

The simulator loop probe style magnetic stimulation design for a nervous system treatment

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신경계 치료를 위한 루프 프로브형 자기자극기의 시뮬레이터

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〈Abstract〉

It is as result that study to apply mini magnet nerve curer in peripheral nervous system disease treatment. Simulator and embodied action power and Control Unit in cylinder form of magnet roof object firstly. Yielded service area about special quality of probe of loop object cylinder style and treatment area dimension and distance of treatment pulse secondly. Embody pulse forming course energy value by Probe's form by third, could embody treatment pulse by disease. Specially, through a special quality experiment, saved Damping pulse form and treatment digital forming etc. variously. Lately, embodied this to aid a little in disease treatment that follow that there is no invasion that there is no stimulation by medicine development. Neuralgia, muscular disease and Alzheimer, with stroke etc. is becoming the matter of concern and interest which disease of adult etc. it is same is important. And the melancholia in compliance with the modern direction of a ceremony which is complicated and garrulous, trillion it will cry and symptoms, it is a tendency where the emotional obstacle etc. nervous psychiatric disorder patient is increasing at class speed. But currently the applicator it will be able to treat like this disease almost it is a condition which is wholly lacking. Consequently like this disease it used magnetic stimulation and it diagnosed and the equipment it will be able to treat plan and it embodied.

Key Words : Digital loop, Probe, Magnetic stimulation, Nervous system, Simulator

I . INTRODUCTION

The armature self-control of existing immediate

contact in the body, there is a possibility of having an ache own magnetic pole with nothing contact and nothing getting wet from various neurological disease widely with muscle diseased channel etc., the

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application area comes to widen, it is going[1-3]. When in about self it explained an organism effect with basic principle, the human body which comes to be put in electric field received a static induction and ranging an electric charge with electric field direction in the human body surface[4]. The dielectric which comes to be put in electric field gets up a hereditary polarization and the electric dipole which confronts in electric field ranges and, the actual condition where the hair stands from the power failure market inside which is powerful is the example[5-9]. The hair receives a force from electric field and there is an impression where the breeze is right from above usual about 200kV/m , $2,000\text{kV/m}$ from classical system above the discharge happens from spearhead department of the organism and if ignition feeling or the etc. surface of the body which feels the one stimulus which stabs the skin with the needle to peripheral nerve etc. there is a possibility of decreasing an effect[10]. Generally the spermatozoon funeral burglar becomes $0.1\sim 1\text{T}$ *6 and it says that it reaches an action in the organism[11]. Only the spermatozoon funeral burglar the bay it knows, the uniform magnetic field is the uneven magnetic field is directivity, movement or rotation of difference and the magnetic field, width or action time of the part where the strong magnetic field happens, different energy[12]. For example there is a valence which presence etc. of mutual interference action of the electric wave, radiation and supersonic etc. and becomes problem, also, like the false report type flowing in the interchange magnetic field undergarment organism to the interchange battlefield undergarment organism the induction electric current makes flow[13-15]. In about the human body the effect degree is the blood pressure, heart beat, the electrocardiogram and brain wave,

reaction time, about blood ingredient etc. until 20kV/m burglars whom it investigates the possibility of seeing an effect was not clinical data[10]. The high frequency and super high frequency electronic funeral organism action come ten actions are subject in words[9]. The electronic energy easily in the organism, absorbs and there is a possibility of knowing the point which becomes 12. Come electromagnetic waves absorption of the organism as heat effect 30MHz enough it sees from LF possibility the organism size or interference of dissection school register structure and wavelength the inside and almost are not because the wavelength being longer size of the organism than considerably[6]. The energy absorption is most from the surface of the body, it decreases it goes exponential function with internal deep direction. But, the frequency rises and reaching the price whose quarter of wavelength is near in extension of the human being the resonance from changeover appearing, it starts and energy absorbance it increases suddenly, it starts. When the frequency is above 30MHz , it will not be able to disregard the interference with organism size and the strong resonance happens from near frequency namely wavelength $3\sim 4\text{m}$ where the half wavelength of the electromagnetic waves agrees to an extension the energy absorption becomes the maximum. It is it thinks the safety of the electromagnetic waves in compliance with ten actions, frequency price near these $30\sim 300\text{MHz}$ it is most important and the neck, the joint, ankle etc. it goes from the resonance condition of standing up extension direction there is a danger where the part is strongly heated. The magnetic field where own magnetic pole changes like this at time it induces an electric field to the human body inside and nothing contact characteristic and nothing is deep get wet, with

the advantage where the magnetic pole of the region which is wide is possible the peripheral nerve, encephalopathy, cranial nerve, muscular power, incontinence, senile and muscle disease, until rehabilitation therapeutic etc. it comes to recent times and actively, the research actively is in the process of advancing. In order to apply the nervous applicator which the beginning mini sleeps last in peripheral nervous system diseased treatment the result which it researches, it plans first in cylinder form of own loop object and it embodies second with quality and therapeutic territory scope of probe of the loop object cylinder style it buys an energy price, operational all the member and a control device, an effective territory in about distance of the therapeutic pulse, there was it will be able to embody the therapeutic pulse which in lesion the pulse gun which it follows in form of third probe with embodies it follows. Specially, quality experiment it leads and with damping pulse form therapeutic pulse form etc. variously, it was made to buy. Became the help a little in the diseased treatment which with medical advancement it follows recently in the nothing magnetic pole and nothing getting wet and character it embodied. From the research which it sees the amplitude therapeutic pulse (a remedial value at short time and with the fact that the demand will on a large scale be magnified magneto-therapy where it is traditional on a large scale enormous intension) maximizes to future.

II. HARDWARE EMBODIMENT

It is composed the single-phase full bridge inverters with the center, the inverter operates with ZVS. All the

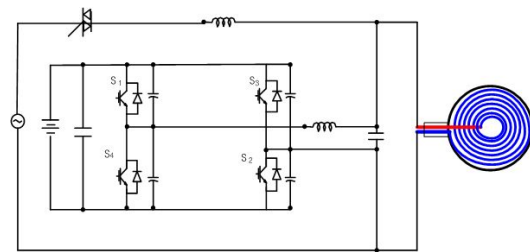


Fig. 1 block diagram

member breaks and by-pass mode and it has backup mode two kind operations mode. From By-pass mode TRIAC are to on conditions and the war potential from all the member directness is delivered almost by load and it makes all the member electric current wave shape improvements and battery charging do of nothing power failure form. The output voltage in compliance with a mains voltage is decided from this mode. From Backup mode TRIAC are to off conditions and nothing power failure all the member from battery direct current war potential supplies an interchange war potential in supply receiving load. This time the output voltage maintains a schedule voltage schedule frequency. UPS the electric current which flows on all the member side is voltage and ditto from and By-pass in order for mode to become the sine group, it is controlled. This time when it considers the fundamental wave parturition in load electric current, war potential with flowing, it will be able to explain.

If there is to a Riga minute charging (trickle charge) condition and this minute charging electric current disregards small, the war potential which flows from all the member side is delivered on all load side I1 with afterwords to make a same size have, it becomes.

$$I_1 = \frac{V_2}{V_1} I_2 \cos \phi \dots\dots\dots (1)$$

The inverter supplies the wattleless power of load and to all the member side the wattleless power does not flow. This operation wattleless power compensator (SVC: Static VAR Compensator) it comes. $I_2 \sin \phi$ where it is a wattleless power minute of load and it digs up and the electric current of the electric current which flows in plaque seater commercial paper makes flow in the inverter. The load voltage with after words is same.

$$\dot{V}_2 = \dot{V}_1 - jX_L \dot{I}_1 \dots\dots\dots (2)$$

When [pas] it is while Riga charging and all the member electric current being expressed compared to and this time the charging electric current with after words is same.

$$I_B = \frac{I_1 V_1 - I_2 V_2 \cos \phi}{V_{DC}} \dots\dots\dots (3)$$

There is not a charger of separate way and it controls I1 and it will be able to control a charging electric current. Harmonic removal function and power factor correction when the control of system becomes accomplished normally, input side electric current becomes the sine group. The subtracting in harmonic of load side the low-end thing is supplied from the inverter and the high harmonic electric current is supplied from the arranging in a row capper seater. While inverter operating also the harmonic electric current which occurs makes flow with this capper seater. With spontaneous war potential aftereffect (Active Power Filter) it operates. When becomes the

power failure and [pas] war potential it makes a supply receiving interchange war potential from and when the infield it does and again all the member is recovered, from commercial business all the member must deliver by supply receiving load. When to armistice all the member side was connected. becoming conclusion by many loads becomes was decided in power failure, in order to intercept all the member side with TRIAC. Also the control loop switching does from this process and safely, in order to be a switching it used a specific control circuit. The voltage which it escapes reserves a decision small from zero-crossing vicinities. U11C switching of the controller at the time of zero-crossing of reference signal to become motive and in order to happen, it provides sync signal to a logical operation circuit. Circuit middle logical operation circuit part AVR Chip E are come true with the crow processor. When the above occurs, the processor TRIAC gate signals to remove immediately and in order to maintain an output voltage with constant voltage settlement wave number, the controller is motive switching grudge. When it is recovered from power failure, motive to commit TRIAC gate signals and in order to control a input voltage, the controller it is a motive switching grudge. The magnetic field pulse applicator the origin of operation is the electric market E which is acquired from a Faraday's Law in after words, the B in compliance with the coil own wife's father who is produced in compliance with Biot-Savart laws in case is same. $m_0 = 4\pi \times 10^{-7} \text{ H/m}$ is a valence which it will show with permeability from free space, the coil promotion of virtue C has a vector d1 synthetically and it operates. The current-pulse in compliance with SCR it was connected it discharges big in compliance

with a plaque seater circuit occurs to the coil which comes to be rolled with series. First, until 2 - 3kV it charged big with the plaque seater, it buys to occur the discharge of the plaque seater big it leads the coil which has been future with the gate iris and it does. The electric current wave shape at least peek shows 5-10kA and 300mS resultantly, the sine group which has become damping where it is typical it has. The E it is induced the damping where it is typical it has. The E it is induced the coil is strongest nearly, there is it stimulates generally to a diameter and the outer cover territory of centimeter of some. The pulses own magnetic pole from the territory where it is stimulated from the near place, nervous units occur not only, producer it is caused by with synaptic inputs they change. Excessively on the level which is minute, the E with trans membrane voltage of nervous unit, and in compliance with it influences in voltage-sensitive ion Channel The brain imaging tools flowing in about the electricity which has become the union, in order to discover, it could be used and the blood of metabolism to it flows and it changes. To motor-cortex magnetic poles, the peripheral device effect in surface electromyography (EMG) as muscle activity it could observe. Fig 4 showed the composition of Loop-coil probe and plan, it saw epoch-making to miniaturize this size according to disease condition until 1 - loops, 2 - loops, 3 - loops, 4 - loops, 5 - loops, 6 loops, 7 - loops, 8 - loops, 9 - loops and 10 - loops it added from picture and 4. For a long time 15cm, diameter 1.5 cm, in order for to become the hole hall 0.5cm, in the condition which is the possibility of drawing out again and it produced. The common person will be able to use who easy conveniently in order, it composed. When being 1 - loop, compares in the system where



Fig. 2 Experiment set

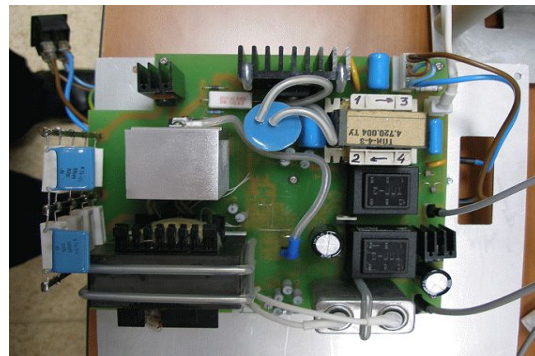


Fig. 3 power supply board

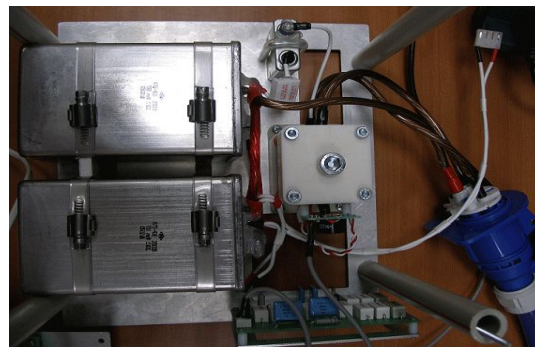


Fig. 4 Energy bank set

the therapeutic pulse is general at 3kA degree and the output gets near to 70% and if price from 1/10 it sees to be few If, bulk if 1/100, efficiency with the fact that it will not search for entirely. The picture 5 according

to water content of Loop-coil probe with size of the wave shape of the therapeutic pulse is the output therapeutic pulse comparative analysis data which shows a therapeutic territory. The fig 6 according to water content and distance of Loop-coil probe with the therapeutic pulse shows the effective distance of therapeutic territory, (A) shows the probe appearance of the loop coil, (B) is the possibility which palm of the hand and it will treat back of the hand marking, (C) is showing a therapeutic pulse radius. The size of the therapeutic pulse according to insertion possibility of the coil is different is showing the thing in after words (D), (E) 12cm goes over and the therapeutic territory suddenly, it shows the fact that it becomes thin. (F) is showing the decrement which the therapeutic pulse is sudden. When it complements a therapeutic scope and a concept, when it is suitable [hyel] even in treatment from around Chinese medicine field and today medical field very with the system which is convenient design or it complements clinically within short amount of time, it is possible even with one kind item of the small and medium enterprise.

III. EXPERIMENTAL RESULT

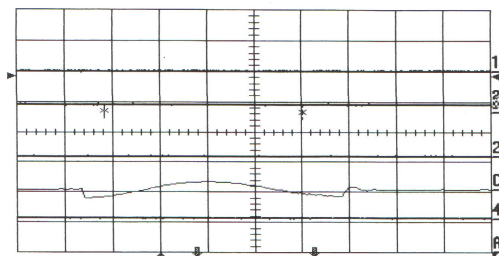


Fig 5. pulse. rep 1Hz

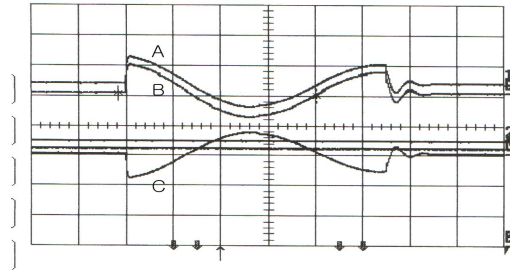


Fig 6. pulse. train 3

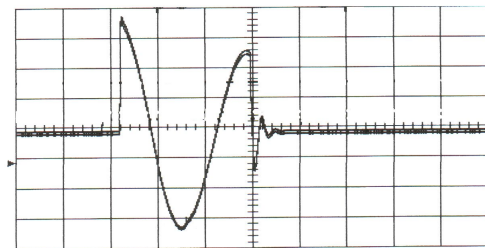


Fig 7. damping loss waveform



Fig 8. Coil Structure

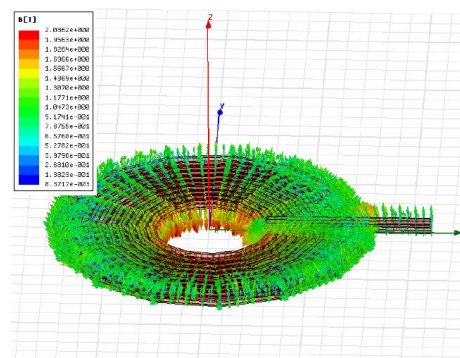


Fig 9. Coil B Vector

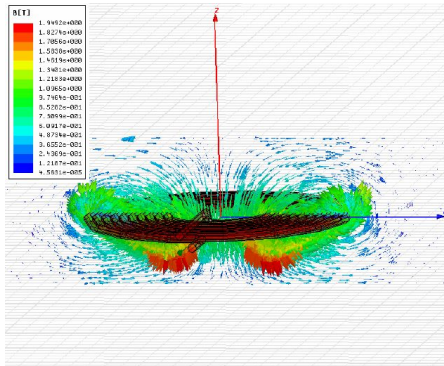


Fig 10 . YZ plane B Vector

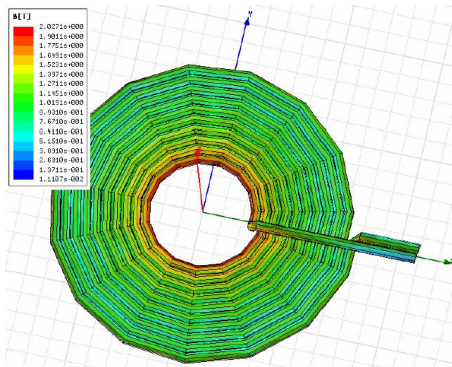


Fig 11. Coil B magnitude

The result which it sees uses Maxwell 3D programs and it is a result which it interprets. Coil form Helix type and Magnetostatic solver coil turns number 10turn and peak current 5000, 6000 and 7000, did with 8000A and they interpreted fig 5 pulse repetitive ratios 1Hz and fig 6 at the time pulse train 3rd, fig 7 shows damping loss waveform. In afterwords, fig 8 is showing in about Coil Structure. Fig 9 Coil B Vector and fig 10. The Y it shows Z plane B Vector. Fig 11 shows magnetic flux B magnitude in about Coil. With the fact that it uses the electromagnet 0.04~0.2T, the effect in the human body of the magnetic field quickly because with the fact that it uses the superconduction electromagnet the patient being bombed in the strong

man market until of 2T degree it was made to pay attention. magnetic feild the magnetic field which changes at time induces an electric field to the human body inside and nothing contact characteristic and nothing is deep get wet, the magnetic pole of the region which is wide is possible the peripheral nerve, encephalopathy, cranial nerve, muscular power, incontinence, senile and muscle disease, until rehabilitation therapeutic etc. it comes to recent times and actively, the research actively is in the process of advancing. The human brain it operates, the explanation which is detailed the boss or measures the electronic badges as is it will be able to confirm in the outside of renewal change. And hemodynamic electroencephalo graphy and magneto encephalography where it uses, positron emission tomography, nearly there is a possibility of changing a infrared spectroscopy and a duty as a matter of own fair tomograph film. The fig 2 only showed the charging voltage comparison of the direction wave shape and the both direction wave shape and fig 6 energy and it rises relationship and fig 7 with tension it had a coil radius and the connection of number of revolution resultantly. The result which it sees uses Maxwell 3D programs and it is a result which it interprets. Coil form Helix elder brothers and Magnetostatic solver the coil the possibility of shaking off 10turn, the peek electric current (Peak current) did with 8000A and it interpreted.

IV. CONCLUSION

The nothing magnetic pole, when the magnetic field nervous applicator receives a footlights with

development of nothing getting wet medical treatment equipment, it became. From the research which it sees about hereupon it researches on a large scale with 4 kind 2 - switch nothing loss application promotion pressure and the zero electric current switch cone butter second, a circuit, according to lesion it planned the form of probe first in various branch form, it planned the current-pulse it embodied, existing became the setting at therapeutic probe of third and did not become the variation, from the research which it sees circle - in socket form it inserted a many kinds therapeutic probe at any time, it produced in the method which is the possibility which it will draw out. There was a possibility of buying various therapeutic probe concretely at the quality and the current-pulse shape and a voltage of fourth. It is reasoning and in future to do with the therapeutic data which is clinical the approach easily in the patient, it became. Research it led and the automatic for the muscle diseased person treatment which is various - it is a plug, plan and embodiment of the nervous system which sleeps it led and a possibility of doing various quality comparative analysis there was.

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