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United States Patent [19]

Pappas

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[54] **METHOD AND APPARATUS FOR PULSED MAGNETIC INDUCTION**

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[51] **Int. Cl.**[6] **A61N 1/00**

[52] **U.S. Cl.** **607/1**; 607/71; 600/13

[58] **Field of Search** 607/1, 2, 71; 600/9, 600/10, 13, 14; 315/111.21, 111.41, 111.91; 361/232, 233, 229; 313/231, 61, 4

[56] **References Cited**

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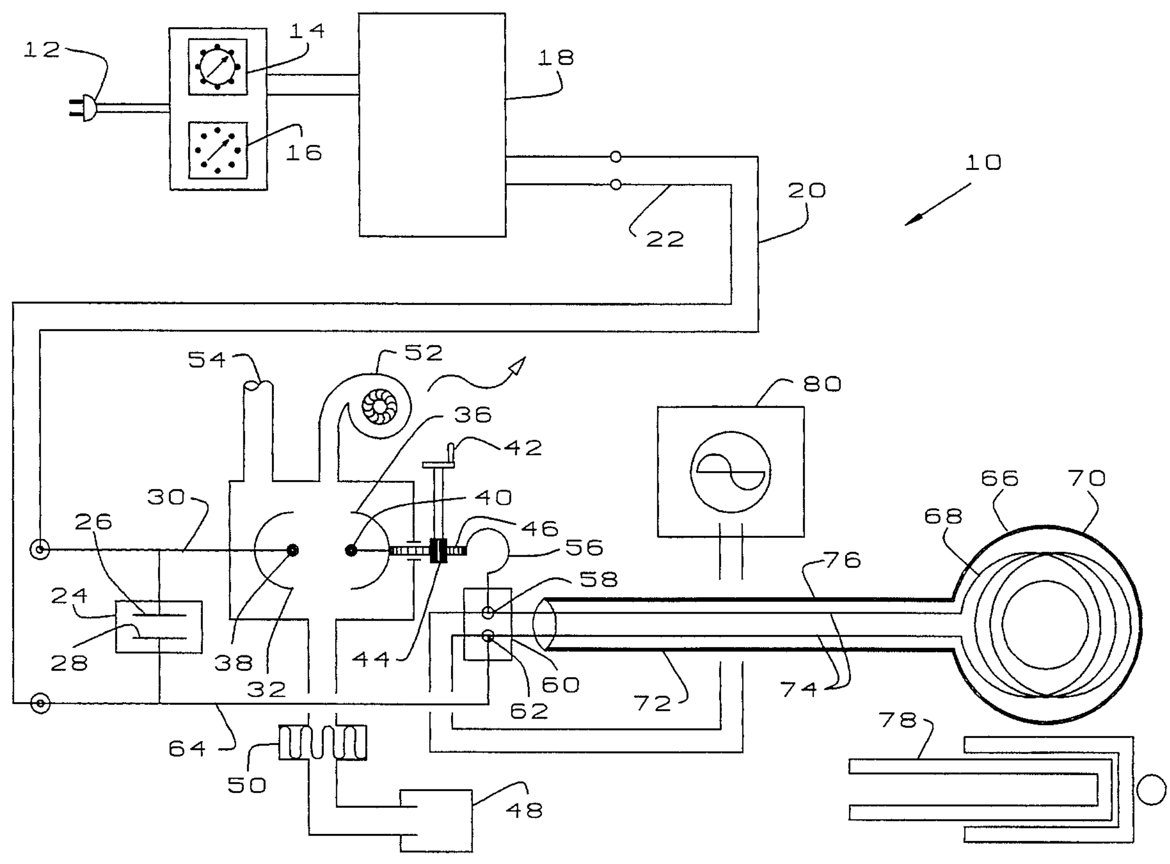
[57] **ABSTRACT**

An improved method and apparatus for pulsed magnetic induction by creating a plasma, supplying energy to excite said plasma to oscillate, and applying said the resulting oscillations to a patient or biological matter.

17 Claims, 2 Drawing Sheets



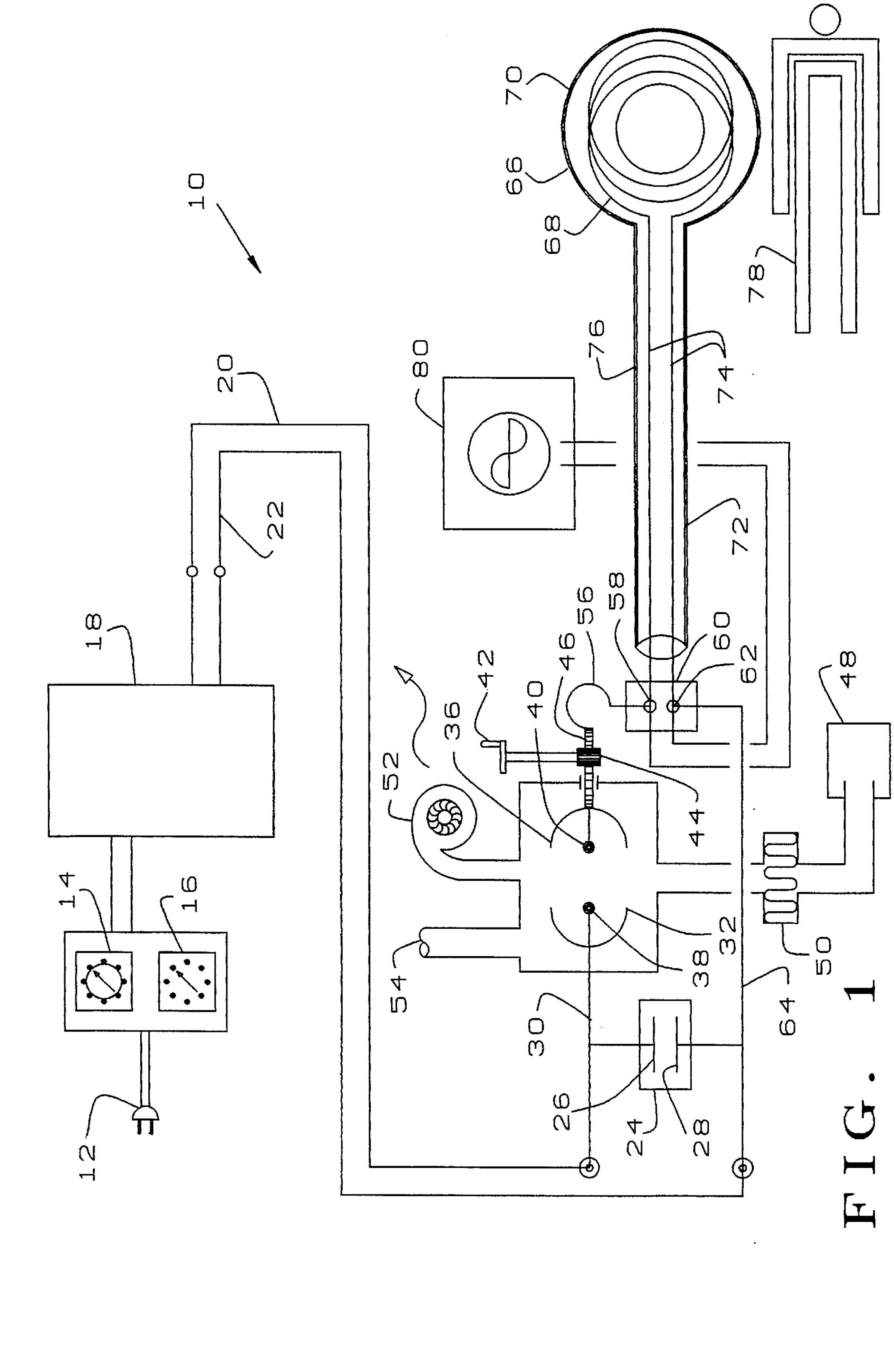

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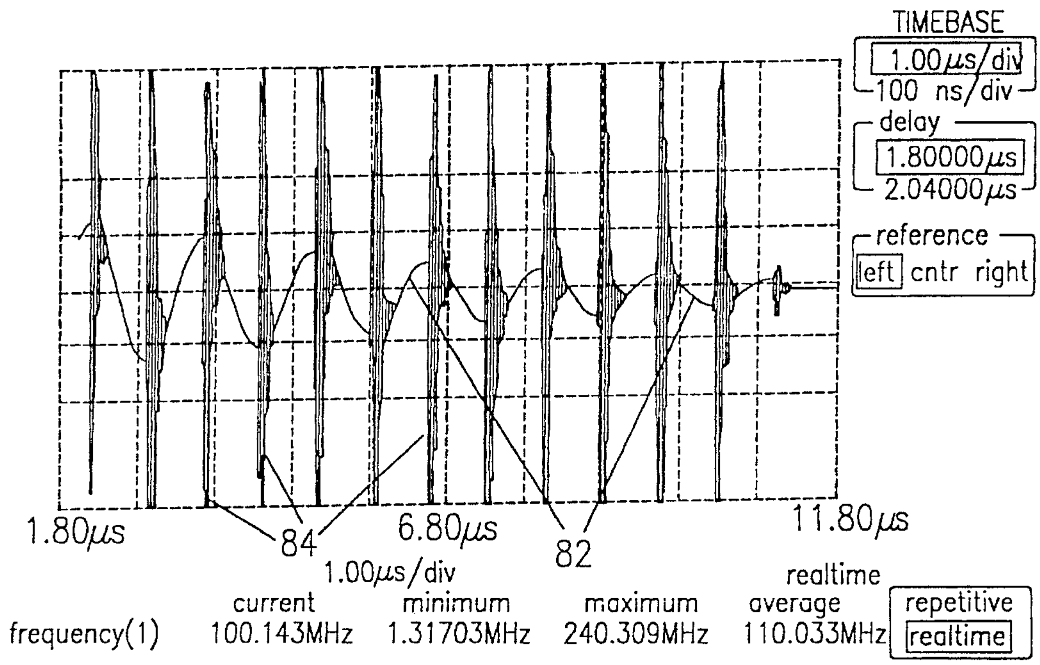
FIG. 1

FIG. 2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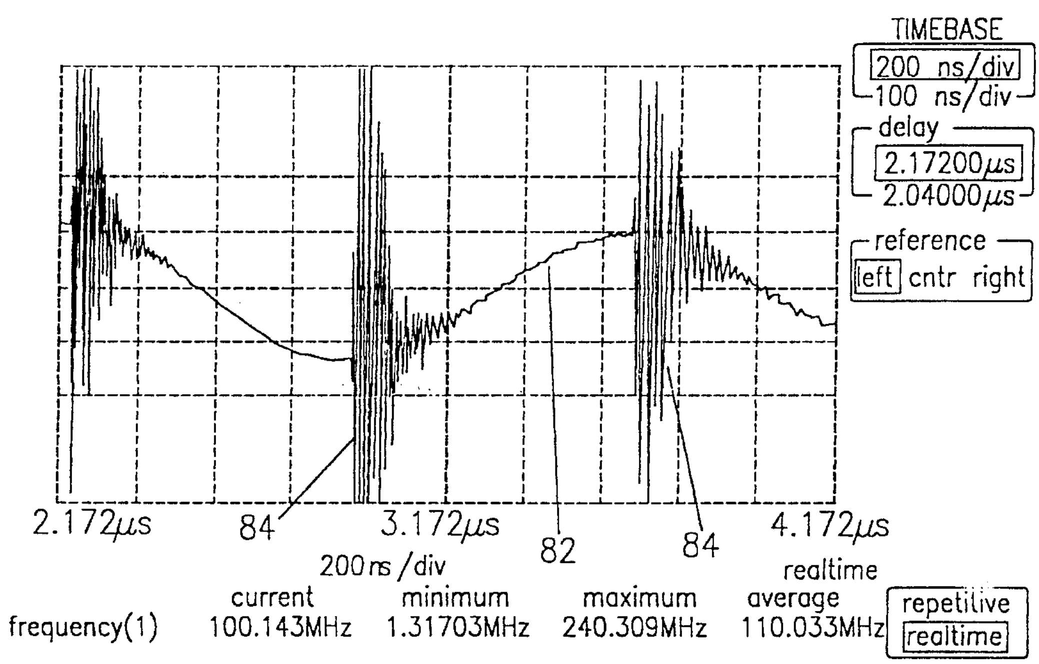
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4.172μs
200ns/div
realtime
current
minimum
maximum
average
repetitive
frequency(1)
100.143MHz
1.31703MHz
240.309MHz
110.033MHz
realtime

FIG. 3

METHOD AND APPARATUS FOR PULSED MAGNETIC INDUCTION

RELATED CASES

This invention corresponds to that disclosed in my Greek patent application Ser. No. 920200309, filed Jul. 10, 1992, and now pending.

FIELD OF INVENTION

This invention relates to pulsed magnetic induction and is particularly directed to improved methods and apparatus for inducing electrical activity within and around the cells of the human body and other biological matter for therapeutic purposes and the like.

PRIOR ART

It has long been known that electrical current and electrical and magnetic fields have significant effects on the human body and various therapeutic techniques have been proposed heretofore for employing such electrical and magnetic effects to achieve beneficial results. In connection with this, it has been determined that human body cells have an electric potential across the surrounding membrane of the cell which energizes the sodium-potassium activity of the cell which, in turn, is responsible for the ion concentration of the cell and the maintenance of the transmembrane potential. When young and healthy, human body cells have a transmembrane potential of the order of 70 millivolts, whereas the transmembrane potential of an aged or unhealthy cell is considerably lower, approximately 50 millivolts. A cancer tumor cell can have a transmembrane potential as low as 15 millivolts. It has been found that cells with a low transmembrane potential are the source of pain generation signals which cause a sense of strong pain. At the same time, the membrane serves to resist extremely strong external electrical fields of the order at least of 70 mv/membrane thickness =70 mv/several Angstrom, which is of the order at least of 10^6 v/m. Only a stronger external electrical source might serve to alter directly the transmembrane potential and, hence, effect the health of the cell. The value of 10^6 v/m for an applied electrical field is prohibitive, as it surpasses the dielectric strength of the atmospheric air, which is 10 Kv/cm, or just 10^6 v/m, i.e. the atmospheric air will break down by such a strong electric field before the membrane of a cell breaks down. This seems to be nature's way for safeguarding the cell against outside electrical disturbances.

Working in this direction, Nordenstrom was led to develop a quite successful method for the cure of cancer by introducing electrodes to supply electric current directly inside the cancerous area. An electric contact in a small area creates a strong field, of the order of several volts per meter v/m, which is inversely proportional to the separation of the electrodes. Theoretically, this field can reach any value by reducing the separation distance of the contact electrodes and might be independent of the total potential in the separation. Thus, in practice, the field of the cellular membrane can be overcome by an invasive or contact method. Unfortunately, implantation of invasive electrodes involves surgery and creates the risk of infection at the implantation site. However, with prior art non-invasive techniques, it has been practically impossible to achieve these values for the electrical field without ionizing the atmospheric air and, therefore, a transfer of electrical charges or ions across the

cellular membrane could not take place with fields which will not first break down the atmospheric air.

The use of static magnetic fields is known to have no significant influence of the static distributions of charges or ions within the cells. Also, a strong electrostatic field may produce an initial displacement of electrical charges, but cannot produce a substantial electric current, such as would be required for ion displacement and electrolytic transport. Moreover, the usual alternating sinusoidal electric field does not appear to have sensible results, due to the successive creation and removal of the electric charges, as well as because such an influence must be at least of the order of 10^6 volts per meter for affecting a biologic cell membrane. Such a value is macroscopically prohibitive, since it surpasses the dielectric strength of air. The use of alternating sinusoidal magnetic fields causes an inductive electric voltage which is theoretically equal to the initial electric voltage of the source which alters the magnetic flux of the coil. However, if the magnetic coupling is less than 100%, which is always the case, the induced voltage will be smaller than the voltage of the source. For ion movement across the cellular membrane to occur, an initial source is required with a field greater than that of the transmembrane potential. However, as explained, this surpasses the dielectric strength of the air and has, therefore, been impossible with the devices of the prior art. The present invention overcomes this problem by instantaneously boosting the voltage to from one to one hundred times the dielectric value of air and quickly reducing the voltage to a safe value before ionization of the air can occur. By bombarding the semitransparent or semiconductive membrane of the cells by short duration burst of magnetic pulses caused by similar bursts of voltages, the transmembrane potential may be increased by ion conduction across the membrane. By bombarding the membrane of degenerate cells or bigger microorganisms with even stronger bursts of magnetic pulses caused by stronger bursts of voltage bursts, pressure inside the degenerate cell or bigger microorganism is increased. This pressure can burst or kill these degenerate cells or relatively bigger microorganisms of biological matter. Thus, this process can be used to perform cold pasteurization or to cause therapeutic changes in infected tissues or organs.

BRIEF SUMMARY AND OBJECTS OF INVENTION

The present method, in order to produce an electrical effect on the cellular membrane from afar, which will be substantial and feasible, uses plasma oscillations observed in electric discharges in various gases under pressure. During these oscillations, a significant energy increase is observed, for a percentage of the electron or ion flow in the arc, which far surpasses any potential difference in the discharge setup. The energy increase of these electrons or ions is achieved by a corresponding decrease in the energy of the remaining electrons or ions and results in the plasma being forced to oscillate with an eigenfrequency(ies) which is(are) characteristic of the gas plasma. This phenomenon was first observed by Langmuir in 1925 and was studied independently by the present inventor (P.T. Pappas, Proceedings, International Conference For Free Energy, Eisiedeln, Switzerland, 1989; International Tesla Symposium, Colorado Springs, 1990; 26th Intersociety Energy Conversion Engineering Conference, Boston, Mass., 1991). During the measurements of the inventor, an instantaneous increase of the effective voltage and current 10 to 100 times greater than the available potential and average current was observed along