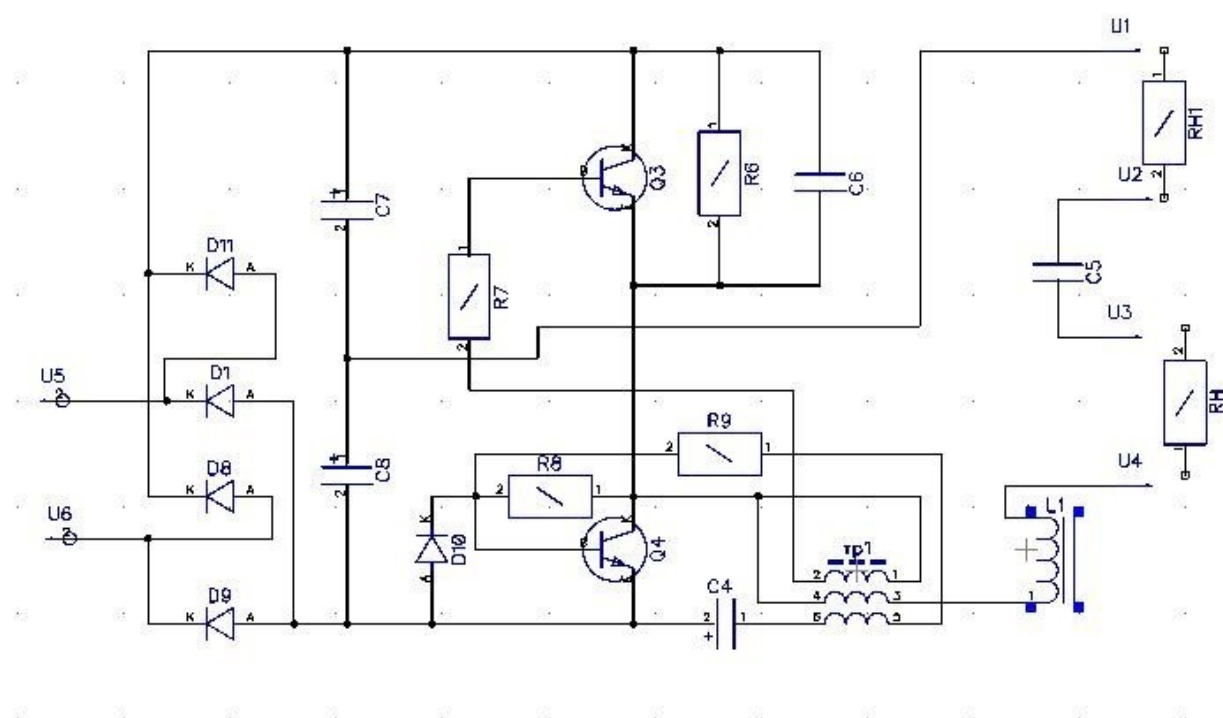
But I see no reason to look for something concrete in them, all this is initially deleted.

Source: http://matri-x.ru/forum/index.php/topic/971-%d1%83%d1%81%d1%82%d0%b0%d0%bd%d0%be%d0%b2%d0%ba%d0%b0-%d1%82%d0%b0%d1%80%d0%b8%d0%b5%d0%bb%d1%8f-%d0%ba%d0%b0%d0%bf%d0%b0%d0%bd%d0%b0%d0%b4%d0%b7%d0%b5/page__st__12420#entry96707

Biom Sent 11 Jan 2011

At the request of the Lord (matri-x.ru owner nickname), expressed in a personal message, I post two schematics in which I can realize the receipt of additional energy from the trigger effect according to the voltage resonance scheme, in the trigger effect is achieved simply. I draw your attention to the fact that the effect itself is a function of the mode in which the circuit operates, so it can be present or not. Schemes are standard, as shown in Fig. 1 scheme is used in “pocket” flashlights, sometimes universal with a receiver, a player, etc. In addition to the ability to work in the trigger effect mode, it will be interesting to you, because it uses the transformer patented by Tesla, on which the blocking generator is assembled and the inductance L1 is shunted by the triac, in replacement of the spark gap. The inductance is made on a cylindrical coil into which the ferrite rod is inserted. The rod is movable and when this circuit is tuned by its movement, the resonant frequency of the LC circuit is matched with the frequency of the blocking generator. A special feature of ferrite cores from iron is that they have multiple magnetic saturation points, so the LC tanks made on them often fall from the trigger mode, but it is not predictable that it is personalized due to this feature. Actually, Tariel spoke about resonance in the “second winding”, possibly having observed this effect. Load connected in parallel with inductance L1 Figure 2 shows a diagram that you can find in any base of the “energy saving lamp”. Also a ferrite core, the circuit guarantees operation in the L1 and C5 resonance, triggering effect is possible. RH and RH1 fluorescent lamp coils.





Appendix B Fragment from Russian school book "Theory of Electric Circuits", Bessonov L.A., 1978.

15.60. Volt-Ampere characteristic of the parallel connection of capacitance and coil with a steel core. Ferroresonance of currents.

In the diagram of Fig. 15.44 the nonlinear inductance L and the linear capacitance C are connected in parallel. The VA characteristic of the nonlinear inductance is shown by curve 1 in Fig. 15.44b, and the capacitance by line 2. According to the first Kirgoff law $I = I_C + I_L$, since the currents I_C and I_L are in anti-phase, the point p of intersection of curve 1 and line 2 corresponds to the ferroresonance of currents mode - current $I = 0$

The resulting VA characteristic of the entire circuit is shown as a dashed curve 3 of Fig. 15.44b (the abscissas of curve 3 are equal to the absolute value of the difference between the abscissas of curve 1 and line 2). Curve 3 of Fig. 15.44 b is repeated in Fig. 15.44 в in with the difference that in fig. 15.44 it was taken into account that in the current ferroresonance mode (point d in the figure), the current I in the unbranched part of the circuit does not decrease to zero due to higher harmonics and the active component of the first harmonic in current I_L .

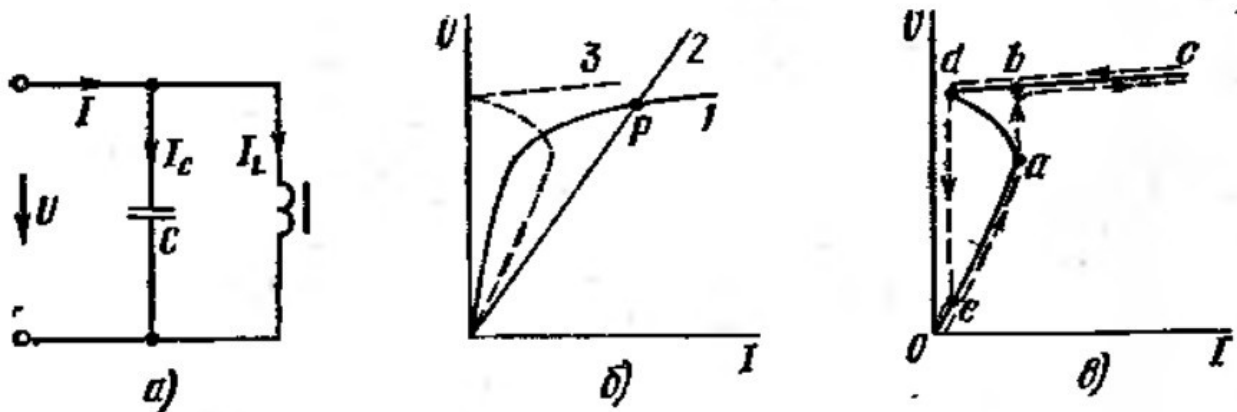


Рис. 15.44

15.61 Trigger effect in a parallel ferroresonant circuit

If the circuit on Fig. 15.44 feed from a *voltage* source by gradually increasing the voltage value of this source at a constant frequency, the imaging point will pass without jumps in all parts of the VA characteristic of the system. If the circuit is powered by a *current* source, then with a smooth increase in the current value of this source and a constant angular frequency ω , the imaging point will first move along the $0 - e - a$ section, then there will be a jump from a to b after which the movement will occur along the $b - c$ section.

With a subsequent smooth decrease in current, the movement will occur from c through b to d then there will be a jump from d to e and further from e to 0 .

Note: that the current ferroresonance mode in the circuit of Fig. 15.44a and the mode of ferroresonance voltage in the circuit of Fig. 15.42a can be achieved by changing the value of the

input voltage U at a fixed angular frequency ω of the capacitance C and a constant VA characteristic of the nonlinear inductance.

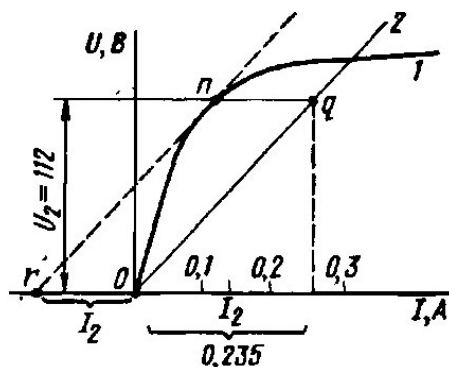


Рис. 15.45

Example 158. The VA characteristic of nonlinear inductance in the circuit on Fig. 15.44a is shown in the form of curve 1 in Fig. 15.45. Neglecting the active resistance and higher harmonics, determine the capacitance C which must be included in the circuit in Fig. 15.44b so that the trigger effect takes place at a current of $I_2 = 0.15 \text{ A}$ at $\omega = 314 \text{ s}^{-1}$

Solution: In Fig. 15.45, we measure current value I_2 to the left of point 0, we obtain point r . From it, draw a dotted line tangent to curve 1 at point n . Through point n draw a horizontal line. Its coordinate is equal to the voltage $U = 112 \text{ V}$ where trigger jump will occur. From point 0, draw line 2 parallel to the tangent rn . Line 2 represents the VA characteristic of the capacitance. The abscissa of the q point (0.235 A) is equal to the current through the capacitance at a voltage of U_2 . Therefore $1/\omega C = 112 / 0.235 = 478 \text{ Ohm}$ and $C = 6.68 \text{ }\mu\text{f}$.

Appendix C Lab exercise #12 Study of ferroresonance phenomena

(from high school physics course)

Objective: to study a circuit containing an inductance with steel core and capacitor when connected in series and in parallel.

General information

In electric circuits containing nonlinear elements, a sharp (jumping) transition from one state of the circuit to another. For example, in serial circuit containing non-linear inductance and linear capacitance, the so-called trigger effect is observed, which is that when a slight change in the voltage at the input of the circuit, the value of the passing through it current. This phenomenon is explained as follows: the resulting volt-ampere characteristic of the entire circuit is the sum of the current-voltage characteristic nonlinear inductance shown in Fig. 1, and I-V characteristic of linear capacitance (direct in fig. 2).

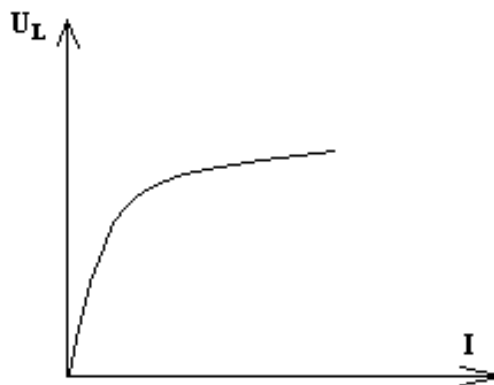


Рис. 1

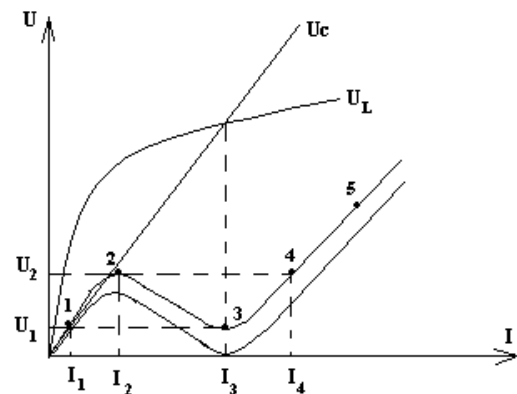


Рис. 2

The result of adding these I – V characteristics is shown in Fig. 2 (recall that the voltages at the capacitance and inductances are out of phase). The resulting IVC has, as we say, S - shaped look. Suppose that the voltage of the source increases slowly, starting with zero value. Then the imaging point will move through point 1 to point 2. A further slight increase in voltage will be accompanied by a surge in current, corresponding to the movement of the point from position 2 to position 4, i.e. surge current will increase from I_2 to I_4 . The subsequent increase in voltage is accompanied by a smooth increase in current over section 4–5 (see Fig. 2). With a decrease in voltage, the image the point will move in the area 5 - 4 - 3 with the transition to point 1. Voltage ferroresonance refers to this mode of operation of a series circuit with nonlinear inductance and linear capacitance, in which the first harmonic current in the circuit is in phase with the voltage of the source.

This state, as opposed to linear circuit can be achieved by changing the magnitude of the applied voltage (it is known that in a linear circuit the resonance of stress occurs when the equal resistance XL and Xc , which can be obtained by changing the supply frequency or by changing the values of L and C). For circuit with parallel connection of nonlinear inductance and linear capacitance currents

ferroresonance is possible (Fig. 5). Fig. 6 shows the ampere-voltage characteristic nonlinear inductance and linear capacitor. Resulting characteristic constructed by subtracting the ordinates I_L and I_C). If you feed the circuit in Fig. 5 from a current source (in the diagram of Fig. 5, the current source is organized by switching in series with the autotransformer capacitor 4 - 6 microfarads), then the image point will move along the area 0 - 1 - 2. A further increase in current will be accompanied by a voltage surge from U_2 to U_4 . Subsequently, as the current increases, the voltage will increase smoothly from point 4 to point 5. If you decrease the current in the circuit, the image point will move along section 5 - 4 - 3 with a transition to point 1, and the voltage will change abruptly from U_3 to U_1 .

Preparation for work

1. Calculate and build the current-voltage characteristic of a linear capacitor for $C = 50 \mu F$.
2. Determine the inductance value at which resonance occurs at a frequency of 50 Hz.

The order of the work

Obtaining characteristics of nonlinear inductance and linear capacities

1. Assemble the circuit according to the scheme of Fig. 3. As a nonlinear inductance is used a three-phase transformer in which the clamps x and y are connected together, and to the clamps a,b applied voltage from autotransformer. Before switching on, set the voltage regulator to zero. Attention! In the process of doing the work, keep in mind that at the terminals AX, VU, CZ) capital letters on the transformer) voltage may exceed 220 V. Since they are not used in work, do not touch them!
2. By changing the voltage of the source so that the current in the circuit does not exceed 1 A, measure the current in circuit and voltage on inductance (ammeter 1-2 A, voltmeter 60 V). Measurement data write to table 1 (7-8 values). Build the current-voltage characteristic of the coil.
3. Instead of inductance, turn on a $50 \mu F$ capacitor and remove 3-4 volt points ampere characteristics, similar to item 2. Measurement data should be entered in the table of the same forms as table 1. Build the current-voltage characteristic of the capacitor.
4. According to p. 2, p. 3 and table. 1 to draw the resulting IVC of the circuit with a serial and parallel connection of nonlinear inductance and linear capacitance.

Table 1

U, B						
I, A						

Voltage(serial) ferroresonance

1. Assemble the circuit according to Fig. 4 (here the resistor R_5 is turned on to limit the circuit current) and get permission to start from your teacher. Before switching on, set the voltage regulator to zero. During the experiment, the capacitance of the capacitor should be equal to $50 \mu F$. For measuring voltage provide a voltmeter at 75 - 300 V with free ends.

2. By changing the voltage at the output of the regulator from zero at small intervals, measure current, voltage across inductance, voltage across a capacitor, voltage supplied to circuit input (after resistor). Keep in mind that the circuit current must not exceed 1 A. Record the measurement data in table 2. By changing the voltage at the output of the regulator from the maximum value reached in paragraph 2 to zero, measure the same voltage and current as in item 2. The results are recorded in table 2.

Table 2

U=0-45V	U, V						
	I, A						
	UL, V						
	UC, V						
U=45-0V	U, V						
	I, A						
	UL, V						
	UC, V						

Before recording instrument readings after the jump, restore the voltage which was just before the jump. Record instrument readings immediately before the jump and after with increasing and decreasing total voltage. When measuring, use the limits of the ammeter and voltmeter, respectively on 1 A and 75 V.

3. According to the table. 2 to build the characteristics: $U = f(I)$, $UL = f(I)$, $UC = f(I)$.

4. Compare the characteristic $U = f(I)$ with the resulting current-voltage characteristic, constructed in Fig. 2.

Ferroresonance of currents (parallel ferroresonance)

1. Assemble the circuit of Fig. 5 and get permission to turn it on from your teacher. Before turning on the regulator set the voltage to zero. During the experiment, the capacitance of the capacitor is 50 μ F, use same windings ax and by as the nonlinear inductance, connected to clamps x and y.

2. Perform step 2 as well as with voltage resonance (i.e. smoothly change with the regulator voltage total current circuit I). Record the measurement data in table 3.

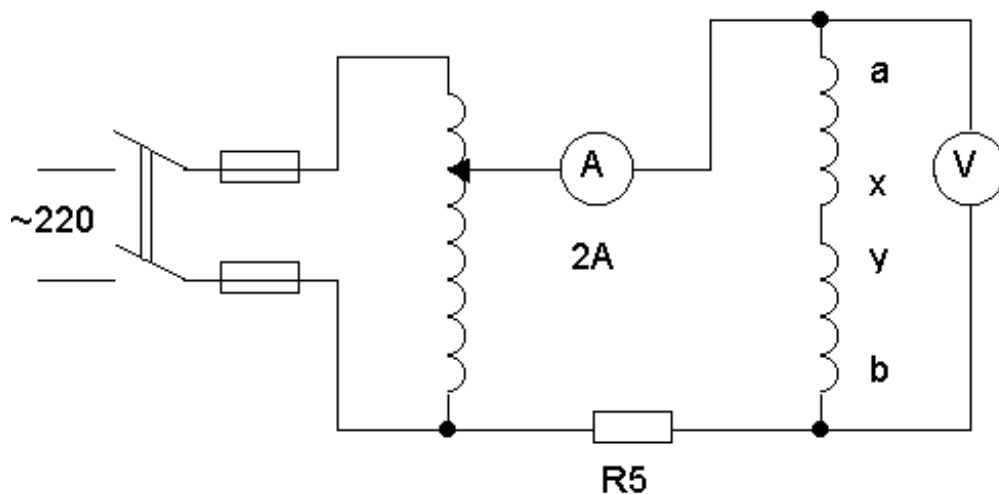
Table 3.

I=0-0,5 A	I, A						
I=0,5-0 A	I, A						

- Determine the current at which a voltage jump is observed from point 2 to point 4 (see fig. 6). Before recording instrument readings after a surge, restore that current, which was immediately before the jump and after with increasing and decreasing total current.
4. According to the data in Table 3, construct the following characteristics: $I = f(U)$, $I_L = f(U)$, $I_C = f(U)$.
5. Compare the characteristic $I = f(U)$ with the resulting ampere-voltage characteristic Fig. 6.

Test questions

1. Why is the voltage value on the resulting IVC shown in Fig. 2 and Fig. 6, does not go to zero, respectively, for $U_C = U_L$ and $I_L = I_C$?
2. Why at high currents the voltage across the nonlinear inductance is practically not changes with current changes?
3. Why is a current source needed in the circuit in Fig. 5?



pic.3

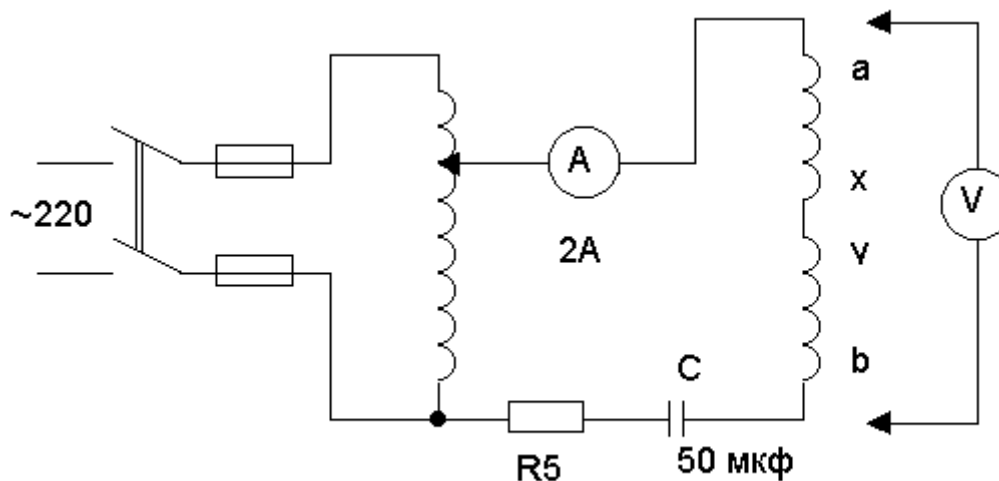


Рис. 4

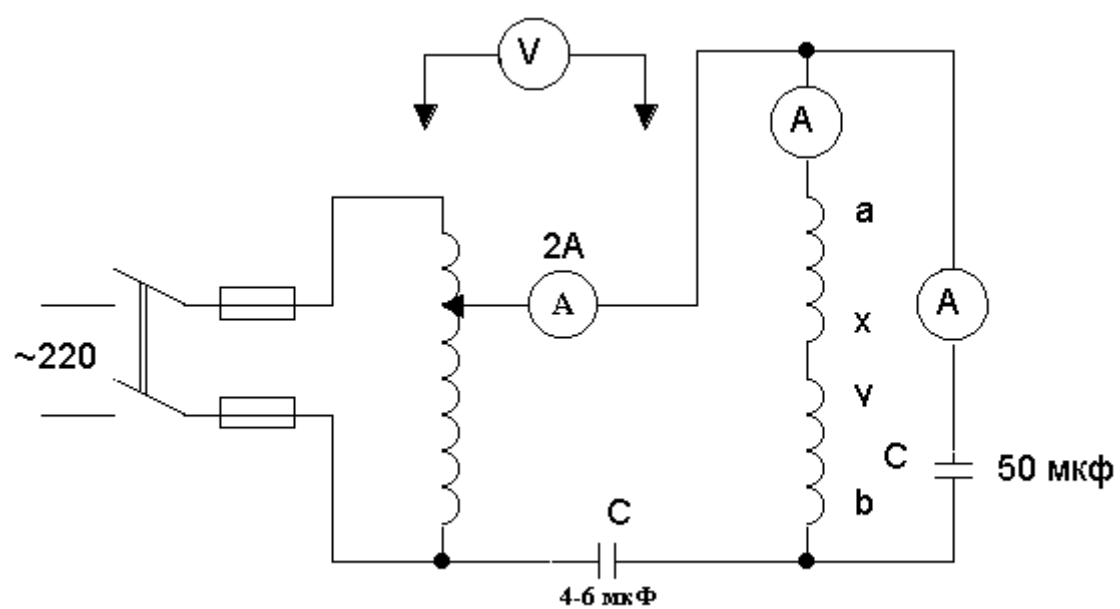


Рис. 5

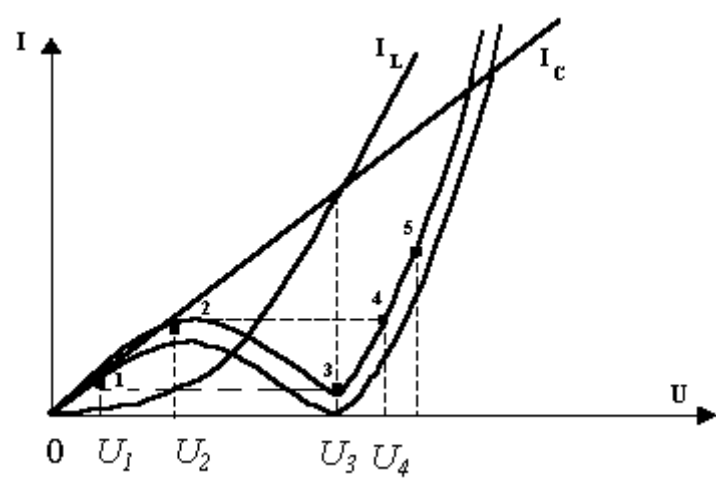


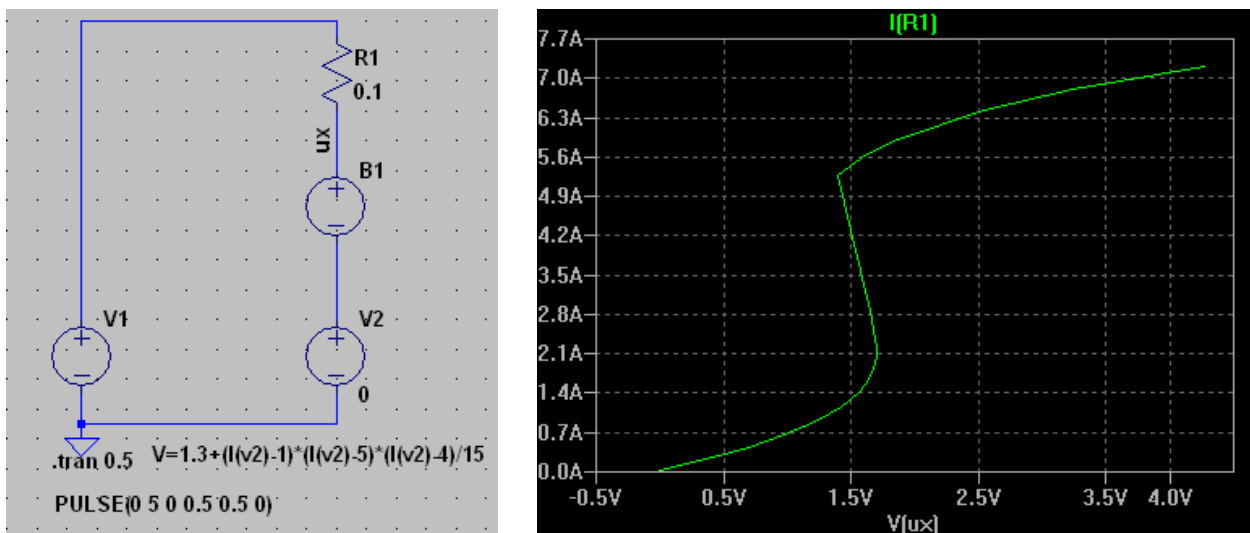
Рис. 6

Appendix D Energy from S-type NDR

We can use S-shaped Negative Differential Resistance to supply additional power to a load if we subject NDR to short pulses. In some way we saw already this principle in pulse systems when discussed first principle (e.g. discharge in gas can be represented as NDR).

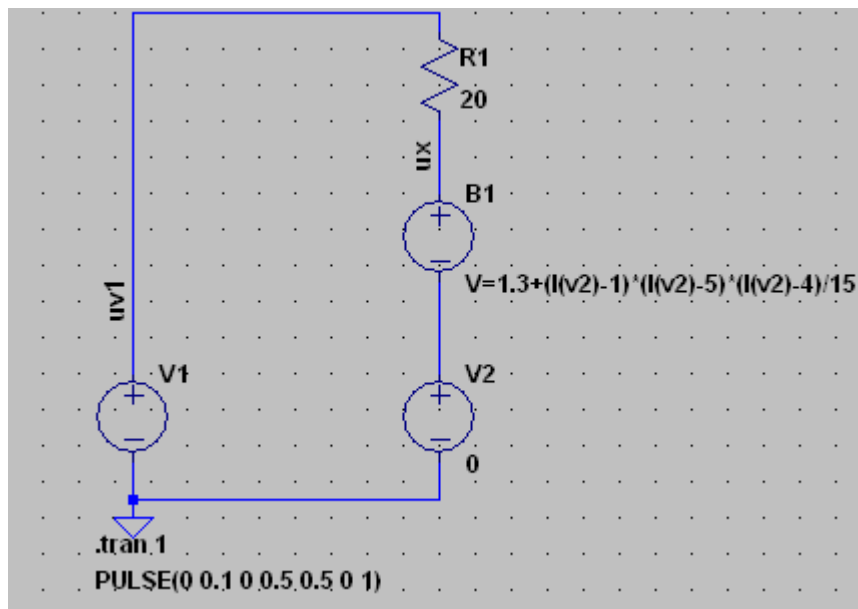
I still think it is appropriate list it as a separate principle because it refers to one of fundamental property of mater – inertia. We use small portion of energy to start some process and then we can capture more energy back. Such behavior can be observer in many completely different systems. Keeping in mind this principle could help us recognize potentially FE system/process.

As an illustration of my words I am adding here simulation results of very simple NDR resistance circuit.

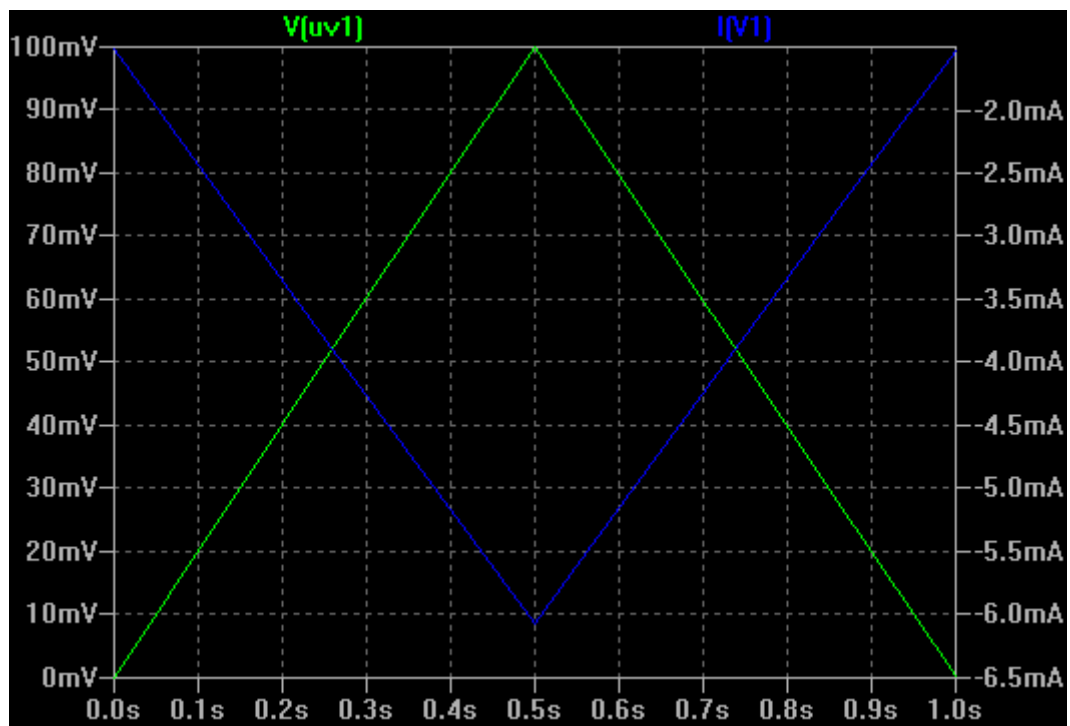


pic. Test S-shaped NDR based on function $f(x) = 1.3 + (x-1)*(x-5)*(x-4)/15$;

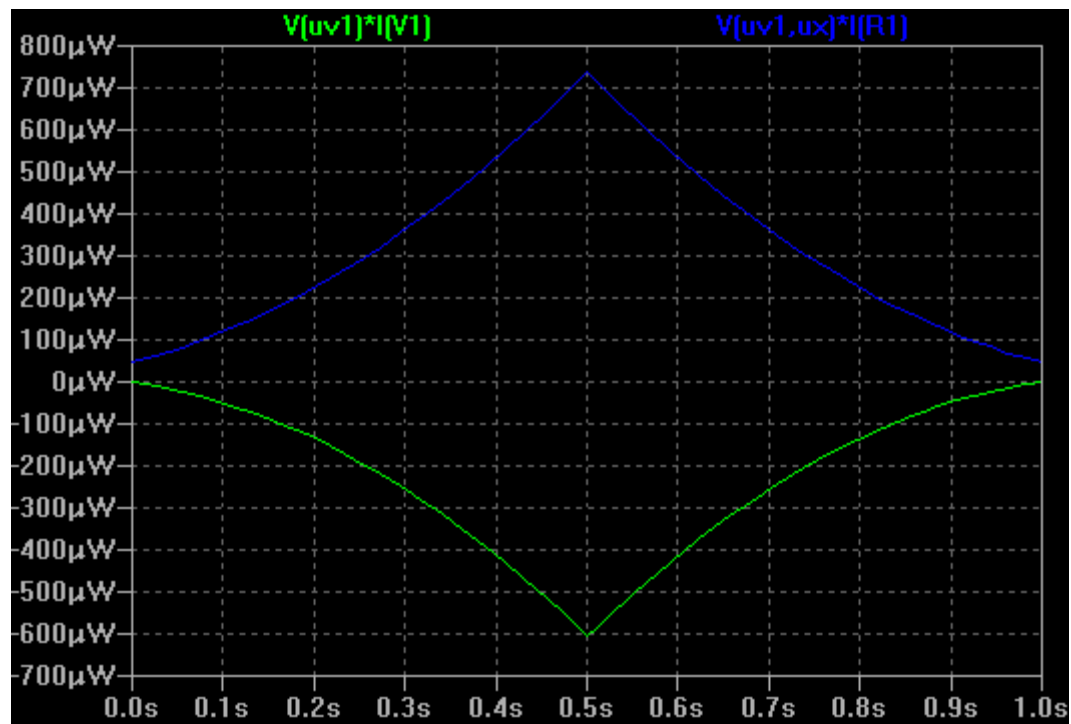
* Despite simple illustration that it is possible often mainstream science denies possibility use NDR to gain energy



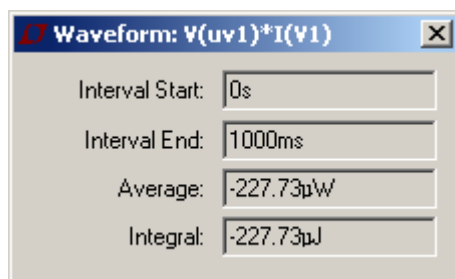
pic. Simulation



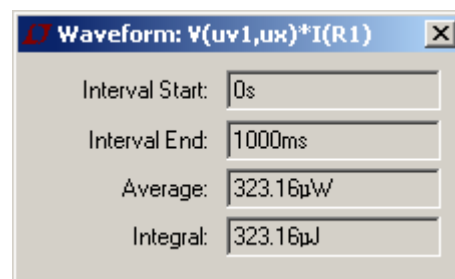
pic. Simulation results – power supply voltage and current



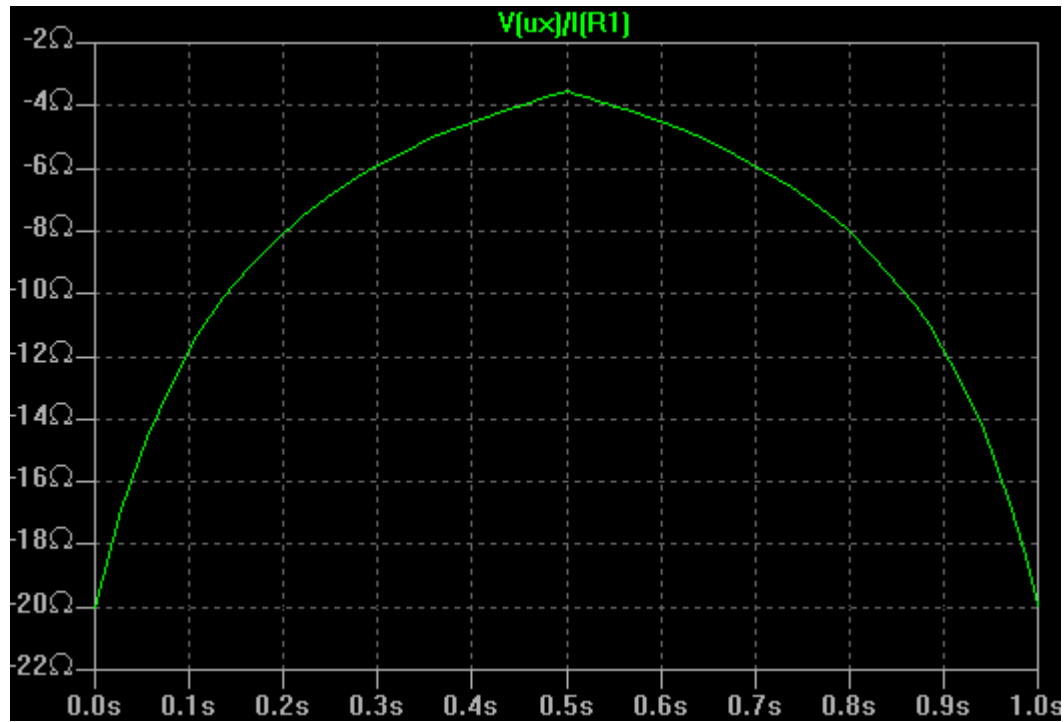
pic. Simulation results – power from power supply and in load



pic. Energy delivered by power supply



pic. Energy dissipated on load resistor



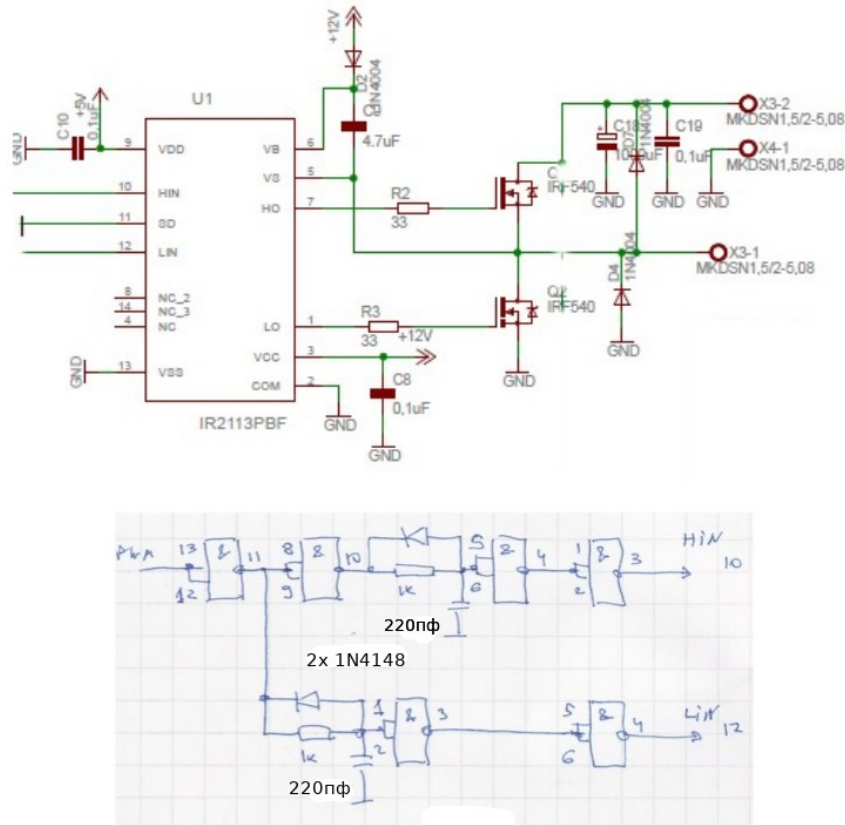
pic41. Negative resistance

References:

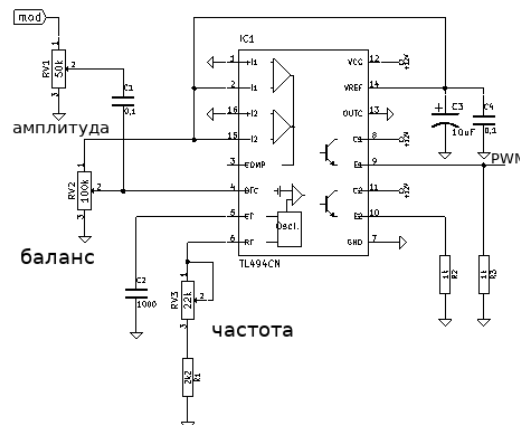
1. Demystifying the Negative Differential Resistance Phenomenon
http://en.wikibooks.org/wiki/Circuit_Idea/Negative_Differential_Resistance
2. Zinc Negative Resistance Oscillator <http://www.sparkbangbuzz.com/els/zincosc-el.htm>
3. Negative resistance in electrical discharge <http://mysite.du.edu/~jcalvert/phys/dischg.htm>
4. FE Basics, chapter 6 https://www.dropbox.com/s/plsrxlltgkl9wtb/fe_basics.pdf

Appendix E Modules for experiments

At the request of readers, I will share several schemes, if suddenly someone decides to try

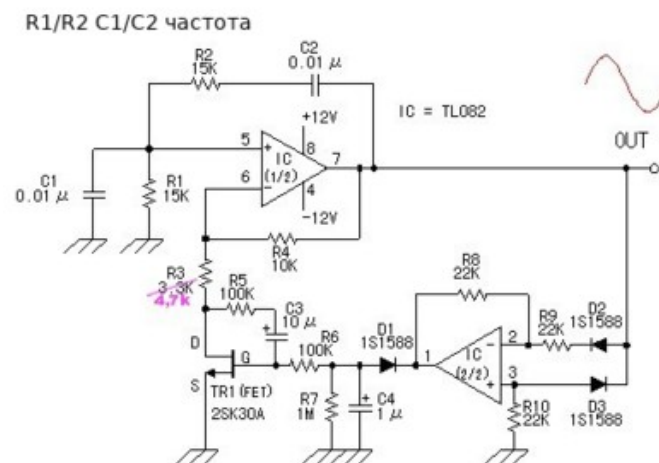


I use here standard half-bridge on IR2113, transistors can be used depending on the desired voltage and current. IFR540 will do for experiments at low power. A pulse shaper is drawn below to reduce the through current. In principle, it will work without it, but it is more pleasant with it.



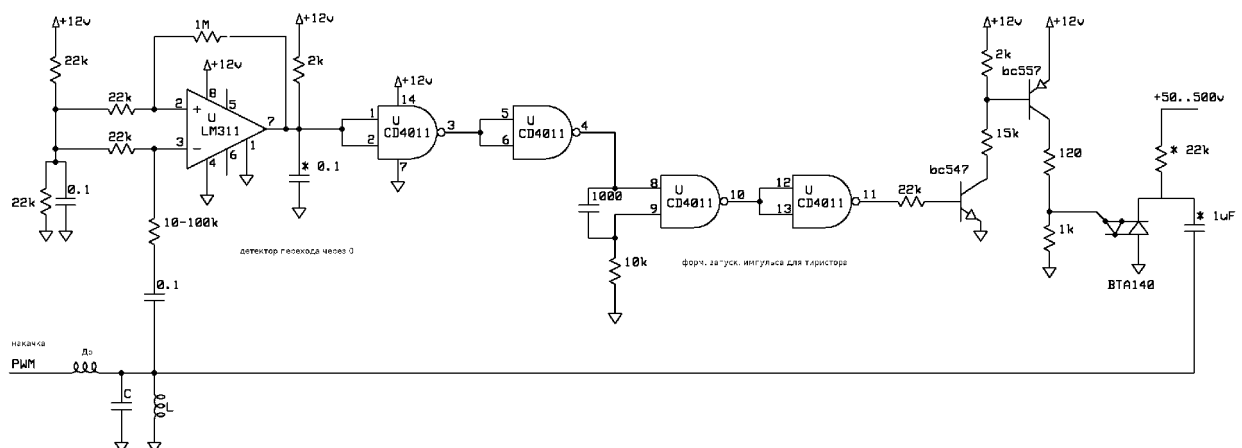
pic. PWM signal source using TL494

It can take input from a standard signal generator or make a simple generator itself, for example, according to such a scheme



A more modern solution is to form a PWM microcontroller such as Arduino, but this is for those who are fond of microcontrollers (for example https://github.com/vasik041/openlab/tree/master/tools/singen_pwm)

Further, for "jumping" you can use this schematic



We select the moment of transition through zero using the comparator (LM311) and discharge the capacitor through the triac. Probably, it is necessary to "hit" not directly into the circuit as shown in the diagram, but into a separate winding (so that the loop capacitor does not interfere).