

SYSTEM FOR THERAPY WITH ACUPRESSURE AND LOW FREQUENCY MAGNETIC FIELD

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Abstract

An simultaneously application of low frequency magnetic field and acupressure is described in the paper. A visualisation of space configuration of low frequency static magnetic field is done in the paper, also. A design of system for acupressure is done together with mathematical description of action of mechanical device for acupressure. The requirements for design of system for therapy with low frequency magnetic field and acupressure are presented. Some mechanical solutions for system for acupressure are described In the paper, also.

1. INTRODUCTION

The application of China's method for acupressure is very actual in medical therapy, now. Usually physicians provide application of acupressure by his hands. It's inconvenient first of all for physician. He's able to work for short time. Then he can continue after relax, but the number of these procedures per day are limited. In other side it would be better to provide acupressure simultaneously on more points on the human body. It's impossible because physician has only two hands.

The results of therapy by acupressure would be more good if there would be provided more intensive movement of the blod in around the points of acupressure. This activation of blod's movement can be provided by application of low frequency magnetic field together with acupressure.

It's clear that it' s necessary to provide special device for acupressure, which can be used together with special device for creating of low frequency magnetic filed around the points for acupressure. Therefore the application of system for simultaneously application of acupressure and low frequency magnetic field is very actual, now.

2. DESIGN OF DEVICES FOR CREATING OF LOW FREQUENCY MAGNETIC FIELD AROUND THE POINTS FOR ACUPRESSURE.

Usually the low frequency magnetic field can be created using two coils, connected to the output of apparatus for magneto-therapy. This apparatus is a source of special electrical signals for the coils.

Often the application of above described method for therapy is on the hand because there are situated many points of acupunctures.

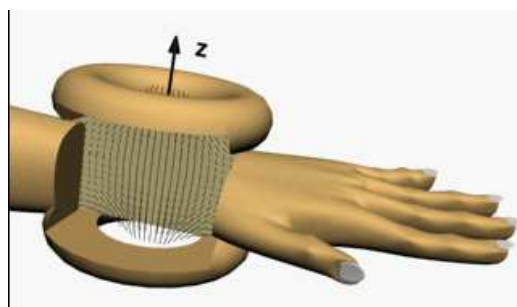


Fig. 1. A possibility for disposition of two coils on the hand

The space distribution of the values of magnetic induction can be seen on fig. 2.

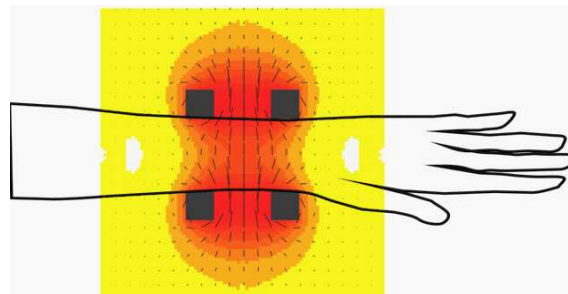


Fig. 2. The space distribution of the values of magnetic induction

In this case one possibility for disposition of two coils together with

The space configuration of the lines of vector of magnetic induction can be seen on fig. 1.

It's well known that on the spine there are many points of acupuncture, also. Some examples for disposition of coils on the spine can be seen on fig.3.

The axis of space components of magnetic induction of magnetic field, created by different coils can be seen on fig. 3, also.

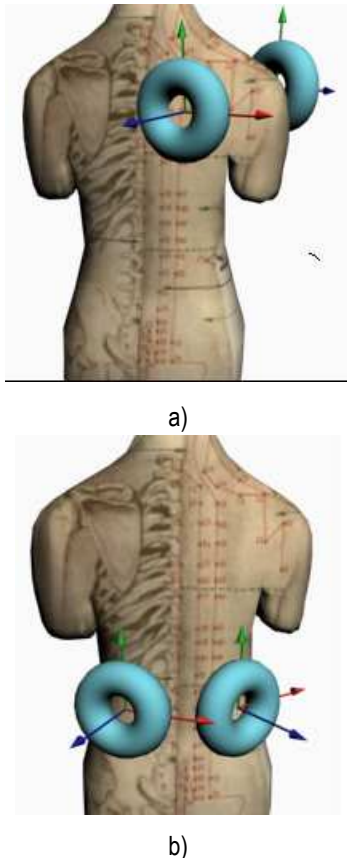


Fig. 3. Some examples for disposition of coils on the spine

A space disposition of two coils in the case of an other application of above mentioned method of acupuncture together with low frequency magnetic field can be seen on fig.4.



Fig. 4a. A space disposition of two coils on X-ray image

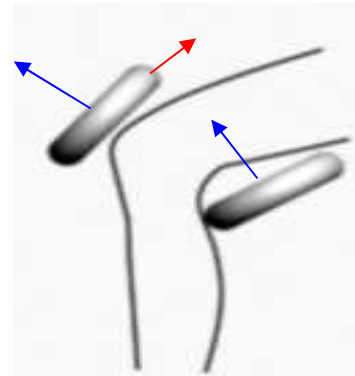


Fig. 4b. The axis of space components of magnetic induction of magnetic field, created by two coils

3. DESIGN OF MECHANICAL DEVICE FOR ACUPRESSURE

Usually the line of mechanical pressure is the axis of coils.

The sizes of coils can be different according to the sizes of "active" area around of the acupuncture points.

On fig. 5 can be seen a mechanical device for acupuncture, when:

- 1 is motor;
- 2 is axle;
- 3 is shaft;
- 4 is a coil, which provides axial movement of the shaft;
- 5 is metal disk;
- 6 is plastics body;
- 7 is massage pimple (osezatel).

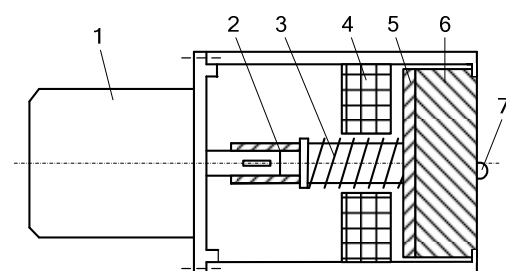


Fig. 5. Mechanical device for acupuncture

The equation of movement of the plastics body 6 is:

$$m\ddot{x} + bx = cx = H \sin(pt) \quad (1)$$

or

$$x + k^2 x = h \sin(pt) \quad (2)$$

When:

$$k = \sqrt{\frac{c}{m}} \text{ is the frequency of own oscillations.}$$

$$h = \frac{H}{m}$$

m [kg] is the masse of movement part;

c [$\frac{N}{m}$] is elastic constant of the spring;

H is the amplitude;

p is the frequency.

The period of oscillation can be determined using the equation (3).

$$T = \frac{2\pi}{k} = 2\pi\sqrt{\frac{m}{c}} \text{ [s]} \quad (3)$$

The integral of equation (2) is the sum of the integral of free oscillations and private solution of equation (2):

$$x = x_1 + x_2$$

When:

$$x_1 C_1 \cos(kt) \quad (4)$$

and

$$x_2 = A \sin(pt) \quad (5)$$

The equation (5) can be put in equation (2):

$$A(k^2 - p^2) = h \quad (6)$$

If $k \neq p$:

$$A = \frac{h}{k^2 - p^2} \quad (7)$$

The integral of equation (2) is:

$$x = C_1 \cos(kt_1) + C_2 \sin(kt) + \frac{h}{k^2 - p^2} \sin(pt) \quad (8)$$

If the frequency of own oscillation is small than intimidating force ($k \ll p$), $A \ll 0$, and taking in account the equation (5):

$$x_2 = -\frac{h}{p^2 - k^2} \sin(pt) = \frac{h}{p^2 - k^2} \sin(pt + \pi) \quad (9)$$

The basic output parameters of the described device for acupressure can be obtained using equations (10), (11) and (12):

$$x = \frac{h}{k^2 - p^2} \sin(pt) \quad (10)$$

$$x = \frac{ph}{k^2 - p^2} \cos(pt) \quad (11)$$

$$x = -\frac{p^2 h}{k^2 - p^2} \sin(pt) \quad (12)$$

For instance, if the movement of device for acupressure is by electrical engine for direct current (6V) with input power $P_1 = 15W$ and current $I_a = 2,5A$, the output torque is:

$$M_{out} = \frac{60P}{n2\pi2_{tr} \eta_{el.eng.}} = \frac{60.15}{50.2.\pi.0,2.5.0,75} = 5,09Nm$$

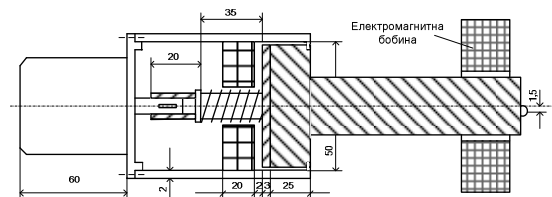


Fig. 6. The modified device for acupressure simultaneously with low frequency magnetic field.

For simultaneously application of low frequency magnetic field and mechanical acupressure, the line of mechanical pressure should be the same as the line of coil. Therefore the devices on fig. 5 should be modified according to the fig. 6.

4. CONCLUSION

1. A computer simulation of space distribution of magnetic induction' values of pair coils depending of the value of electrical current around the points of acupuncture in different cases of disposition of coils on the human body has been don in the paper .

2. A mathematical description of mechanical device for acupressure has been done.

3. Some mechanical constructions of devices for separate acupressure (Fig. 5) and for simultaneously acupressure with low frequency magnetic field (Fig. 6) have been done, also.

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