

Court bans sale of useless systems to protect against EMF through grounding

A small company installed systems it claimed diverted dirty electricity, stray electricity, ground currents, and radio-frequency radiation into the earth through an elaborate grounding system. It also sold modifications to cars to make them radiate less. These services were offered to people with electrical sensitivities.

The systems were based on the common misunderstanding that these electrical problems can be fixed with increased grounding.

A court ruled that these systems did not work as claimed and barred any further sales.

This article describes the court case and provides appendices with technical details and explanations.

Keywords: grounding, earthing, deep ground, deep earth, transients, dirty electricity, stray electricity, stray current, ground currents, EMF, protection, net current, EMC, radio frequency, electrical sensitivity, low EMF, cars, lawsuit

The deep grounding system

The firm offered an elaborate grounding system which it claimed reduced or even eliminated ground currents, stray electricity, dirty electricity (transients) and airborne radio-frequency radiation. The system supposedly did that by sending them deep into the earth.

The main feature was a deep bore hole that was at least 200 meters (600 ft) deep with a thick copper cable going down to the bottom of the hole. The cable was a special design that was custom made for this purpose. This was, in effect, a giant ground rod.

Another thick copper cable was buried in a trench to connect the breaker panel to the cable in the deep borehole. Sometimes copper wires were also buried in circles around the house and even strung along fences.

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Inside the house thick copper wires connected the breaker panel, washing machine, stove, refrigerator and other appliances to the bore hole ground cable.

The firm had a patent on the system and the special cables. It charged at least \$75,000 for an installation. Customers had to sign an agreement that they would follow the firm's instructions and were discouraged from discussing their system with anyone who didn't own one.

More details on these systems are provided in the appendix at the end of this document.

The grounding system didn't actually work. When customers complained that they saw no health benefit from their new system they were told it took time for their bodies to adjust to a low-EMF environment. They were also offered to buy "primary modules," which were actually ordinary copper clamps they were instructed to install on the copper wires. They were told this should help. One customer installed dozens of these clamps over several years.

Sometimes the customer was told that additional copper cables had to be added to the borehole. In some cases a customer was even told that the borehole was "saturated" and a second borehole had to be drilled. Some of the later boreholes went as deep as 400 meters (1200 ft).

Low EMF cars

The firm also offered to modify cars to make them radiate less. Some customers were verbally told that these modifications would also protect the drivers against microwaves (presumably from transmitters outside the car).

The mainstay of these modifications was to install capacitors in the car's fuse box and extra cables between the battery's negative post and other parts of the car.

The charge for this service was about four thousand dollars.

These modifications did not work and sometimes made the car radiate more. The claim that microwaves would be reduced was, of course, ludicrous.

When electrically sensitive customers complained that they still got symptoms when driving their car, they were told to keep driving it anyway – it would get better over time as their body adjusted to the new and "better" EMF environment. One customer was told this for seven years.

Loyal following

The idea that such an elaborate grounding system can send unwanted electricity deep into the ground seems plausible to most people. Even among electricians it is a common misunderstanding that the earth is a sort of waste basket for electricity and electrons. (It isn't, electricity always runs in a loop. There is no such thing as a blind alley for electricity, but the soil of the earth can be a part of the loop and often is. This is a fundamental law of electricity, called Kirchoff's First Law.)

The firm advertised in the magazine *Ljusglimten*, which was published by the Swedish support organization for people with electrical hypersensitivity. People with this illness usually find little help from the medical system and can be quite desperate for relief.

Some of the customers did feel better after the installation of their system. This is probably due to the placebo effect, where people get better on their own because they expect to get better. It is a well-studied phenomenon and is the reason new drugs are tested on patients who don't know if they get the real drug or an inactive placebo pill – it is not unusual for 20% or more of those on a placebo to report they feel better. That some of the customers had a placebo effect does not mean they imagined their electrical sensitivities.

Studies of the placebo effect have found that more elaborate placebos are more "effective." A large and colorful placebo tablet is more effective than a small, plain pill, and a saline injection is more effective than any placebo pill. Sham surgery is yet more effective.

It is not surprising that there was a placebo effect in some customers. The installation was quite elaborate with a big drill rig operating in the yard for several days, the special patented cables, and the large expense. There was also a closed community that was cultivated by the company through its newsletter and encouragement to only discuss the system with other customers.

The company also used its customers as part of its salesforce and some customers bought stock in the company.

Expansion plans

The firm was named Elmiljo4all and based in Sweden, where it had installed more than twenty of the deep grounding systems. It had sold many more of its car modifications. Sweden was a limited market and the firm was working on going global.

International patents were secured for several countries, including the United States, Canada, Australia, Japan, etc. A corporate structure with subsidiaries was being constructed with Electrical Environment 4all Global Invest AB as the corporate owner.

Dissatisfied customers

Neither the grounding system nor the car modifications actually worked and neither did the “upgrades.” Customers were losing patience. The firm discouraged the complainers by threatening them with defamation lawsuits. Some customers complained to the authorities, including the consumer ombudsman, but got no help.

Several customers complained to the Swedish electrical sensitivity patient organization, which promised confidentiality. This organization is known as FEB in English.

FEB hired an expert to take a look at the deep grounding systems. He contacted some customers who were satisfied with their system and asked if he could make measurements, but they all declined. The company had apparently told its customers that such measurements could somehow damage their expensive system.

He got more cooperation from the dissatisfied customers and was allowed to do measurements on a system before, during, and after it was dismantled. This way he could fully document that it did not work. It did not reduce the electrical fields, magnetic fields, stray currents, dirty electricity, or radio-frequency radiation. The system actually *increased* the amount of ground current in the soil and caused an imbalance in the electrical service feed. This was not surprising at all. (Specific data is provided at the end of this document.)

It was clear to the FEB leadership that these products did not work as advertised. The FEB chairman included a mild rebuke in his editorial in the 2012/4 issue of their magazine *Ljusglimten*. He simply stated (in translation) that “no type of grounding will reduce the radiation from wireless technologies.”

Six months later the magazine brought another mild rebuke (p.20 in 2013/2), this time in a technical column where it was explained that a long ground wire doesn't work for the short wavelengths used in wireless communication.

By the end of 2013 the editor of the magazine refused to publish any more ads from the firm. Since EHS patients were the firm's customer base, this was a direct threat and the company sued FEB.

The first lawsuit

The lawsuit against FEB was heard in the Nacka court. The firm asked FEB to compensate for loss of profits due to the missing ads. They claimed each missing ad meant they lost an order for one deep grounding system and three vehicle modifications.

The profit for each deep grounding system was said to be 250,000 Swedish Krona (about \$35,000) and 15,000 Swedish Krona (\$2000) for each car modification.

The court ruled in favor of FEB.

The second lawsuit

The FEB leadership decided to stop the firm through legal means. The large sums of money people had paid for the systems and the ongoing upgrades, the fact that the public authorities had not stepped in, and the aggressive way the firm tried to silence the opposition, were weighty parts of the decision. FEB could take the firm to court in a way an individual could not.

The firm tried to get FEB to back down in various way, including an attempt to overthrow the leadership, but was not successful.

Meeting in court

The court hearing took place over five days in the Swedish Commerce Court (Marknadsdomstolen) in Stockholm, in late September 2015.

FEB was represented by two attorneys from MarLaw, a law firm specializing in commerce law. They presented three expert witnesses.

Elmiljo4all was represented by its leader and a lawyer who owned stock in the company. They presented several of their staff and satisfied customers, but no independent experts.

FEB started by presenting an expert in patent law. He testified that the patent should never have been issued since there was nothing new in it, and it made a lot of claims that weren't supported. It was simply an ordinary copper cable placed in an ordinary bore hole with a lot of unsubstantiated claims. The witness had a masters degree in electrical engineering but declined to comment on whether the system could or couldn't work, since that was outside his expertise.

The second expert witness was Clas Tegenfeldt, who had a masters degree in electrical engineering plus further studies in physics. He had twenty years of full-time experience in mitigation of EMF problems (EMC), measurements, etc. It was him FEB had asked to look into the deep grounding systems.

He described at length the basic physics and why the deep ground system could not work as claimed. He also presented his detailed reports on his objective measurements on a system before and after it was dismantled – measurements documenting it didn't work.

The court later ruled that his testimony was not independent, since he regularly associated with FEB.

The third witness was Torbjorn Karlsson, who had what is probably the highest credentials in the country with regards to EMF mitigation (EMC). He had a Ph.D in the field and had done hundreds of technical studies for Swedish industry and military. He stated that the deep grounding system simply could not work.

Then it was time for the company to present its defense. The leader of the company first described his credentials. He had no applicable education and his experience was in sales of electrical equipment. He described that he got sick with electrical hypersensitivity and did experiments to help himself. He tried to ram hundreds of ground rods into the ground around his house and felt better afterwards. He then tried to drop a copper cable down his well and seemed to feel better after that as well. It was all subjective.

There wasn't anything about how he dimensioned his grounding systems, such as the depth of the bore hole or the size of the wires, or any science behind it all. He explained that he had installed about two dozen of the deep grounding systems and that 56% of the billed amounts were profit.

Three employees of the company were then presented. None of them had an applicable higher education. Some were electricians, but had no expertise in EMF mitigation (EMC). None of them could explain how the system worked. In a court case, credentials and expertise are essential.

Then a host of supportive customers spoke before the judges. They described how they felt better after the installation and how they still had to upgrade their systems over time. They were desperate people hoping the system would help them. None of them understood how it all supposedly worked.

That they did feel better didn't prove the system worked. There could be other reasons, such as placebo. That they still had to upgrade their systems shows that they didn't work well for them either.

The verdict

The court issued its verdict on November 20, 2015. The four judges were unanimous in ruling for FEB on all counts.

The court ruled that the firm's advertising was misleading and unreasonable, since the products it sold did not reduce or eliminate EMF.

The court ordered the firm to pay FEB's legal expenses and barred the firm's leader from selling any EMF mitigation products or services.

Commentary

This is an important ruling since the bogus system was based on common misunderstandings. It happened in Sweden, but it could happen anywhere. If the firm hadn't been stopped it would likely have started selling its products globally as it was planning to do. There are people elsewhere who have the same basic idea that grounding can solve problems with stray electricity, dirty electricity, etc.

People who are sick and desperate are easy prey for sellers of products that do not work, especially when technologies seem a bit mysterious, though plausible, and are promoted with great salesmanship. EMF/EMC is complicated and will seem mysterious to most people, including most engineers and electricians.

It appears that the leader of the small firm got caught up in his own web. He had no applicable education and simply tried a common idea and felt better afterwards. He apparently genuinely believed his system worked, just as some of his customers did. His aggressive business methods did not earn him much sympathy, however.

The firm changed its name after it lost the court case. There does not seem to be any publicly available plans for the future.

So how can a bogus product be awarded a patent? The answer is that the patent process is not perfect, and it is not up to the patent office to build, test and verify that an invention actually works. There are lots of patents for things that don't work.

Sources

The world patent application (WO 2010126421 A1) is the most verbatim English translation of the original Swedish patent (SE 533 434 C2), with minor modifications made in the US patent (US 8878D57 B2).

The Swedish commerce court's web site (www.marknadsdomstolen.se) contains the case documents, including the verdict and Clas Tegenfeldt's technical reports. The case number is C 12/14. All these materials are in the Swedish language.

FEB's magazine, *Ljusglimten* had extensive coverage of the court case in their 4/2015 and 1/2016 issues. These articles provided the circumstances of the case as well as some technical details not mentioned in the court filings.

Information about the placebo effect came from Wikipedia and the book *You are the Placebo* by Joe Dispenza (Hay House, 2014).

The names of most of the involved people have been omitted as they are not important and there is no reason to vilify anyone. The names of the main persons can be found throughout the above sources, though the court documents refer to all witnesses by initials only, according to Swedish practice.

Appendix A: the grounding system

The world patent application (WO 2010126421 A1) is a verbatim translation of the Swedish patent and is freely available on the web. A few terms are poorly translated: stray electricity is called "vagabond current", ground current is called "ground fault current" (not quite the same) and dirty electricity/transients are called "overtones."

The original patent specifies a bore hole that is at least 200 meters (600 ft) deep though the US patent also says that a hundred meter hole may be sufficient.

The special cable is a central part of the patent and specified to have an inner core of 370 thin wires (0.5 mm thick) that are twisted together. The outer core of the cable consists of 18 thicker wires (2.2 mm) that are twisted as a mantle around the core. The areas of the core and the mantle are both 70 mm², i.e. the total area is 140 mm² or similar to a #2 AWG cable in America.

The cable was not insulated and the grounding system relied on ground water in the bore hole to provide contact between the cable and the sides of the bore hole.

The patent specifies the need for a casing for the first 36 meters (111 ft) of the borehole and that the cable is to be well-connected to the casing. It states that the depth of the hole is important to avoid “overtones” (i.e. dirty electricity) close to the surface, and to ensure that much of the cable is submerged in ground water.

The patent also makes various claims of efficacy, such as stating that for their prototype site the ambient radio-frequency level was 0.04 uW/m² and the ambient magnetic radiation was 0.02 microtestla (0.2 milligauss) without stating what the levels were without the installation.

The patent states that “resistance in the ground conductor was measured of 0.08 ohm and even lower.” This claim is ambiguous – do they mean the resistance in the cable itself, or the resistance between the cable and the earth, which is more important.

The basic idea is to create an exceptionally good (low impedance) connection between the electrical ground wires in a house and the earth, instead of the usual ground rod that is placed near the service entrance.

Unfortunately, it doesn’t work that way. The system does not even provide a particularly good ground connection. It is not at all superior to standard methods.

Clas Tegenfeldt, the expert FEB hired, tested multiple deep grounding systems, including two before and after they were dismantled. One of the dismantled systems was extensively documented in the court documents, though the results were similar for both of them.

The documented system was located in a rural neighborhood. It consisted of a 234 meter (725 ft) bore hole that went through 1.6 meter (5 ft) of topsoil and then solid rock for the rest. The top 42 meters (130 ft) of the borehole was lined with a 14 cm (5.6 inch) casing. The report doesn’t state the depth of the water table, but it is apparently close to the surface throughout Sweden.

When the customer didn’t feel better after the system was installed, it was upgraded with a second copper cable in the bore hole. The bore hole cables and casing were connected to the ground bus bar on the service entrance electrical panel on the garage, using a buried copper cable. All these cables were of the special type listed in the patent and were all uninsulated to provide good contact with the soil.

The bonding between the ground system and the electrical neutral was presumably done at this panel on the garage. The house was detached from the garage, apparently with its own subpanel.

The report shows pictures of an electrical panel with a very large bus bar mounted below it. The bus bar has a large number of thick copper cables attached, that are presumably connecting the various house appliances to the grounding system.

This system was then dismantled, including digging up the buried copper cable and pulling the cables out of the bore hole. There was a total of 580 Kg (1280 lbs) of copper, which was sold as scrap metal.

The idea with the long copper cables in the bore hole was to create a very low impedance (low resistance) connection to the soil. Using a standard method (Eurotest 61557), the resistance to the soil was measured with two, one, and no cables in the bore hole. The results were:

Two cables: 8.22 ohm
One cable: 9.32 ohm
No Cable: 15.96 ohm

With no cable in the well, the well casing provided the ground connection by itself. None of these numbers are impressive. It is not uncommon for a standard conventional ground rod to provide a better ground connection. A problem here was that the borehole was almost entirely in granite, which has very poor conductivity. Then it doesn't matter much that the bore hole is filled with copper and water. The well casing alone provides most of the ground connection, while the cables add little more. Once the grounding system reaches the water table, little can be gained from going deeper.

The actual measurements were far from the 0.08 ohm listed in the patent. A much more effective grounding system would use multiple ground rods, buried plates, horizontally buried cables or even meshes. These are commonly used methods when a simple ground rod is insufficient.

The above measurements were for 50 hertz power frequency. Since the patent claimed that the system could "deflect" high frequency signals to the soil, the impedance (resistance) was also measured for increasing frequencies. It was found that for frequencies above 50 kilohertz (much dirty electricity is now at higher frequencies) there was no difference whether the two cables were in the bore hole or the ground connection was provided by the casing alone. This is not surprising since the impedance increases dramatically with the frequency.

Tegenfeldt took a piece of the cable home to his laboratory to test how well this special patented cable conducts high-frequency signals. He tested it up to 1 megahertz and found the cable to perform just like any other cable. There was no difference, none expected. These “special” cables couldn’t transfer high-frequency signals very far, contrary to what the patent suggests. It was simply impossible for this cable to carry any sort of radio-frequency signals or dirty electricity deep into the ground.

Measurements were taken inside the house with the grounding system in place and after it was removed. With the system in place the results were:

- Electric field (5-2000 Hz): 10-100 V/m
- Electric field (2-400 kHz): 0.1 – 0.3 V/m
- Magnetic field: 10 nT (0.1 milligauss)

Both the electric fields were high and an oscilloscope showed a lot of high-frequency transients on the house wiring.

The buried cable from the service panel to the bore hole carried a current, which created a magnetic field of 60 nT (0.6 milligauss) even 5 m (15 ft) from the cable. The electrical service feed was unbalanced, with a net current of 0.05 to 0.2 amps, which means there were significant stray electricity/ground currents.

Removing the grounding system did not change any of the readings inside the house. There was no change in the dirty electricity, electrical fields or magnetic fields. There was also no change in the ambient RF/microwave levels outside the house. The system clearly did not improve the situation at all, and the levels continued to be high enough to give problems for someone who is electrically sensitive.

Outside the house the situation improved with the *removal* of the grounding system. The magnetic level dropped to 10 nT (0.1 milligauss) everywhere and the net current on the service feed dropped to 0.01 amps. This did not affect the house because the service entrance was on the detached garage; had it been on the side of the house it would likely have improved the magnetic readings inside the house.

The second system Tegenfeldt measured was disconnected later and not documented in court filings, but covered in the 1/2016 issue of *Ljusglimten*. This was an even more extensive system with three copper cables in a 271 meter (840 ft) deep bore hole and an extensive network of buried copper wires around the house. A total of 2140 Kg (4720 lbs) of copper was removed. The before/after

results were similar, with extensive ground currents that greatly diminished once the grounding system was removed.

Tegenfeldt mentions a third such system, which was connected to the steel pipes of a district heating system. Such systems are notorious for carrying stray currents and he measured about 10 amps on the grounding wire.

These elaborate grounding systems actually *created* more ground currents instead of reducing them. This is not surprising at all as ground rods are the source of ground currents wherever the electrical system is designed as it is in Sweden and most of the world (the WYE system).

In the WYE system one of the electrical wires is connected to the ground. This is called the “neutral” wire, or the “grounded conductor.” This grounding provides an alternate path for the electricity to run through the soil to another grounding point, in addition to running through the wire. Electricity prefers to take the path of least resistance, so if the path through the ground is improved (i.e. lower impedance) then more of the electricity will run that way instead of through the wires. The result is increased ground currents and increased ambient magnetic radiation – the opposite of what was claimed and desired.

Instead of these very expensive and ineffective systems, the owners could have the electrical systems in their houses modified using proven methods that would have cost a lot less. Such methods might include rewiring the house with steel conduits to shield the cables, in-line filters, source reduction and other measures as appropriate.

Appendix B: the low EMF car modifications

The firm’s car modifications mainly consisted of installing capacitors in the fuse box and extra cables from various parts of the chassis to the negative battery post.

Cars use 12 volt DC electricity, which is in theory healthier than AC electricity, but in a car there are a lot of transients on the wires from the alternator, fuel pump, spark plugs, electronics, etc.

Modern cars already have capacitors to limit radio noise from the ignition system for the spark plugs, but capacitors must be placed at the source to be effective. Placing them in the fuse box, as Elmiljo4all did, is too far from the sources of the transients.

The idea behind the many extra cables connecting the battery negative directly with various parts of the car appears to be that the battery should act like a sink for transients. In practice that didn't work and provided additional paths for the electricity to run, which caused elevated magnetic fields in some cases.

A more effective rewiring scheme would be to use two-conductor cables (i.e. plus and minus) directly to the fuel pump, etc., so the opposite-direction of the two magnetic fields can cancel each other out. Shielded cables would be even better. Other possible measures include degaussing the tires, shielding, modifying or disconnecting sources, etc.

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