Human Body as an Active Component of a Water Prospecting System

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The author proposes a method of detecting subterranean water, employing an electric field, generated by contracting leg muscles of a walking operator. Presence of a water lens under a soil deflects electric lines of forces of the field, generated by the walking operator what can be detected by the field-measuring instruments. This operator-produced filed mechanism also can be a component of the physical base of the *Dowsing*, because its operators inevitably walk during the search process.

1. General Approach

A Pulse electric field, generated by contracting leg muscles of a water prospecting operator can be used in the combined bio-technical system. This field counts as order of ~10 V/m and even more next to the legs. The process of emanation of the field is most considerable when walking. Contracting leg muscles produce major portion of the generated field. Electrically conducting human body emanates electric field around it and can be conditionally considered as a field emitter.

Presence of subterranean waters drastically alters patterns of electric field around them.

Fig.1 shows a distribution of electric lines of force of the operator over a soil without (a) and with (b) presence of the subterranean water. Water is a polarized fluid and, by this reason, strongly influences external electric field. The field, generated by human muscles, is deflected by the water lens, so an external field-sensitive devise will detect this.

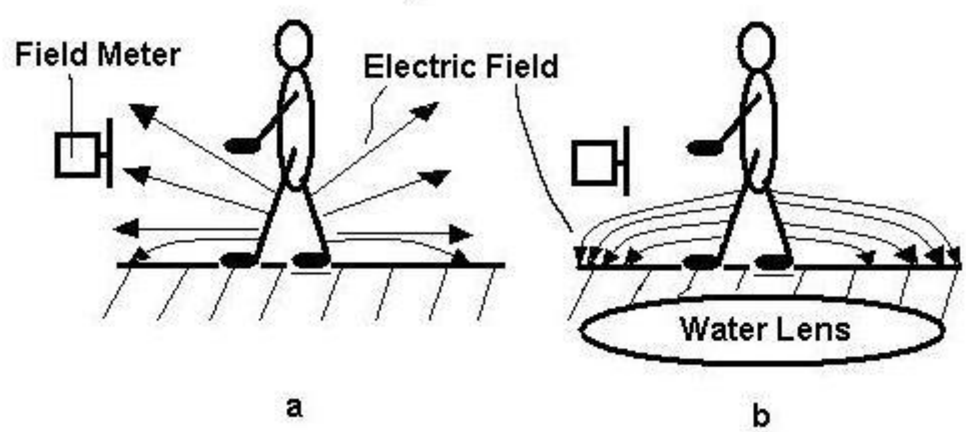

Fig.1

This picture illustrates operation of the Method: subterranean water deflects electric lines of force, produced by musle of an operator as walking.

There is some analogy between this proposed method and well-known method of a *Dip Needle* for detecting underground waters basing on their diamagnetic properties [1, p.348]. In that magnetic-based method, diamagnetic water distorts inclination of magnetic lines of force detected with the Dip Needle.

The preliminary results have shown a high sensitivity of the proposed method, which promises to be efficient for dowsing and water prospecting.

It has to be noted that dowsers mostly detect subterranean water when walking. Even at rest condition, there is some muscle activity, which produces the electric field.

Namely contracting muscles produce electric field pulses which probe the soil. This can be one of the explanations of how a *dowsing* works.

During the dowsing process, its operator has to walk [1]

2. Calculation of the Distribution of the Field

In this application all the original charges are produced by muscles of the operator, while the secondary sources are surface charges on borders between components like air-soil, soil-water and so on.

Electric potential at arbitrary point of observation is defined by action of a sum of all original charges ρ and induced by them secondary charges σ, Fig.2. The calculation is based on more general method [2].

It has to be said that action of the secondary sources in Fig.2 opposes to that of the primary/original source because of their opposite polarities. As a result, the field strength at the *observation point* in Fig.2 will be less than without the soil and the water lens.

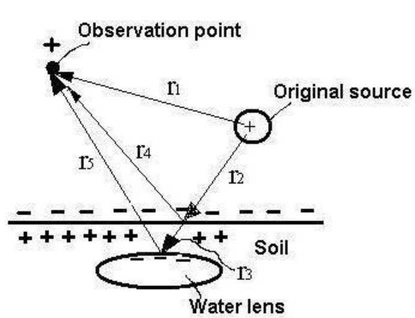

Fig.2. On calculation of electric potential at the observation point under a joint action of the original source of the field and induced surface charges (secondary sources).

$$\varphi_r = \frac{1}{4\pi\varepsilon_0\varepsilon_1}\int_V \frac{\rho}{r_1} dV + \frac{1}{4\pi\varepsilon_0\varepsilon_1}\int_S \frac{\sigma_1}{r_4} dS + \frac{1}{4\pi\varepsilon_1}\int_{SL} \frac{\sigma_2}{r_5} dS \quad (1)$$

Generally the secondary sources can be found as a function of the normal component of the field at the border of two media, having different electro-physical properties

$$\sigma = 2\varepsilon_0 E_n \frac{\varepsilon_2 - \varepsilon_1}{\varepsilon_2 + \varepsilon_1} \quad (2)$$

It has to be said, that the value of surface charges σ_1 is a function of the field between the original charge and the soil and the field between the water lens and the soil. The σ_2 surface charges are a complex function of the field of the original source and that fort the soil-lens border. Index *SL* means a surface of integration for the water lens.

Formula (1) describes a whole contribution of all charges in the potential of an arbitrary point.

We have to know all the charges in a certain problem to calculate the potential at any given point. This is an integral approach.

The differential approach is a calculating the potential in vicinity of an arbitrary point, basing on the Poisson equation, considering the distribution of the potential, influenced by given charges:

$$\frac{\partial^2\varphi}{\partial x^2} + \frac{\partial^2\varphi}{\partial y^2} + \frac{\partial^2\varphi}{\partial z^2} = -\frac{\rho}{\varepsilon\varepsilon_0} \quad (3)$$

However, if the gradient of the potential was created by some external source and there are no other free charges in the area of our interest, that is $\rho=0$, it can be calculated by the Laplace equation:

$$\frac{\partial^2\varphi}{\partial x^2} + \frac{\partial^2\varphi}{\partial y^2} + \frac{\partial^2\varphi}{\partial z^2} = 0 \quad (4)$$

It's obvious from Figs. 1 and 2 and the equation (1) that presence of the water lens under the operator will deflect the field toward the lens.

This can be used for developing a special measuring instrument, kind of a differential electrometer, Fig.3. In this instrument, two identical field sensors are located along a vertical line along a human body. The differential/operational amplifier increases difference of their signals. At a rest position of the operator, there is no the field, produced by his/her legs. As the operator walks over a soil with no subterranean lens, the field developed by his contracting muscles, acts on both the sensors, prevailing at the lower one. The meter displays the difference of the signals. When the operator walks over the subterranean lens, the electric lines of force are deflected downward and the upper sensor gets less induced charges. As the result, the differential signal, displayed by the meter, drastically increases.

The advantage of this method is in that while the operator is at rest, only the Earth's field acts on the sensors and its influence can be estimated and compensated by means of the operational amplifier.

Therefore, the instrument will be dominatingly sensitive to deflection of the field, caused by the subterranean waters or any other object influencing the field.

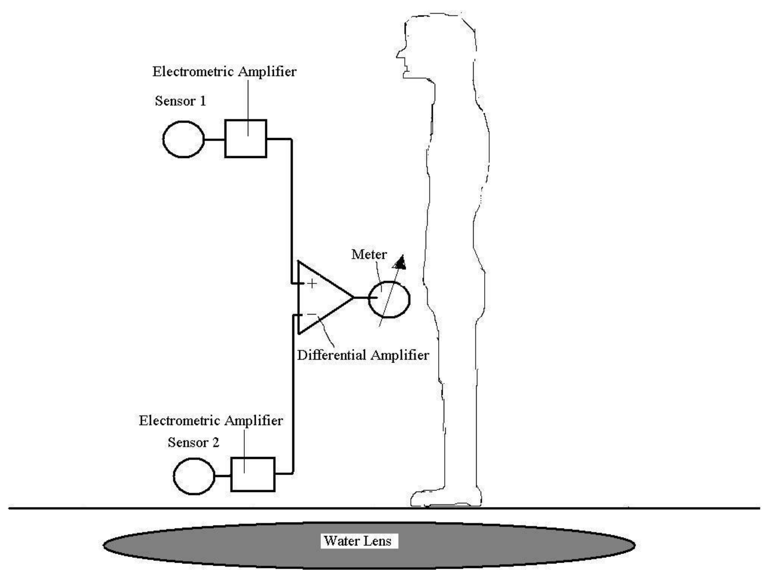

Fig.3. Distortion of the electric field, developed by contracting leg muscles of a walking operator in a presence of a secondary charges source like a water lens, can be detected as a difference of the signals of two field sensors located on a vertical axis at different levels of the human body.

3. Experiments

In the repeated experiments with electrometric sensors, redistribution of the electric lines of force of the operator's legs generated field was observed when the floor was covered with a thin water film.

As the operator walks, the instrument displays, at each a step, a field pulse produced by contracting leg muscles. For a single sensor, located at the upper portion of the operator's body reduction of the magnitude of the pulses was observed on a wet floor. The rubber, electrically insulated shoes excluded direct leakage of electric charge through the water film.

Unlike the detection of turbulent streams of subterranean water, based on DC-to-AC conversion of the Earth field [2], this method allows to work with calm standing subterranean water.

Both the methods can compliment each other.

Literature

1. Christopher Bird, *The Divining Hand*, Witford Press, USA, 1993, 372 pp.
2. Тозони О.В., *Метод Вторичных Источников в Электротехнике*,- М. Энергия,1975, 2006 с. *Secondary Sources Method in Electro Technology* (in Russian)
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