

Design and embodiment of variableness band style magnetic field nerve stimulation system that apply 1^{trigger} 2^{mode} magnetic field treatment Probe for disease treatment

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Abstract— When compose magnetic field curer by belt and band style and need by magnetic field ripple last month, produce self-discipline roof. Bred in muscle disease (lumbago, backbone disease, corpulence) back. Result that study, manufactured various variableness band style - magnetic field probe firstly. Can establish self-discipline treatment pulse price by disease secondly. Could seek correct variableness band punishment, - magnetic field probe relationship implementation and property in waist, and so on, shoulder, neck, arm, leg, ankle, wrist etc. by third. Could find variableness band style energy value that need in - magnetic field Probe's treatment by fourth. This research could design pulse of self-discipline in band form and apply each according to disease.

Index Terms—magnetic, stimulator, variableness band,

I. INTRODUCTION

There is cervical vertebrae, humerus, dorsum, lumbar, femoral, crural, carpal, tarsal various kinds disease etc. of nerve human nature frame disease and muscle disease. Specially, many patients are increased by entry of aging society coming at recent times. Excitability cell of nerve cell and modern age alveolus etc. reacts sensitively in electricity stimulation. Electricity stimulation is used widely in various stimulation experiments because there is advantage that can regulate easily the strength or time than mechanical stimulation or chemical stimulation.

Also, because excitement phenomenon of living body is biographical activity itself in cell wall or phenomenon that have this and close connection, analysis of biographical phenomenon of cell wall is acting important role on excitement mechanism elucidation. Since magnetic field stimulation system is proposed by Barker and so on in the 1980s, is becoming much developments. Existent electricity stimulation radical touches directly in body, and can have sore but application extent of magnetic field stimulation flag is widened extensively by muscle disease system etc.. in various nerve diseases without contact, invasion.

If explain human body effect for a magnetic field to basic principle, human body that is lain in the

courteousness receives electric force judo and range charge by electric field direction on the human body surface. Because dielectric substance put among ago causes heredity polarization, electricity dipole that correspond for monetary unit is ranged, phenomenon that hair stands within strong electric field is the example.

Because hair receives force in electric field, laudable custom is correct impression in about 200 kV/more than ms usually. If discharge happens in pointed end department of living body in high electrometer of 2,000 kV/more than ms, red heat stuff or skin if is a skin ticket that feel mordant prompt by hands of a clock to relationship tip of a twig nerve etc.. influence can .

Usually, strength of a magnetic field does 0.1~1T (Tesla) * 6 that exert action in living body if is imposed. Recently, in river magnetic field to 2T degree that use 0.04~0.2T, super entire island electromagnet that use permanent magnet or electromagnet in imaging device that use nuclear magnetic resonance phenomenon that is used in presence at a sickbed for diagnosis patient because is done effect to human body of magnetic field festinate observe . Strength of a magnetic field is not and difference, direction of a magnetic field, east or curl, dimension of part that strong magnetic field occurs or action time, other energy of if is a magnetic field that is if is an equal magnetic field, existence and nonexistence etc.. of interference action can become an issue mutually with electric wave, radiation, supersonic waves etc. for example. That become most to problem from a low frequency electricity magnetic field is that is based in common use interchange, and it is high tension transmission lines that must do elctetric feild strength in ground 1m by 3 kV/below ms in case can exert danger in human body by power failure lacteal gland in standard about electrical device it is elctetric feild robber of several kV/m under justly. Also, as eddy current is flowing in living body of interchange own inside of the hall, guided current is passed in human body in interchange electric field. Effect degree for human body examined about blood pressure, heart beat, ECG, brain waves, reaction time, blood ingredient and so on, but there is presence at a sickbed data that could not see effect to strength of 20 kV/ms. By next time, heating action of high frequency and human body action of ultrahigh frequency electromagnetic field is subject.

Electron energy can know heated point because is assimilated as is easy in living body. Electromagnetic waves absorption of human body as heating effect than 30Mhz enough daytime in frequency wave length than size of living body more fairly long . It is seldom living body size or anatomy of interior and interference with

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wave length. Energy absorption is most in surface of body, and reduce power of a number functionally for interior of the body deep direction. But, because frequency rises, if 1/4 of wave length amounts to near worth in human's kidney, resonance in whole body begins to show and energy absorption begins to increase rapidly.

Think safety of electromagnetic waves by heat actions, this 30~300 Mhz nearby frequency band is most important and there is danger that part that go such as neck, joint to disappear, ankle in resonance state of standing up height direction is heightened strongly. In this way, magnetic field stimulation flag comes self-discipline which change by time at recent times to tip of a twig nerve, brain disease, cranial nerve, muscular power, main point incontinence, old man disease, myopathy, rehabilitation treatment etc. by advantage that stimulation of deep and, wide region is possible without contact, invasion deriving electric field on human body interior and research is progressing abuzz vigorously.

II. SYSTEMS EMBODIMENT

2.1 1^{trigger} 2^{mode} band style Probe by Loop

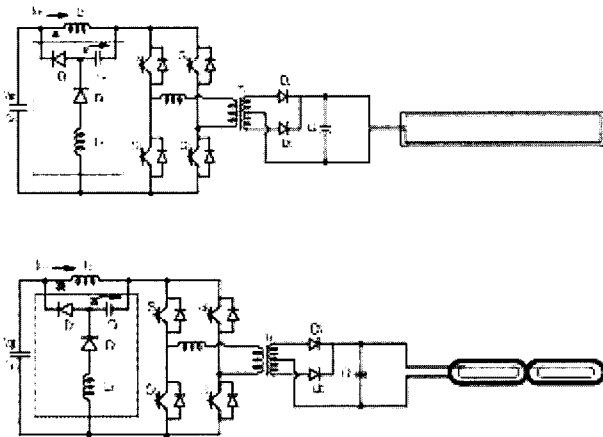


Fig. 1 Basis composition

1^{trigger} 2^{mode} in 1 imperative by 2 (pulse, series wave) action is possible specially, muscle does form and muscle tissue's classification by function, and disease about skeletal muscle is increased continuously. If muscle contraction forms activity voltage because muscle is stimulated in some form by relation between flap and contraction phenomenon, mechanical phenomenon that the result muscle is contraction appears. Neuro can be stimulated by electromagnetic fields by change during applied time externally. Stimulation is achieved as that integrate strong pulses by flowing if decide position through coil. Is referring basis formula for from numerical formula (1) to numerical formula (4) electric field and a magnetic field.

$$\Delta * E = - \frac{\partial B}{\partial t} \text{-----(1)}$$

Being electric field E that is acquired from Faradays law origin of action, is given by Biot-Savart rule in case is a magnetic field that B is produced by coil.

$$B(r, t) = \frac{\mu 0}{4\pi} I(t) \int_c \frac{di(r') * (r - r')}{(r - r')^3} \text{-----(2)}$$

Can appear by permeability from freedom space. Have and act coil winding C A vector dl synthetically. Current pulse occurs by discharged capacitor CCT that is linked in winding coil by series by SCR.

$$\Delta^2 \Phi = \frac{\partial^2 \Phi}{\partial X^2} + \frac{\partial^2 \Phi}{\partial Y^2} + \frac{\partial^2 \Phi}{\partial Z^2} = 0 \text{-----(3)}$$

First, produce capacitor's discharge through inverse coil to capacitor, gate of interval rise site that charge to 2 - 3kVs. Current wave style do peak as a result at least 5A - display 10kAs, 300mS, and have sine waveform that become typical damping . Guided E is strongest near coil, and usually stimulate outer covering area of some centimeter in diameter.

$$\Phi(Z) = VoZ / d, 0 \leq z \leq d \text{-----(4)}$$

Pulses of magnetic field stimulation flag are occurred in near place of neuro in stimulated sacred ground, as well as, change to occurrence by synaptic input. Way (3) is displaying 1 - displaying loop, way (4) is 2 - loop. Composed an experiment in band form to 1 - 7 in roop - roop in this research. Specially, wish to look for way that can treat applying magnetic field pulse according to new solidity muscle disease and connection disease.

2.2 Embodiment of band style Probe power supply

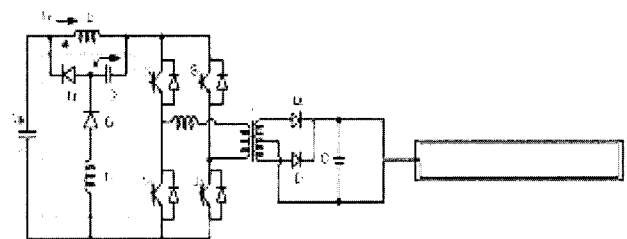


Fig. 2 Propose of Circuit composition

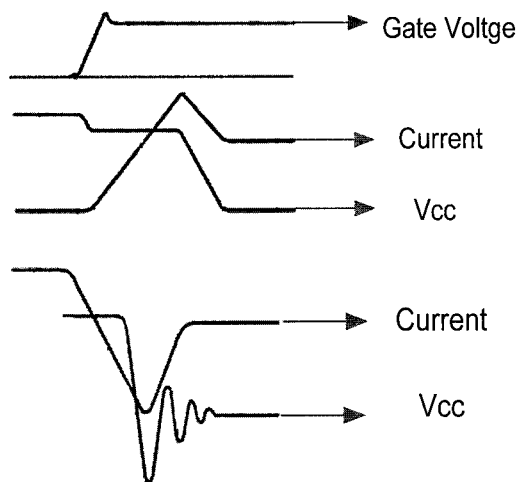


Fig. 3 IGBT operation of Waveform

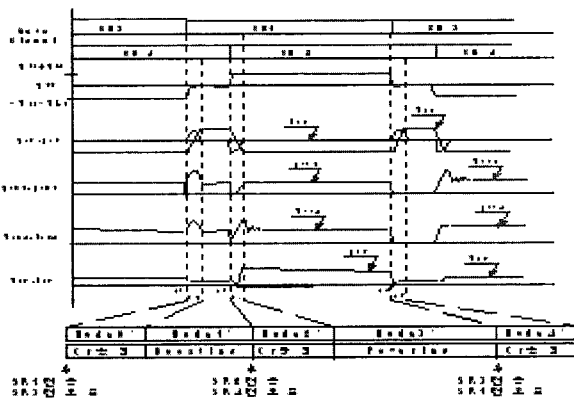


Fig. 4 Area action waveform

Basic 1 - apply each radish damage snubber circuit in the first DC Link decision in full bridge converter main circuit to embody loop. Main switching devices controls so that zero voltage switching is possible offering low impedance path of flowing current to input up-mode inductor Lb at last month from up-mode to powering mode. At the same time, is get turn-off switching damage reduction and parasitism tremor, EMI reduction. Main switching devices is possible zero voltage switching applying snubber circuit that there is no damage that is consisted of 1 snubber capacitor (Cs), 2 snubber diode (Dp, Dr) and 1 snubber inductor (Lr) instead of RCD snubber in the first DC Link decision in full bridge converter main circuit. Switching devices S1 becomes Turn-on in t0 in mode 0 (t0-t1). From AC input Vac short circuit through rectifier diode ⇒ up inductor Lb ⇒ switching devices S1, S4 form. Procure energy to up inductor Lb, and current ILb rises. During Mode high frequency transformer Tr primary winding with switching devices S1 short through S4 do. As high frequency transformer Tr primary voltage does so that energy is not passed and do charging through output capacitor Co although is high frequency transformer Tr the second leakage in high frequency transformer Tr the

second output department amounting to 0, Reset is done and energy that is stored to output capacitor Co does discharging by load. Mode 2 (t2-t3) does S4 Turn-off in t2, and at the same time, S2 energy stored to input up mode inductor Lb if do Turn-on through path of snubber capacitor Cr and current diode Dp's Low-Impedance than switching devices S1 ⇒ high frequency transformer Tr ⇒ switching devices S2's High Impedance path, snubber capacitor Cr's charging voltage Vcr + in VLb discharging do begin to.

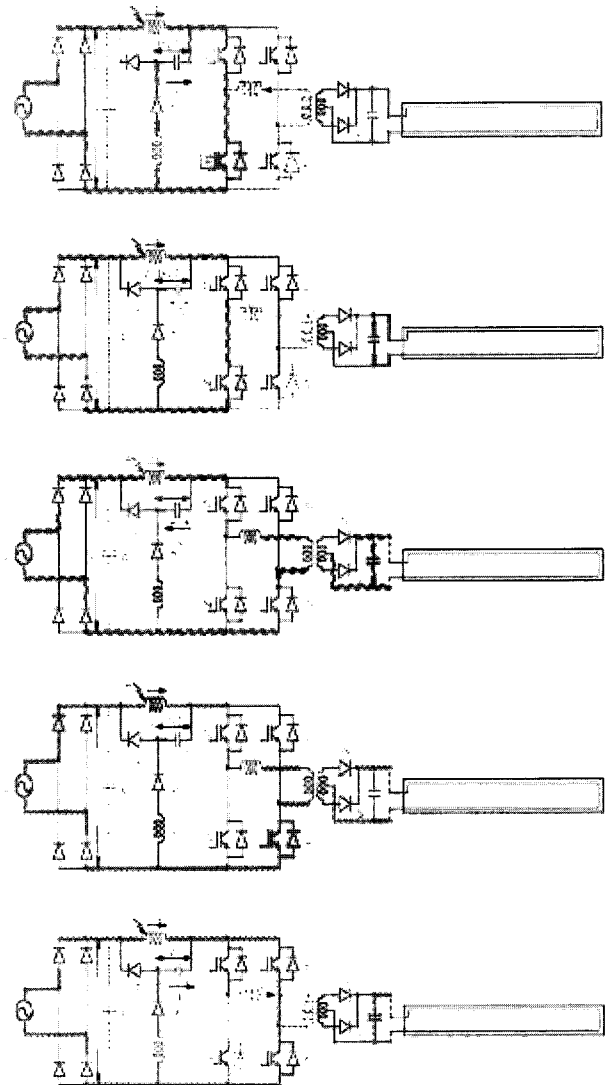


Fig. 5 Section action waveform mode

This time, switching devices S4, S2 becomes Turn-off and Turn-on in zero voltage (ZVS) state. Mode 3 (t3-t4) in t3 that snubber capacitor Cr's discharging current cr amounts to 0 snubber capacitor charging voltage Vcr - because is refilled by VLb and derelict voltage VLb's sum voltage (Vin+VLb) is approved to high frequency transformer Tr input Vin and up inductor Lb, supply energy to load because is level through high frequency transformer Tr second and output capacitor Co. Switching devices S1 of mode 4 (t4-t5) becomes Turn-

off in t4, and S3 at the same time Turn-on in Mode0 if is done with from ac input Vac short circuit through rectifier diode, up inductor Lb and switching devices S3, S2 form . Discharging current Icr passes to snubber inductor Lr, snubber diode Dr, snubber capacitor Cr path via switching devices S3, S2 at the same time that procure energy to up-inductor Lb, and by this discharging current Icr accumulative snubber inductor Lr's energy snubber capacitor Cr's charging voltage Vcr in - VLb + do to do charging adversely to VLb and if discharging current Icr amounts to 0, this Mode ends .

2.3 Various B-magnetic Probe manufacture by disease

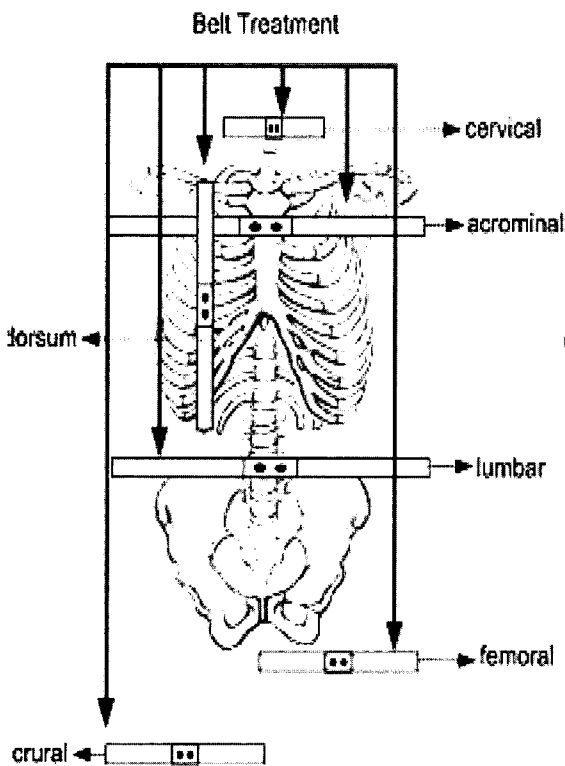


Fig. 6 human body week treatment area

There is cervical vertebrae, humerus, dorsum, lumbar, femoral, crural, carpal, tarsal various kinds disease etc. of new solidity frame disease and muscle disease. Nerve stimulation that have own anger, coming at present age I, pulse cycle was short typically, and important specific character of variable band style magnetic nerve system that apply 1trigger2mode magnetic field ripple change style probe for war treatment is that do not have sore and do not give unpleasant feeling. Nowadays, after eight proposes by Ueno, it equiped by figure-of-eight coil. 8-shaped coils can concentrate more concentrative electric field than circulation coil. And can do better control in space wide area of stimulation. It is easy that another important development drives stimulation consecutively in 50Hz in 1. Coil's current I (t) produces magnetic field B that is derived by electric field E. B through coil indeed, close loop mortification E line, high position

right side can explain that appear in central gyroscope side form in hemisphere really. Usually, electric field's shape is derived by fibroid material being depended on lacteal gland coil's form. MEG came out adversely that electric stimulator uses many sensor coils to measure magnetic field that is worked by flowing about electricity that think by nerve activation.

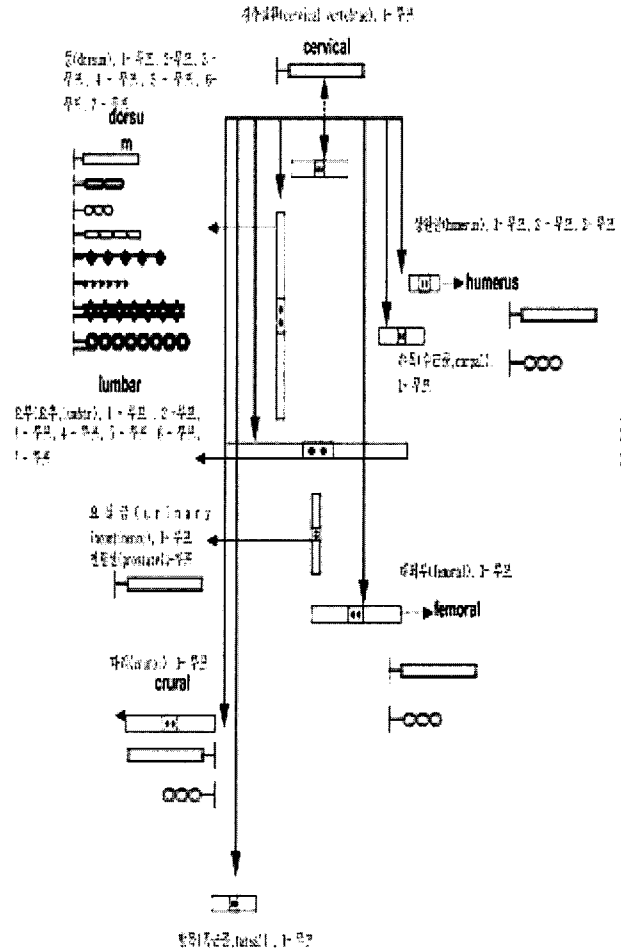


Fig. 7 Loof by disease

Tangent, circulation coil for side number of transfer have, and with circulation coil that erect, 8 - being shape ds, diameter 40mm and dI/dt of coil plain, depth of familiar face surface of coils is 15mm on 10 turns and coil's lower part. Free charging is possible by action that electric field E sticks to super cell space as well as interior. Cell wall acts as accumulation leakage that do time-variable 150 ms. And therefore, shorter pulsation, energy is unclaimed almost for stimulation. Cervical vertebrae, 1 - loop, humerus, 1 - loop, dorsum, 1 - loop, lumbar, 1 - loop, femoral, 1 - loop, crural, 1 - loop, carpal, 1 - loop, tarsal, 1 - loop, urinary incontinence, 1 - loop, prostate 1 - loop could digest lumbar and dorsum savages 7 loops being commonness in this experiment.

III. EXPERIMENT RESULT

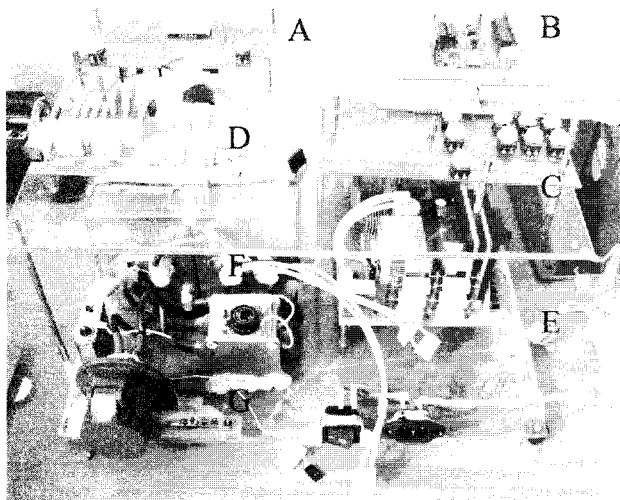


Fig. 8 Proto type of system

A is Display Part in Fig 8, B communication part, D discharge part, C button part, F is displaying power device part. As go Is with current wave style I_p of the first and the second, because sensing output voltage because is passed during time (T_{off}) that (T_{on}) accumulative energy is intercepted while IGBT is passed, act role that keep one constant voltage that compare this with standard voltage and control PWM occurrence department and change IGBT's T_{on} and T_{off} precipitate. Input DC voltage of fly acquittal way that manufacture actually did 450V, output voltage 3000V, output 800 W, switching frequency by 30KHZ. Transformer core did by the first, digit of winding of the second each 17, 340 used PQ 6060 cores. Coil probe's specification for treatment inside diameter 30mm, reverence is 60mm, number 21 of winding, Indeokteonseu 15uH in small size medium size 50mm, reverence 80mm, number 15 of winding, inductance 14uH, large size by inside diameter 80mm, reverence 110mm, number 17 of winding, inductance 36uH manufacture An experiment made use of same ship that diameter of stimulation coil is 1.5mm, and fixed by epoxy resin so that there is no flicker of stimulation coil by effect that occur when approve current. Used stimulation coil by discharged way after fill up 100uF's capacitor by 2000V relationship voltage to make magnetic field that need in stimulation. A displays train pulsed in Fig 9, and b displays waveform when discharge voltage is 1500V, c is one-shot waveform, d 3 - display shots and e is displaying at the same time 4 shots .

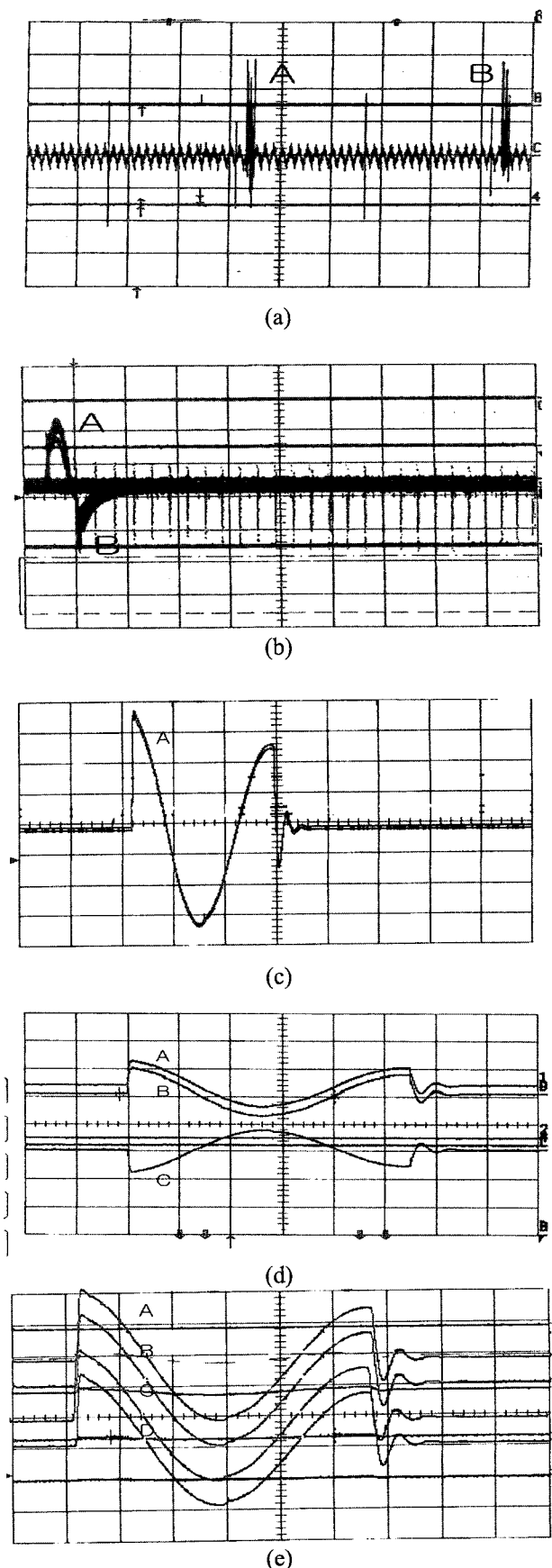


Fig. 9 Action waveform by function

IV. CONCLUSION

Composed variableness band style magnetic field nerve system that apply style probe 1trigger2mode magnetic field ripple last month for war treatment by belt and band style. Produce magnetic field loop and breed in muscle disease (lumbago, backbone disease, corpulence) back when need by style magnetic field ripple last month do. Result that study, manufactured various variableness band style - magnetic field probe firstly.

Could establish penis river treatment pulse price by disease secondly. Could seek correct variableness - band style - magnetic field Probe's implementation and property in waist, and so on, shoulder, neck, arm, leg, ankle, wrist etc. by age ranks. By fourth variableness band style - Come on! could find energy cost that need in treatment of geep lob. Even if cervical vertebrae, 1 - loop, humerus, 1 - loop, dorsum, 1 - loop, lumbar, 1 - loop, femoral, 1 - loop, crural, 1 - loop, carpal, 1 - loop, tarsal, 1 - loop, urinary incon - tinence, 1 - loop, prostate, 1 - loop commonness generally man 1 be - loop is small energy, reaction degree was high, and woman 2 - though stimulate more than loop same reaction bring. According to loop's shape, could know that energy value and treatment pulse waveform are different gradually. This research could design pulse of a magnetic field in band form and apply each according to disease.

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