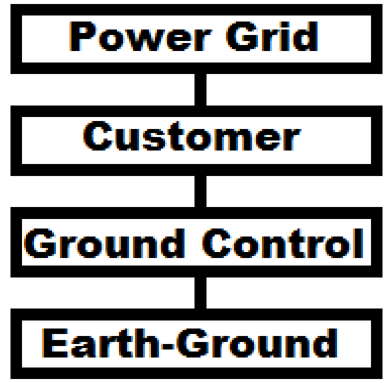
Ground-Impedance Conservation Device

Claimed:



1. IC: An apparatus comprised of an oscillating impedance circuit that controls the ground potential that is seen by a device or by a supply circuit for the purpose of compensating for an excessively high supply voltage.
2. IC: An apparatus comprised of an oscillating impedance circuit for the purpose of storing energy to smooth out sudden drops in supply voltage and to smooth out abrupt power surges caused by customer equipment suddenly turning on or off.
3. IC: An apparatus comprised of an oscillating impedance circuit for the purpose of replacing a step-down transformer or partially replacing a step-down transformer so that a smaller or/and more reliable step-down transformer can be used in place a larger step-down transformer.
4. *IC: Apparatus comprised of one or more oscillating impedance circuits that are arranged to cause an EMP event to induce a compensating impedance event in a circuit as small as a microprocessor or as large as the national power grid.*

Background Problems:

When power companies distribute electrical power to their customers, they are dealing with conflicting requirements:

On the one hand, it is desirable to maintain the highest line voltage that the distribution system *itself* can safely handle, due to the following facts.

- Higher line voltage means that more power is instantaneously available and there is less prospect of line voltage decreasing to the point where customer equipment malfunctions or is even damaged.
- Higher voltage also makes more efficient use of the grid infrastructure since far more energy can be transferred without increasing ohmic resistance losses.

On the other hand, we have the conflicting requirement that devices should only be run at the lowest practical voltage because:

- Excess voltage potential can *also* damage customer equipment.
- Excess voltage potential wastes electrical power since P = VI.

These conflicts are further-exacerbated by the fact that earth-ground potential *itself* varies quite significantly from point to point, within the entire grid distribution as well as throughout every level of every subsystem.

Grid Fatally Vulnerable to *Inevitable* Major EMP Events.

Furthermore; it is well-known that the current power-grid is in danger of catastrophic collapse when, *inevitably,* an extreme EMP event finally strikes. Depending on severity, it is *highly*-likely to take months or even *years* to rebuild the grid, assuming scenarios that are base on well-documented historical events. Loss of human life is expected, by the US military to number in the *tens of millions* in the US alone. NRC studies have concluded that many nuclear reactors would be impossible to cool in the face of a protracted, nationwide power-grid outage in combination with the disruptions in fuel supplies for emergency generators and shortages of spare parts and the ability to deliver them in a timely fashion. A hundred Fukushimas simultaneously spewing radiation from simultaneous multiple meltdowns and spent-fuel pond breaches is highly-likely yet terrifyingly unthinkable. When something is *unthinkable* we are even less likely to respond to in while there is still time to act! Such an event could *easily* make the entire Northern Hemisphere uninhabitable for *centuries.*

The present invention provides a unique opportunity to adequately address all of these problems:

- One the one hand, electrical power can be distributed at the highest voltage that the grid distribution system can handle for greater distribution efficiency.
- On the other hand, A microprocessor-controlled impedance-producing, oscillating circuit is set up between the customer circuits and *local* earth-ground. This gives us the ability to *dynamically* **and** *locally* control the *relative* voltage potential that is acting on the customer equipment in the face of an already overly-variable supply voltage, even if the supply voltage is allowed to swing even higher than is currently permitted, which is actually desirable for greater distribution-efficiency and improved grid stability.

Power companies already sell power to consumers that is often at a higher voltage than is optimal for consumer purposes. Therefore, even if power companies do not alter their own practices, the consumer benefits from the present invention because he is enabled to better-control exactly how much power his devices use. This can be accomplished on a device by device basis or by a circuit by circuit basis or we can control the ground-potential for the entire customer electrical panel.

Ground-Control (G-C) accomplishes much of what the Smart Grid technology is trying to accomplish, but without the need for centralized controls; therefore, G-C can be immediately implemented while the rest of the Smart Grid to be brought online. This can be done without even interrupting customer service and without even having to setup a service appointment with the customer since it will be little more intrusive than meter reader personnel stepping onto private property, as is already done, routinely. At this simplest level, local power-supply companies can add a ground-control device in parallel to the existing ground wire that exits the consumer's building and attaches to the ground-rod. The parallel portion of the wire can then be cut leaving only the G-C device to complete the household circuit to ground. Indeed, smart grid infrastructure for future use can be built right into these devices for a fairly modest additional price.

If desired, the devices can also include a modest power-storage feature that compensates for momentary power surges withing the customer's system or momentary brown-outs on the part of the power company; again, the goal is to increase grid stability and efficiency.

A more involved approach would place more ambitious impedance circuitry between the consumer and the high voltage lines, altogether eliminating the local step-down transformers; this approach would store a great deal of power in these reactive circuits for additional distribution system stability.

Such an approach would also provide the opportunity to implement adequate protections against natural EMP events as well as to mitigate the effects of deliberate EMP attacks. Power systems can be *further*-protected against EMP events by setting up reactive circuitry so that an excessive EMP pulse induces an equal and opposite reactive impedance event. Even long distance power lines can be safeguarded in this manner.