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Nakayama

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[54] **MAGNETIC MEDICAL TREATMENT DEVICE**

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[52] **U.S. Cl.** **128/1.3**; 128/13

[51] **Int. Cl.**[2] **A61N 1/42**

[58] **Field of Search** ..... 128/1 R, 1.3, 24.1, 68.1, 128/82.1, 379, 380, 381, 382, 384, 385

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[57] **ABSTRACT**

A magnetic medical treatment device having a plurality of magnets or magnetic shells so arranged that the same polarity poles of the magnets or magnetic shells closely contact a selected part of a human body such that polarization and induced currents are efficiently generated in the human body. Each of the magnetic shells of the same polarity is provided with a ferromagnetic metal plate on the side thereof opposite the body contacting sides of the magnetic shells.

2 Claims, 7 Drawing Figures

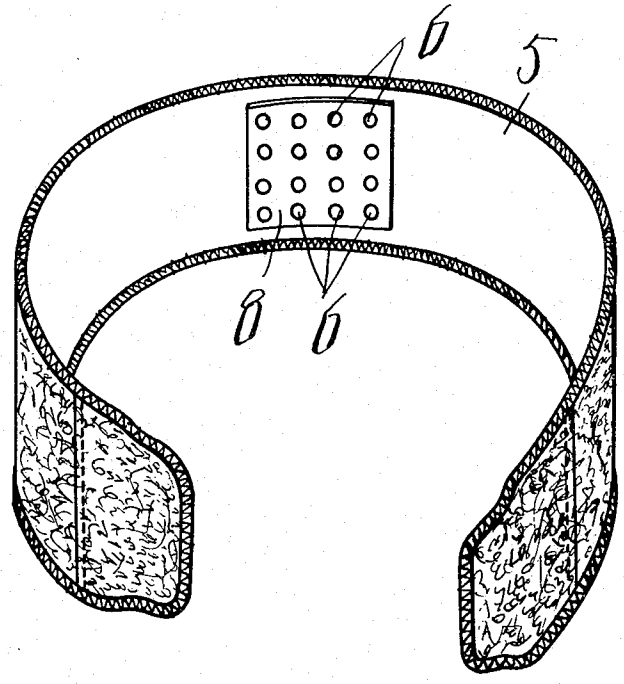


FIG. 1

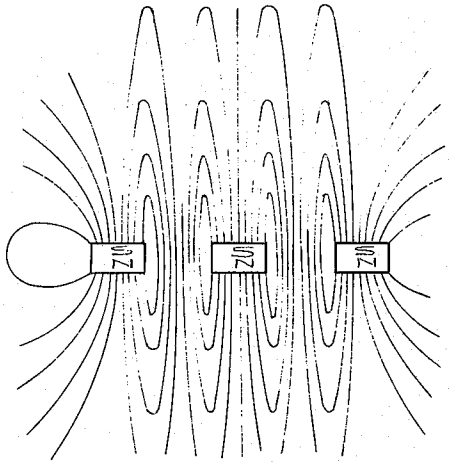


FIG. 2

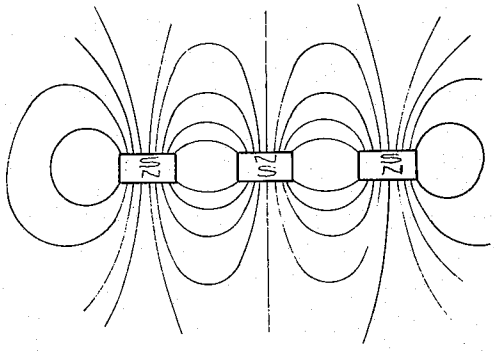


FIG. 3

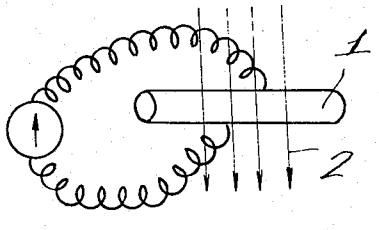


FIG. 4

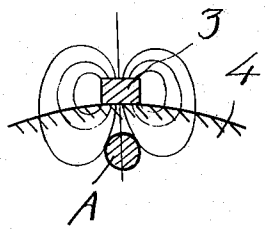


FIG. 5

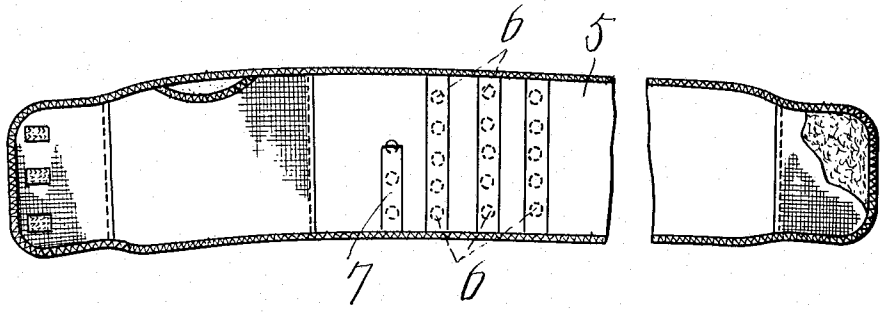


FIG. 6

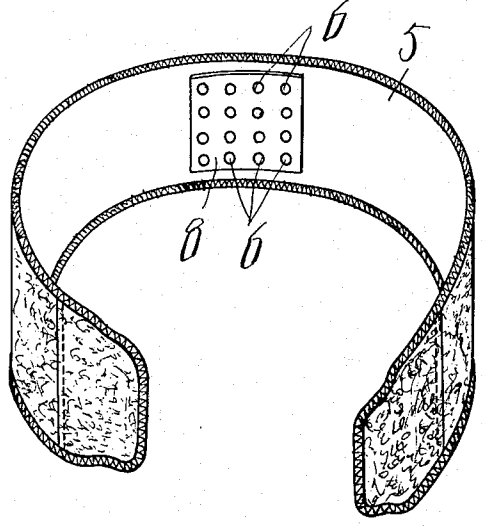
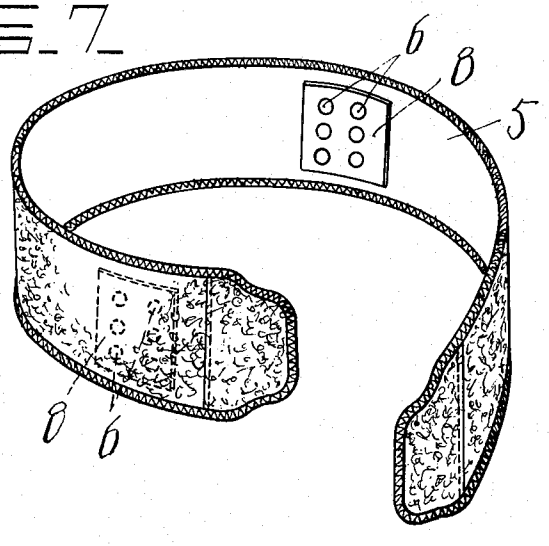


FIG. 7



MAGNETIC MEDICAL TREATMENT DEVICE

BACKGROUND OF THE INVENTION

I. Field of the Invention

The present invention relates to a magnetic medical treatment device for efficiently causing magnetic flux to act on a human body.

II. Description of the Prior Art

A magnetic medical treatment wrist band which allegedly magnetically cures an affected part of a human body by the utilization of the magnetic force of magnets has been known. However, the conventional magnetic medical treatment wrist band has been constructed by merely arranging magnets in a particular pattern.

SUMMARY OF THE INVENTION

This invention, which will be subsequently described in greater detail, relates to a magnetic medical treatment device for efficiently causing magnetic flux to act on a human body and comprises a plurality of magnets so arranged that the same polarity poles of the magnets contact a selected part of a human body. The present invention is applicable to magnetic medical treatment devices such as a wrist band, belly-band, pillow, bed, pad and plaster which magnetically treat an affected part of a human body. The magnetic medical treatment device of the present invention greatly enhances treating effects by effectively utilizing magnetic force to increase flux density. For this purpose, according to the present invention, the magnetic treatment device comprises a plurality of magnets so arranged that the magnets of the same polarity closely contact a selected part of a human body or alternatively, the magnets are applied with ferromagnetic metal plates to the sides thereof oppoiste to the sides where the magnets contact the human body, whereby flux density can be greatly increased to enhance curing effects.

It is therefore a principal object of the present invention to provide a magnetic medical treatment device which can treat an affected part of a human body.

It is another object of the present invention to provide a magnetic medical treatment device which treats an affected part of a human body by arranging a plurality of magnets in a unique way.

It is still another object of the present invention to provide a magnetic medical treatment device which treats an affected part of a human body by arranging a plurality of magnetic shells in a unique way.

It is a further object of the present invention to provide a magnetic medical treatment device which comprises a plurality of magnets so arranged that the same polarity poles of the magnets closely contact an affected part of a human body.

It is a further object of the present invention to provide a magnetic medical treatment device which comprises a plurality of magnetic shells so arranged that the same polarity poles of the magnetic shells closely contact the body while the magnetic shells are provided with ferromagnetic metal plates on the sides opposite to the sides where the shells contact the human body.

It is a further object of the present invention to provide a magnetic medical treatment device in the form of a belly-band comprising a plurality of magnets so arranged that the same polarity poles of the magnets closely contact an affected part of a human body.

It is still a further object of the present invention to provide a magnetic medical treatment device in the form of a belly-band which comprises a plurality of magnetic shells so arranged that the same polarity of the magnetic shells closely contact an affected part of a human body, and the magnetic shells are provided with ferromagnetic metal plates on the sides thereof opposite to the sides where the magnetic shells contact the human body.

According to the present invention, there has been provided a magnetic medical treatment belly-band comprising a main body, a plurality of magnets secured to one side of the main body where the band contacts a selected part of a human body, the magnets being so arranged that the poles of the same polarity are disposed in one and the same direction. Cloth pieces cover the magnets.

Other objects, advantages and applications of the present invention will be more apparent to those skilled in the art of magnetic medical treatment devices when the following detailed description of some examples of the best modes contemplated for practicing the invention is read in conjunction with the accompanying drawings which show specific embodiments of the invention for illustration purposes only, but not for limiting the scope of the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The description herein makes reference to the accompanying drawings wherein like reference characters refer to like or equivalent components throughout the several views, and in which:

FIG. **1** is a magnetic figure of one embodiment of a magnetic medical treatment device constructed in accordance with the principles of the present invention and in which the same polarity poles of magnets are arranged in the same direction;

FIG. **2** is a magnetic figure of a second embodiment of a magnetic medical treatment device constructed in accordance with the principles of the present invention and in which the opposite polarity poles of magnets are alternately arranged;

FIG. **3** is a view showing the principle on the basis of which a polarizing current is generated;

FIG. **4** is a view showing the principle on the basis of which an induced current is generated;

FIG. **5** is a reverse side view of a belly-band in which the present invention is embodied;

FIG. **6** is a perspective view of a belly-band in which a different type of magnetic medical treatment device embodying the present invention is employed; and

FIG. **7** is a perspective view of a belly-band in which a further different type of magnetic medical treatment device embodying the present invention is employed.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

When the same polarity poles of several magnets are arranged in one and the same direction as shown in FIG. **1** and applied against a selected part of a human body, the magnetic lines of force surrounding the magnets to the extent that the driven magnetic lines of force may permeate deep into the human body whereby a high polarization current is generated in the human body. The curve of the magnetic field outside of each of the outermost magnets will be greater than those around the remaining magnets, thereby generating an induced current. Therefore, the arrangement of

magnets as shown in FIG. 1 is most effective to generate polarization current and induced current.

In FIG. 2, the opposite polarity poles of magnets are alternately arranged. Although the magnetic field outside of each of the outermost magnets may have a greater curve than those around the remaining magnets and an induced current will be generated as in the arrangement of FIG. 1, the magnetic lines of force pass around only the surface of the human body and consequently, only a low polarization current is generated.

The greater the number of magnets in an array, the more effective is the generation of polarization and induced currents. In such a case, the magnetic lines of force between adjacent magnets are expelled far away from the associated magnets by the magnetic lines of force surrounding the magnets to permeate deep into the human body and the curve of the magnetic fields around the outermost magnets is greater than those of the magnetic fields around the intermediate magnets.

It is generally preferable to arrange magnets in a number of n (n being greater than 2) along an axis of ordinate and an axis of abscissa and at a slanted angle thereto. The greater the value of n, the more effective is the generation of polarization and induced currents. When the same polarity poles of the magnets are arranged in one and the same direction, it has been experimentally found that the magnetic lines of force are driven far away from the magnets due to the repulsion force between the same polarity poles of magnets so that the magnetic line of force can permeate deep into the human body. It has been also found that the magnetic lines of force outside the outermost magnets in the array pass by nearer to the associated magnets than the magnetic lines of force for the intermediate magnets pass by the associated magnets and the magnetic lines of force for the outermost magnets will have a curve greater than that of those for the intermediate magnets. However, when the opposite polarity poles of the magnets are alternately arranged, most of the magnetic lines of force will pass along only the surface of the human body and only a small portion of the magnetic lines of force will permeate deep into the human body.

When the magnets are arranged in a ring with the same polarity poles of the magnets directed inwardly, the magnetic lines of force will extend to the center of the ring without attenuation. On the other hand, when the opposite polarity poles of the magnets are alternately arranged in a ring, the magnetic lines of force having the opposite polarities will attract toward each other and in consequence, the magnetic lines of force will pass along only the surface of the human body.

A ring of magnets which is called a magnetic band in the art is generally worn on an arm or leg. In the limbs of a human, blood and body fluid flow in the longitudinal direction thereof in both the hypodermal and deep areas in the human body. Therefore, it is preferable that the magnetic lines of force pass at right angles to the longitudinal direction of the limbs and will not attenuate in the deep area of the human body. In other words, since a polarization current is more effective than an induced current for medical treatment, it is preferable that the magnets be arranged to increase the polarization current as much as possible or the magnets be arranged with the same polarity poles of the magnets disposed on the inner side.

The effects of a magnetic field upon a living body are due to the fact that the electrolyte within the living body is dissociated by polarization and induced currents and the dissociation of electrolyte is effective in controlling the sympathetic nerve system among autonomic nervous systems.

Effects of polarization and induced currents on a human body are as follows:

1. Polarization current:

As shown in FIG. 3, when it is assumed that a component of force having the flux density of 2 which acts on a blood vessel 1, at right angles thereto is B gauss, the electromotive force generated thereby is E volt. The polarization current (the principle of an electromagnetic flow meter) is a current which is generated at electromotive force E. The polarization current generates an ionic polarization in the blood vessel which in turn causes electrolyte dissociation in the human body.

2. Induced current:

As shown in FIG. 4, when a magnet 3 is applied against a human body 4, only a non-uniform magnetic field acts on the human body 4. Therefore, when some systems of the human body having a curvature (blood, intracelluar liquid, lymph and the like) move in the direction of the curvature or in a direction at right angles to the plane of the magnetic pole, the electromotive force is in proportion to variation in the magnetic lines of force across which such systems move for a unit time. The relationship between the electromotive force E and variation in the magnetic lines of force may be expressed by the equation $E = K d\phi/dt$ wherein K is a proportional constant and $d\phi/dt$ is the flux density across which a particular system of the human body moves for a unit time. Current generated by the electromotive force is called an induced current. The induced current also causes electrolyte dissociation. When the magnetic poles are arranged so that the magnetic field induced by the magnetic poles effectively generates polarization and induced currents in a human body in the manner as mentioned hereinabove, there is provided a most effective magnetic medical device.

FIG. 5 shows one embodiment of the magnetic medical treatment device of the invention which is in the form of a belly-band comprising a main body 5 having a center portion (the center portion is applied against the waist of a human body when the device is worn by a human) which is provided with magnets 6 in a plurality of rows with the same polarity poles of the magnets directing in the same direction on the side which contacts the belly of a human body when the belly-band is applied against the belly. Numeral 7 denotes a cloth piece which covers the magnets.

With the arrangement and construction of the magnetic medical treatment device of the invention, when the belly-band is applied against the human body, the magnetic lines of force induced by the magnets can permeate deeper into the human body than the magnetic lines of force induced by the magnets in the corresponding conventional magnetic medical treatment devices can permeate into the human body.

FIG. 6 and FIG. 7 show modified embodiments of a belly-band of the invention. In the embodiments of FIG. 6, a plurality of magnetic shells 6 are arranged in a plurality of rows in the center or waist portion in the body 5 of the belly-band and the magnetic shells are provided with ferromagnetic metal plates 8 on the side thereof opposite to the side where the shells contact the haman body. In the embodiment of FIG. 7, the belly-band is provided with a group of magnetic shells 6 in a plurality of rows in the center or waist portion and belly

portion, respectively, and each of the groups of magnetic shells are also provided with the ferro-magnetic plate **8** as mentioned in connection with the embodiment of FIG. **6.** Although not shown, the magnetic shells may be secured to any desired other position of the belly-band then the waist and belly portion as mentioned above, i.e., to an area in the belly-band which corresponds to the side of a human body. In such a case, the magnetic shells may be arranged with the poles having the same polarity (N pole or S pole) directing in one and the same direction or the poles having the opposite polarities may be alternately arranged.

When a plurality of magnetic shells are, respectively, provided in the waist portion and belly portion of the belly-band in such an arrangement that one or more magnets in the waist portion face one or more magnets in the belly portion, the magnet or magnets in the waist portion and the magnet or magnets in the belly portion should be so arranged that when the belly-band is worn by a human body, the magnets of the opposite polarities face toward each other and in some cases, all the poles of N polarity are provided in the waist portion and all the poles of S polarity are provided in the belly portion.

The magnetic medical treatment devices of the invention are characterized in that in any of the above-mentioned embodiments of FIGS. **6** and **7,** the side of the belly-band opposite to the side where the belly-band contacts any part of the human body is provided with a plate of ferromagnetic material so that the magnetic field which acts upon the human body is intensified.

Experiments were conducted for determining flux densities in the direction of a magnetic axis at various points along the magnetic axis for an instance in which a single magnetic shell was placed on a wooden plate and for the other case in which the same magnetic shell was placed on an iron plate. In conducting the experiments, in order to maintain the probe of a gauss meter at a precisely predetermined distance from the magnetic axis, acryl resin sheets of different thicknesses were placed over selected points of the magnetic axis and the probe was moved along the magnetic axis maintaining the probe in contact with the resin sheets by pressing the probe against the resin sheets with a slight force. the particular gauss meter employed was a model GX-**09** made by the Nippon Denji Sokki K.K. (Japan Electro Magnetic Measuring Instrument Co., Ltd.) and the results of the measuring experiments will be given in the following Table **1.**

TABLE 1

Distance of probe from pole face (mm)		0	4	9	15	21
Density of magnetic field (gauss)	When one magnetic shell was placed on a wooden plate of 5 mm. thick	620	400	145	68	32
	When one magnetic shell was placed on an iron plate of 0.3 mm. thick	850 (137)	510 (128)	195 (135)	94 (138)	43 (134)

(The parenthesized figures represent the determined values of flux densities at selected points on a magnetic shell placed on the iron plate on the basis of the flux densities at the corresponding points on a magnetic shell placed on the wooden plate which are assumed as 100. In any case, the figures less than three places of decimals are ignored.)

From the above Table **1,** it will be seen that the flux density in the magnetic axis direction is greater in the case wherein a magnetic shell is placed on the iron plate than the flux density in the magnetic axis direction in the case wherein the same magnetic shell is placed on the wooden plate which is non-magnetic both at the pole face and each of the selected points.

A second series of experiments where conducted for determining flux densities in the direction of the magnetic axis of a magnetic shell in the space above the magnetic shell for a case in which an elongated glass sheet having magnetic shells arranged thereon with the same polarity directed in one and the same direction was placed on a wooden plate and for the case the same glass sheet was placed on an iron plate and the results of the measuring experiments will be given in the following Table **2.**

TABLE 2

Distance of probe from pole face (mm)		Glass sheet 3 mm	6 mm	9 mm	13 mm
Flux density (gauss)	Magnetic shells placed on a wooden plate	340	200	134	78
	Magnetic shells placed on an iron plate	450 (115)	290 (145)	200 (140)	120 (154)

(The parenthisized figures represent the determined values of flux densities at selected points on magnetic shells placed on the iron plate on the basis of the flux densities at the corresponding points on magnetic shells placed on the wooden plate which are assumed as 100. In any case, the figures less than three places of decimals are ignored.)

A third series of experiments were conducted for determining flux densities in the magnetic axis direction for an instance in which the opposite polarity poles of magnetic shells were alternately arranged on a wooden plate and for the other case in which the same magnetic shells were placed in the same alternate arrangement on an iron plate and the results of measuring experiments will be given in the following Table **3.**

TABLE 3

Distance of probe from pole face		Glass sheet 3 mm	6 mm	9 mm	13 mm
Flux density (gauss)	Magnetic shells placed on a wooden plate	420	222	156	78
	Magnetic shells placed on an iron plate	450 (115)	290 (145)	200 (140)	120 (154)

(The parenthesized figures represent the determined values of flux densities at selected points on magnetic shells placed on the iron plate on the basis of the flux densities at the corresponding points on magnetic shells placed on the wooden plate which are assumed as 100. In any case, the figures less than three places of decimals are ignored.)

It is clear from the experimental results shown in Tables **2** and **3** that whether the magnetic shells are arranged so that the poles of the same polarity mat direct in the same direction or the poles of the opposite polarities are alternately arranged, the flux densities in the magnetic axis when the magnetic shells are placed on the iron plate (ferromagnetic material) are greater than those when the magnetic shells are placed on the wooden plate (non-magnetic material) at different points along the magnetic axis.

A fourth series of experiments were conducted for determining the flux densities at different points in the magnetic axis of the center magnetic shell in an array of magnetic shells secured to the surface of a glass sheet. In one case, the magnetic shell-carrying glass sheet was placed on a wooden plate and for the other case, the same glass sheet was placed on an iron plate. The results of the measuring experiments will be given in the following Table **4.**

TABLE 4

Distance from pole face (mm)		Glass sheet 3 mm	6 mm	9 mm	13 mm
Flux density (gauss)	Magnetic shells placed on a wooden plate	330	201	104	64
	Magnetic shells placed on an iron plate	420 (132)	221 (110)	142 (136)	91 (144)

(The parenthesized figures represent the determined values of the flux densities at selected points on the iron plate on the basis of the flux densities at the corresponding points on the wooden plate which are assumed at 100. In any case, the figures less than three places of decimals are ignored.)

From the results given in Table **4,** it will be seen that the flux densities when the glass-sheet supported magnetic shells are placed on the iron plate are greater than those when the same magnetic shells are placed on the wooden plate. The results of experiments measured when the magnetic shells of the opposite polarities were alternately arranged are given in the following Table **5.**

TABLE 5

Distance of probe from pole face (mm)		Glass sheet 3 mm	6 mm	9 mm	13 mm
Flux density gauss unit	Magnetic shells placed on a wooden plate	425	275	162	81
	Magnetic shells placed on an iron plate	410 (120)	332 (117)	209 (128)	108 (133)

(The parenthesized figures represent the determined values of flux densities at selected points on the iron plate on the basis of the flux densities at the corresponding points of the wooden plate which are assumed as 100. In any case, the figures less than three places of decimals are ignored.)

In any case, it has been found that the flux densities when the magnetic shells are placed on the iron plate (ferro-electro metal material) are greater than those when the magnetic shells are placed on the wooden plate (non-magnetic material). And it has been found that the flux densities when the poles of the magnetic shells which have the same polarity are arranged in the same direction are greater than those when the poles having the opposite polarities are alternately arranged. However, since the same magnets were not employed in the experiments, the results of which were given in the above Tables **2** and **3,** the absolute values are different.

From the experimental results given hereinabove, the following conclusions can be made:

1. It is preferable to position a magnet on one side of a substrate, which side has applied thereto a ferromagnetic metal sheet rather than positioning the magnet on a non-magnetic substrate because the space on the other side of the ferromagnetic metal-applied substrate has a greater flux density.

2. The flux density when the poles of magnets which have the same polarity are arranged in the same direction is greater than that when the poles having different polarities are alternately arranged.

3. When a ferromagnetic metal plate is applied to the outer side or the side of a magnet which is opposite to the side which contacts the human body, the flux density which acts on the human body will be greater than otherwise, regardless of whether the magnet is disposed in any way.

Therefore, when a predetermined flux density is desired, if a ferromagnetic metal plate is applied to the side of a magnet opposite to the side where the magnet contacts the human body, such a magnet may be of a low magnetic force. The use of the low magnetic force magnet having the ferromagnetic metal plate applied to one side thereof will have a high efficiency.

4. In order that a magnetic flux can induce a moderate degree of magnetic field to act on a human body to efficiently generate polarization and induced currents in the human body, it is preferable to apply a ferromagnetic metal plate to the outer side or the side of the magnet opposite to the side where the magnet contacts the human body. In a magnetic medical treatment belly-band, the deeper the magnetic flux permeates the human body, the better the treatment. Therefore, the belly-band embodying the present invention is particularly suitable for magnetic medical treatment purposes.

Since it does not constitute any part of the present invention to theoretically consider the phenomena which provide such effects, details of the phenomena will not be disclosed herein. To state briefly, it is believed that the flux density increases in the space on the inner side or the side of the magnet where the magnet contacts a human body because the magnetic reluctance is present on the other side or the side of the magnet where the magnet does not contact the human body.

Furthermore, the increase rate of flux density varies depending upon the arrangement of magnets, the space between magnets and the material, size, shape and thickness of the ferromagnetic metal plates. Thus, when the present invention is applied to a magnetic medical treatment belly-band, it is necessary to select suitable magnets and ferromagnetic metal plates suitable for particular applications taking the above factors into consideration.

Although the best modes contemplated for carrying out the present invention have been shown and described, it will be apparent to those skilled in the art that other modifications and variations may be made without departing from the spirit of the present invention or the scope of the appended claims.

What is claimed is as follows:

1. A magnetic medical treatment device for a human wherein magnetic force is utilized to achieve a desired magnetic flux which is cause to act upon a human body generating polarization and induced currents within said human body, and comprising:

a supportive apparatus for magnetic means adapted to contact a portion of the human body;

a plurality of magnetic means arranged in a plurality of rows upon a first surface of said supportive device, each of the means being disposed with respect to each other such that one pole of each magnetic means closely contacts a selected part of the human body to achieve a desired intensity of magnetic flux; and

at least one ferromagnetic metal plate affixed to a second surface of said supportive device which is opposite said first surface of said supportive device;

wherein said supportive device comprises a belly-band having a main body and said magnetic means secured to said first surface of said supportive device where said belly-band contacts the waist portion of said human body.

2. The magnetic medical treatment device according to claim **1**, wherein said magnetic means comprises a first plurality of magnets positioned in the center of said main body and a second plurality of magnets positioned in any area adjacent to one end of said main body where the belly-band contacts the waist portion and belly portion, respectively, of said human body, and wherein, when said belly-band is worn by a human body, the poles are the same polarity of said first plurality of magnets substantially face the poles of the opposite polarity of said second plurality of magnets.

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