Magnetic Field Transformer (MFT)

(a method for duplicating of alternating magnetic fields for free)

Let us consider ring-shaped core transformers - … it is easier to draw them.

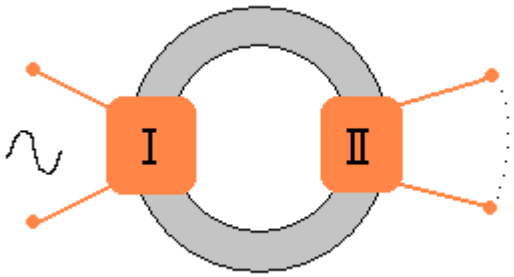
All the windings will be considered similar in the number of turns and the type of wire, if nothing is separately specified. The input source of alternating current will be considered sufficiently powerful and low-resistant in order not to pay attention to it.

I am trying to describe the idea itself and what it is based on; I shall try to do it as simple as possible.

Several first variants are trivial; however, they are necessary in order to demonstrate from which elements the final construction is assembled, since the formation of the thought often is more interesting than the discussion of the final result and the following explanations of the basics.

Variant 1

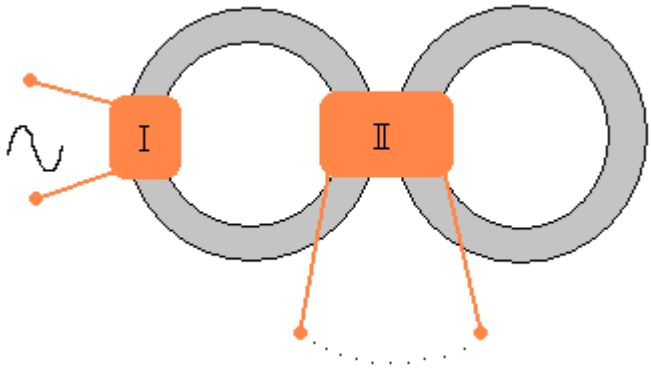
An ordinary transformer with one ring-shaped core



Let us supply input alternating current to winding I and remove the same current from winding II; if we short-circuit winding II, in winding I the input current will sharply amplify since inductance I decreases and the inductive impedance to the input alternating current decreases as well. This is a well-known fact. The one, who does not believe, can short-circuit the secondary winding of the network transformer and under tension, he/she can hear hum and smell effects caused by the amplification of the input current.

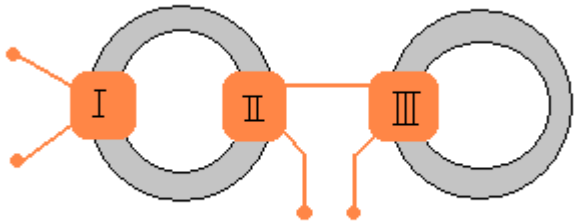
Variant 2

Wherein an additional core with the section similar to that of the main core is introduced into the secondary winding



Let us supply input alternating current to winding I and de-energize winding II like in the first case; however, when we short-circuit winding II it **does not lead !** to the amplification of the current in winding I since the inductance of the first winding does not decrease but on the contrary it increases slightly due to the connection of the additional core. In this variant, current can be also removed from the secondary winding, but it should not exceed the idle current in the primary winding (taking into account the resistance at the specified frequency), it means that the primary winding totally determines the power which is transmitted via such transformer.

A possible equivalent to the previous construction is that the central winding is divided into two independent inductances, which is more convenient for designing of turns.

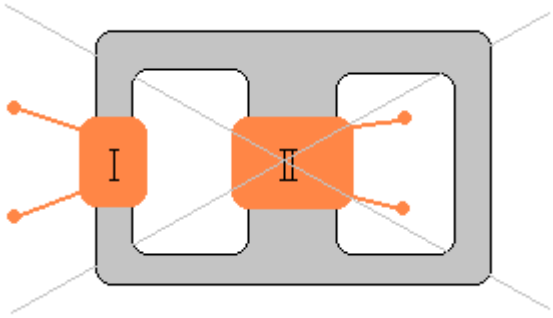


What is the benefit in this case?

1. The output winding practically does not influence the primary winding and consequently, when the primary current is brought into resonance and a specified (even large) current is created in it, the load on the secondary winding will not “spoil” the resonance in the primary winding.
2. If we short-circuit winding II, this short-circuit will form sort of a mirror for the magnetic field. In this case, ring current of winding II does not allow to change magnetic flux passing through its section, which leads to the appearance of the magnetic flux in the second core, the direction of which is opposite to that of the magnetic flux in the first core, thus, the magnetic flux in winding II remains unchanged (overall).

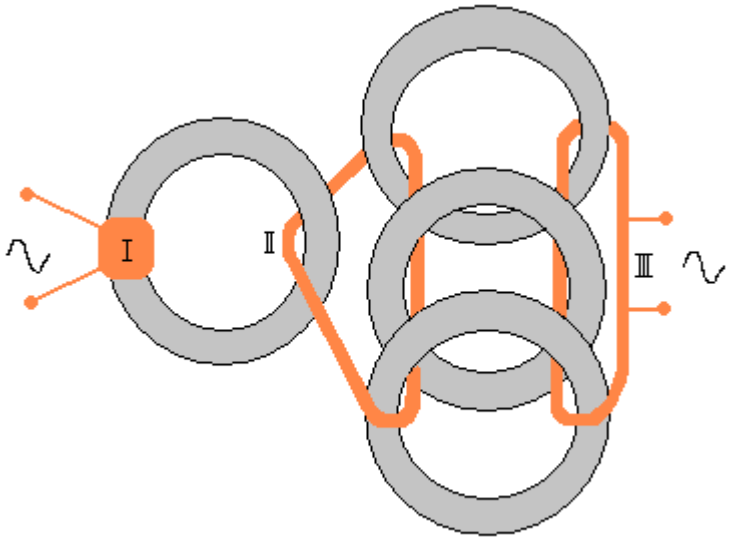
3. We have managed to create an **additional** magnetic flux almost without any energy consumption. We remove the energy from the secondary winding, and the more energy we remove, the more exact the magnetic flux is duplicated in the second core.
4. Special attention should be paid to the fact that the use of a Ш-shaped core is not equivalent to the above construction, because in the offered construction it is important that the magnetic field would be created **only** by the **currents** of winding II, and the above cores should not have magnetic coupling between themselves.

Example of a variant which is **not suitable !** for the idea offered.



Variant 3

Unlike the above, not one but several cores are introduced into the secondary winding



In this case, winding II is short-circuited (tappings are not shown in the figure), which results in the fact that inside the secondary winding the sum of alternating magnetic fields tends to zero, i.e. the magnetic field of the primary winding is mirrored at three cores in the opposite direction, which means that in three right cores (overall) the alternating magnetic field should correspond to the magnetic field in the first (left) core. Or in other words, the magnetic field (alternating) from winding I is divided equally between the three cores.

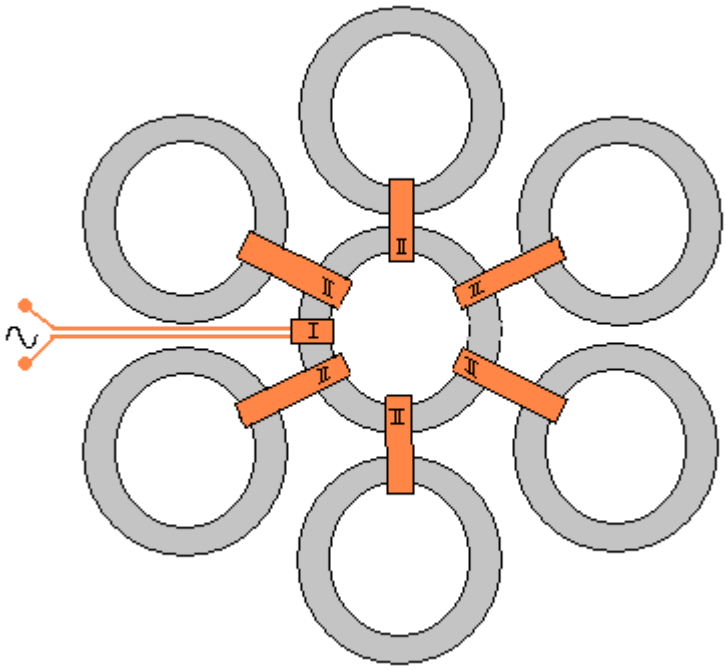
If we feed alternating current to winding III, everything happens in the other way in winding II, i.e. the sum of magnetic fields (with the opposite sign) from the three right cores is mirrored to the left (according to the figure) magnetic core via the current of winding II; in this case, on the left core there is an alternating magnetic field (of the opposite sign), however its value will correspond to the sum of the magnetic fields from the three right cores. There is one unpleasant thing here, though: the phases on the three cores are slightly different.

We pay your attention to the fact that in this variant of the construction, the alternating magnetic field in one direction (from left to right) is divided into separate fluxes (in winding II) or is collected from separate cores into one (in winding II) at the reverse switching (from right to left).

Variant 4

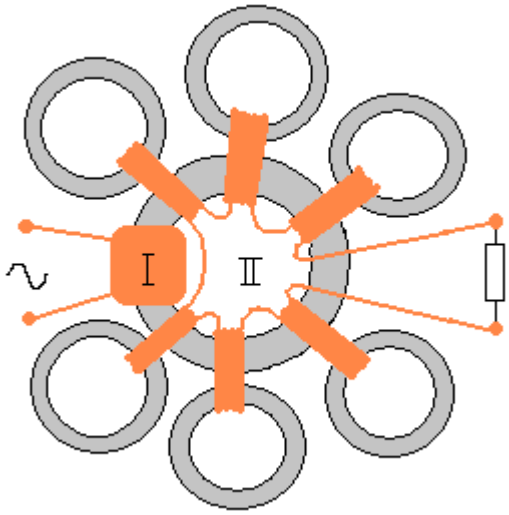
Let us go back to variant 2, draw its modification, in this case windings II are independent and in a short circuit.

(Doesn't it remind a little of Habard-Cater transformer construction?)



When alternating current is supplied to winding I, each winding II will mirror an alternating magnetic field to each core, which are situated circumferentially; in this case, in each core the magnetic flux (alternating) will be practically similar to that in the central core, which can be easily check by loading of any of the peripheral cores with its own coil, but since all of them are coupled, when one is loaded, we kill in all of them via common coupling (with a phase delay though!!).

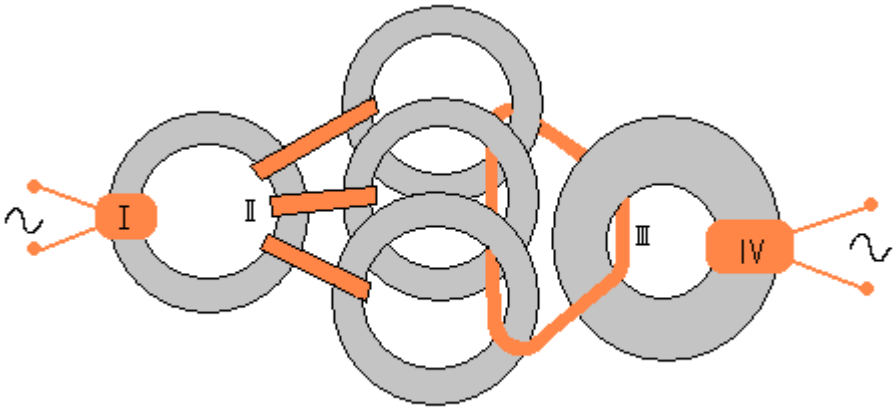
It also should be noted that from each winding II it is possible to obtain energy in the size of the no-load operation of input winding I on the central core because even being in a short-circuit windings II cannot influence winding I, i.e. the input signal.



Variant 5

It deserves more careful investigating

Based on the above variants we can understand the logic of functioning of separate units



Let us consider the steps of its functioning successively:

Alternating current is supplied to input I; it creates an alternating magnetic flux in the first core, which is, let us say, one unity; then, via three equal short-circuited windings designated as II the magnetic flux is mirrored (duplicated!!!) to three central cores (the number of them can be larger). After that, the three alternating magnetic fluxes are united and mirrored by a short-circuited winding to the third core (a thick one) and as the result, a triple alternating magnetic flux flows

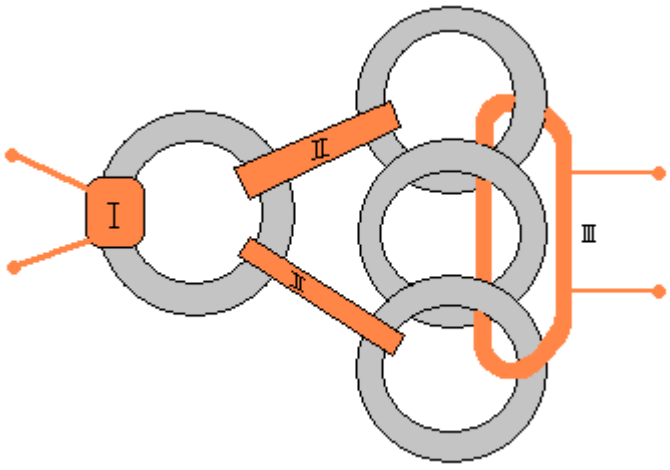
through winding IV. In this case, the last ring of the core is not necessary; however, it gives a visual representation of where and how an extra energy is accumulated.

For the sake of control let us check the development of the process in the reverse direction: from winding IV to winding I.

Let us supply alternating current to winding IV; as the result, in the right (according to the figure) (thick) magnetic core, a magnetic flux with the force of one unity is circulating. Via short-circuited winding III, the magnetic flux will be mirrored to three magnetic cores simultaneously, i.e. it will be divided into three approximately equal fluxes: in each central core, a magnetic flux will be one third!! as great as the input flux. Via windings II, each magnetic flux from the central core will be balanced by the similar flux in the left core. It means that the central rings of the cores should have a magnetic flux equal to that of the left (according to the figure) core, in order there will be approximately zero alternating magnetic flux in each short-circuited winding II, i.e. it should be equal in different directions. In other words, after having flown through winding II, the magnetic flux in the left core will be the same like in each central core.

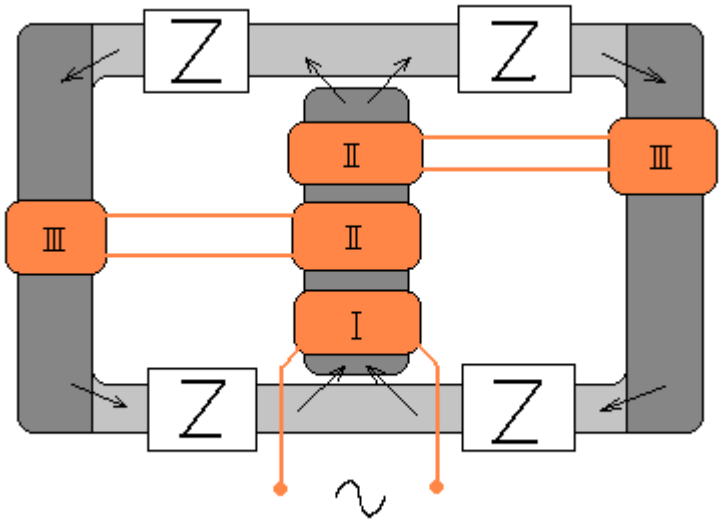
Conclusion: in the present construction, from left to right, the force of the alternating magnetic flux increases, consequently, the energy increases as well (I wonder from where it appears?) and from right to left, the alternating magnetic flux force decreases and, consequently, the energy should decrease too (I wonder where it disappears?).

An example with doubling of a magnetic flux without influence on the input (the central ring balances the output):



Variant 6

Similar to variant 5, but in this variant there are two additional cores; it is brought close to the F-transformer form and an attempt has been made to fulfill a positive feedback in one construction.



An alternating voltage is supplied to winding I. Windings II are connected in parallel, **each has its** own winding III. Since the inductance of windings II and III is the same, (I think) this is equivalent to a single short-circuited winding, in which the magnetic field from winding II is duplicated in each winding III, i.e. in the side cores (they are dark in the figure), alternating magnetic fields are formed equal to that in the central core. In order to obtain a positive feedback in the right phase, they should be supplied to the central core again. I have designated the elements for the delay of the magnetic field front by a specified value by Z. I happen to remember that a ring from thick wire sometimes can delay the appearance of a magnetic field, which is used in some engines…)

In the present construction, there can be much more side cores, for example, 8 or 16 like in Habard-Cater constructions, and the closed cylinders used by them are probably used for the delay of the phase of the magnetic field influence similarly to thin magnetic screens, which one of Tesla transformers has…

Variant 7

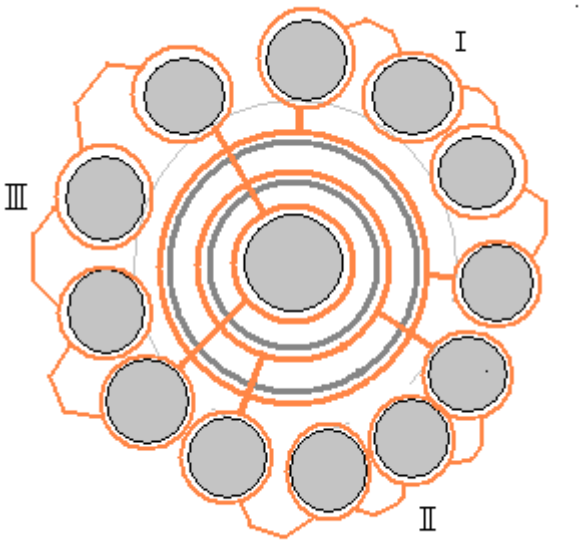
This is a top view (sort of horizontal profile) of Habard-Cater construction

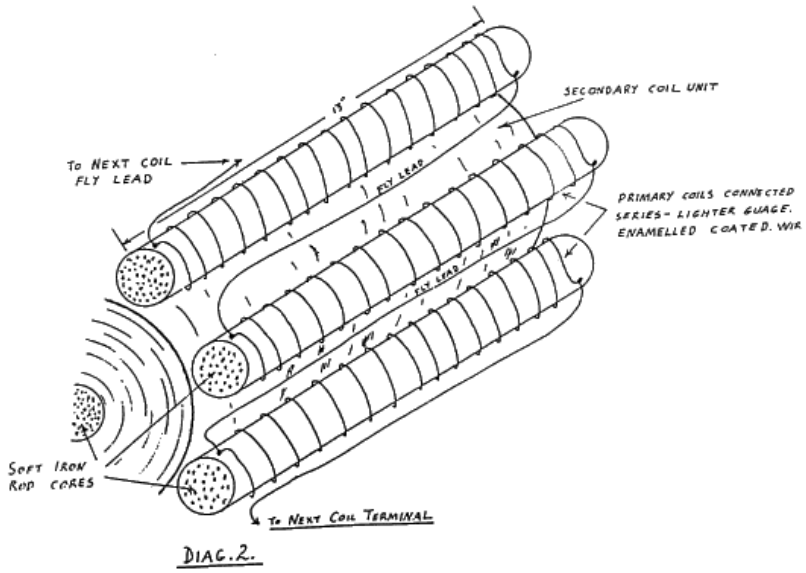
Grey color is vertical rods of cylindric cores

Orange color is windings on each core

Radial orange lines are winding switching

Thin brown concentric circles in the centre are magnetic screens from tin, which are electrically closed circumferentially.





DIAG.2.

If we suggest that the switching of the system has been performed as seen in the figure (and switching in descriptions is the most obscure thing), it is possible to mark out the above-described elements for multiplication and integration of magnetic fields.

If we somehow create an alternating magnetic field in the central core, the induced inductance in the concentric central coils (the peculiarity of magnetic screen is not considered here yet) creates current in the latter, which is supplied via the radial conductors to the group of peripheral coils (in this case, there are 4 coils in one group, but the number of them can be different as well), and a

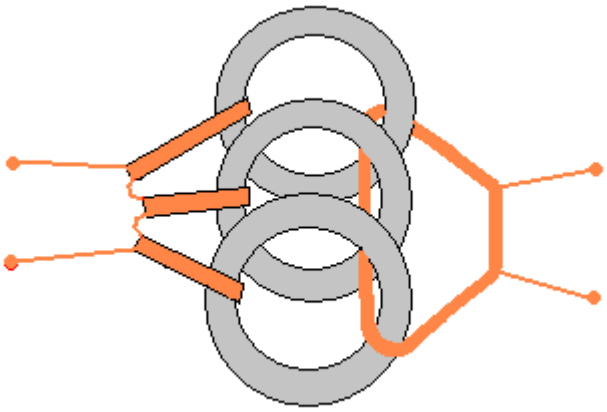
magnetic field is created in them, which is similar to that in the central core (under the condition of the equality of inductances); the same takes place in the other groups of peripheral coils.

As the result, an alternating magnetic field is created in all peripheral cores, which is three times stronger than the magnetic field in the central core. After that the created field should be transmitted to the central core in order to be amplified, in this case, a right phase should be necessarily provided. At this step, the presence of thin layers of magnetic screens becomes important. They can be used for the delay in transmission of the magnetic field from the peripheral cores to the central core (which has been proved by the experiment). The presence of the short-circuited turns inside the volumes of the magnetic screens is an additional help in delaying of the front of the magnetic field change in this case.

It should be noted that such construction is very sensitive to the change of operating frequency, the initial current of start-up, the thickness of magnetic screens and gaps between them; but then everything is made constructively in a single block except capacitors; therefore, it is more preferential when produced on the production line. Such transformer with positive magnetic couple (rather some sort of inductance) can be swung in resonance, when it is turned on as an oscillating circuit, and the energy can be increased until it will be physically broken because of the excess of magnetic fields, which did take place sometimes according to descriptions…

It is interesting to test Habard ferrite-ring transformer:

Pay attention to the fact that when the number of rings is increased, i.e. the number of turns in the primary winding is increased, the output voltage grows. This is an anomalous effect for an ordinary transformer.



The idea of the main principle:

The windings with additional separate magnetic circuit should be used in transformers, engines (motors) or generators.

An unusual use of ordinary network step-down transformers…