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(54) **HEEL CRADLE EXERCISE DEVICE AND FOOTREST**

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(57) **ABSTRACT**

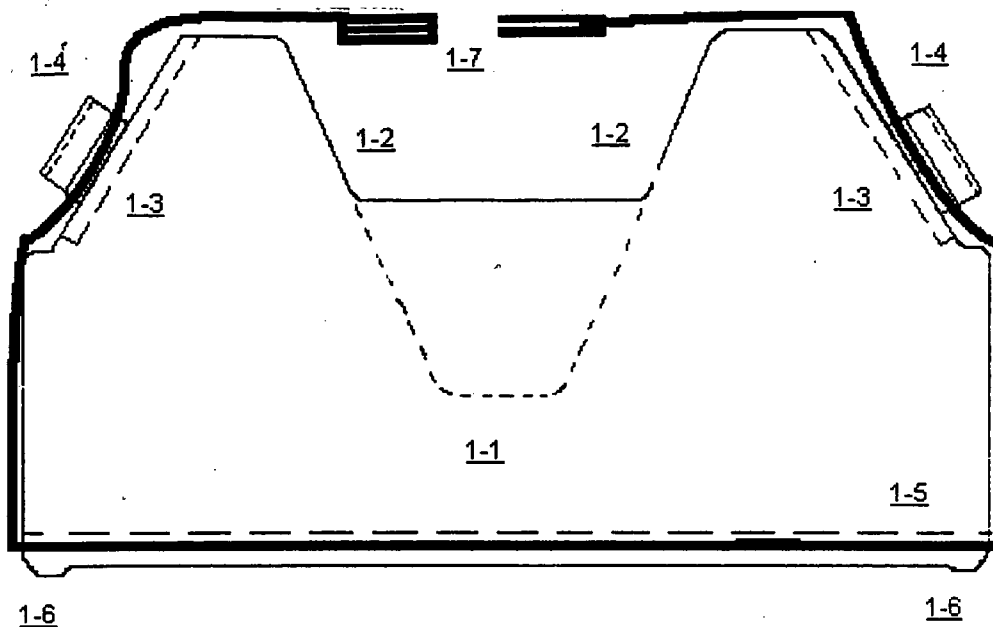
A heel-cradle exercise device and footrest having a base structure, and internal cavity with the geometry to funnel all forces entering said cavity onto the base plate at the internal apex of the funnel shape cavity, a means of straps for fixing or holding one's foot in a flexed position, two brackets mounted on the external portion of the funnel shaped cavity cable of attaching an external anchoring mechanism and also to hold said straps in relative position, having on the bottom of said base structure feet, foot pads or the like, supports having a high friction coefficient to restrict motion of said base unit on the floor surface, having an internal cavity to receive a material to increase its density of the base unit, having an access point to act as an entry point to insert said material such as to the increase the weight of the base unit.

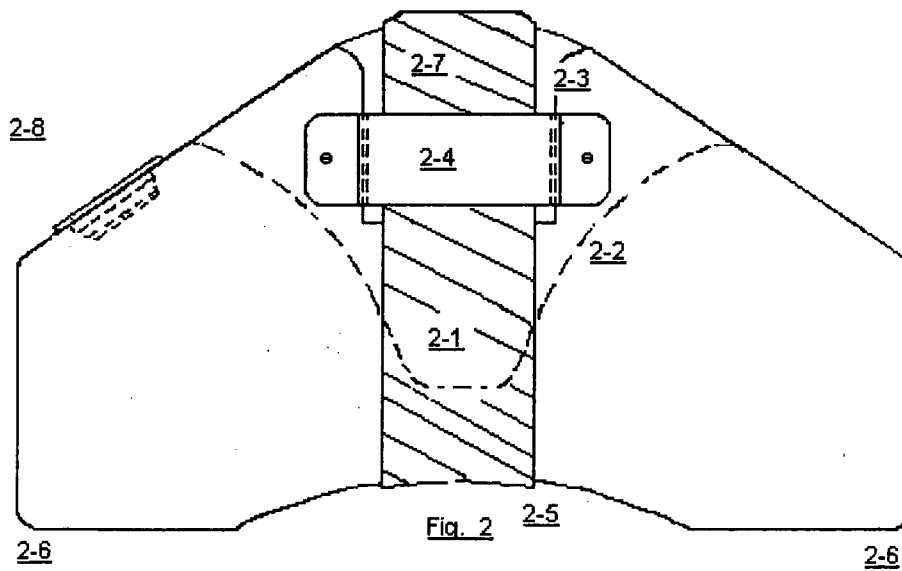
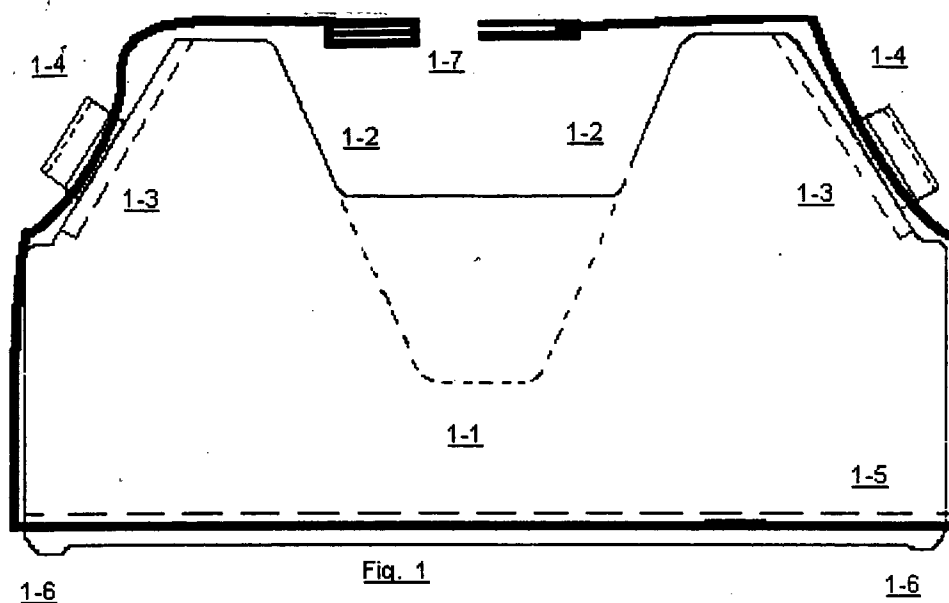
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HEEL CRADLE EXERCISE DEVICE AND FOOTREST

BACKGROUND OF THE INVENTION

[0001] This invention relates generally to exercise equipment and more particularly, the passive exercise equipment utilized for the lower extremities and pelvic area Foot cradle—heel cradle exercise devices have been in use for many years. Unfortunately, past foot cradle exercise devices such as the type exemplified by U.S. Pat. Nos.; 5,554,090; 5,087,036; 5,343,856; 4,561,649; 4,538,595; 5,165,363; 5,498,222; 5,411,456, and 6,077,203, have many problems associated therewith in either their ability to easily be used or in the lack of ability to strengthen the muscles of the buttocks and lower limbs effectively. Also those prior patents lack the ability to enhance and simulate pelvic mobility.

[0002] It is an accepted standard that functional mobility is dependent entirely on R.O.M. or range of motion or even more specifically, the limitations of R.O.M. With respect to pelvic mobility, full range-of-motion devices are usually neither portable nor inexpensive nor easy to facilitate.

[0003] Those experienced in the fields of body movement and mobility, dance, therapy and exercise modalities understand fully the importance of pelvic mobility and core or trunk strengths. One's biomechanical life is based on the functional mobility of ones hips or pelvis.

[0004] It is well understood that prolonged periods of sitting will inhibit pelvic mobility. Even minimal periods of sitting can prove detrimental and impede one's functional mobility.

[0005] The action or more specifically inaction of sitting presents a number of distinct problems: First and most obvious is that one's posterior becomes attached to the seat pan. The force of gravity acting on the individual, forces the buttocks or gluteus maximus to become virtually attached to the seat pan or fixated to the chair. All movement of the pelvic area is now compromised. Whether vertical or lateral the trunk of the body remains motionless.

[0006] A second problem which exists with sitting but is less evident is the fact that as one tries to adjust or reorient ones hips, from time to time, those efforts are futile. (This activity is the result of a subtle system movement, called micro-movements which happen automatically and are actually the body's inherent movement system. The body adjusts from time from time to compensate for inactivity.) The reason those efforts are futile is because the surface of the floor or ground is flat. As one tries to engage the ground those efforts are compromised, since there is no means of leverage or fulcrum available to reciprocate those forces applied by the lower limbs.

[0007] Foot cradle apparatus in the past designed to act as a fulcrum mechanism had limited effects. The affects of those earlier foot cradle apparatus such as those demonstrated in U.S. Pat. No. 5,411,456 and U.S. Pat. No. 6,077, 203 of this inventor were limited to muscular activities in the lower portion of the lower limb and very little resulting force and mobility being transferred on to the hip-pelvic region.

[0008] Looking at the anatomic structure of the foot, we find a simple cause and effect relationship inherent to the heel or calcaneus bone (divine design). The size and density

of this bone suggest durability and excessive capacity. It is therefore a simple logical deduction, such that it is clear that this bone must be able to endure excessive loads without breakdown.

[0009] A further observation to the foot's anatomy demonstrates a mechanical structure which serves an invaluable function with regards to walking and stepping. However it fails miserably to connect the linear kinetic chain of forces to and through the ground, when seated via the lower limb. That structure is the ankle. Its vast rotational ability actually interferes with the direct application of forces onto the ground. In fact, further analysis will demonstrate that as forces applied to this structure, when seated or when attempting a pelvic lift floor exercise, when lying on the ground. It actually will cause muscular tension in the lower limbs with translation to the lower back.

[0010] A descriptive representation of the application of forces along a linear path can be found in the actions of a pole vaulter. Simply put pole vaulting involves two mechanical structures, one the pole and two the pole vault box. The geometry of the box is slightly more complex. Its funnel shape assures that pole will be directed exactly onto the internal apex of the box. It is also positioned such that it will remain completely immobile upon impact. The pole is a simple linear structure, of course, with great resilience to absorb the force. Combined, these geometrical structures give the vaulter the confidence that a failure will not occur.

[0011] If we were to represent the pole as our lower limb, then we must then represent a pivot joint some distance from the end of the pole to represent the ankle. What confidence might the pole vaulter enjoy now, knowing that at the point of impact his linear force will be converted into rotational force instantaneously?

[0012] This means that as we apply linear force the ankle joint. It then travels in more than one direction, resulting in rotational movement.

[0013] A further analogy as mentioned above demonstrates that a muscular tension results in an effort to restrict rotational movement. An example to illustrate this, is in fact muscular tension, can be found by an individual attempting to cut an object with a saw. The geometry of the object dictates the function of the saw and the function of the person cutting the object.

[0014] One would only have to ask, is it easier to cut a flat object of wood, steel etc. or a round cylindrical object say a pipe or rod. Clearly it is easier to cut the flat object, since that object is not subjected to rolling. In fact, the individual must hold the round or cylindrical object fixed or fixated in an effort to restrict rotational movement. As soon as that action takes place, muscular tension occurs. Master plumbers are all too well adept at this skill.

[0015] Therefore it is simple, the more load applied to the foot by the lower limb when seated or as an individual attempts to do a pelvic lift floor exercise, rotational force takes place through the ankle. Then the individual must fix or fixated the lower limbs and the lower back to restrict the rotation.

[0016] Another simple rule applies, where there is a possibility of rotational force, which results in muscular tension, the individual will be less likely to administer that move-

ment. Just as the pole vault won't ever utilize a pole with a pivot joint some distance from the end of the pole.

[0017] Having established that the ankle joint is the weak link in the linear chain of forces of the lower limb, efforts must be undertaken to bypass or fix the problem to give the individual the capability to generate enough force to lift one's pelvic area. To eliminate this weak link means to splint or fixate the ankle joint. Further review of the anatomy of the foot illustrates that a function occurs once one's foot is in a flexed position. When the foot is in the flexed position, we find that the calcaneus bone achieves a direct linear orientation to the bones of the lower aspect of the lower limb, the tibia and fibula. Once this alignment is achieved a direct linear path of forces through the calcaneus bone can be accomplished.

[0018] We find that before excessive force can be applied through the lower limb and heel, another geometric flaw must be overcome. That flaw is the spherical geometry of the heel or calcaneus bone itself. As forces are applied to the heel the individual must make conscious effort to "hold" the heel from slipping across the floor. Add to this, the fact that the individual is still "holding" the ankle in a flexed position. Therefore the efforts that were undertaken to eliminate muscular tension, actually created a subsequent muscular tension activity.

[0019] To eliminate the muscular tension caused by "holding" the ankle and a flexed position there must be a means of strapping or locking the foot in a flexed position, such that the user no longer has to use conscious effort.

[0020] Furthermore, design must be made to overcome the spherical shape of the heel such that the forces may be applied to the floor surface effectively and with the confidence of the user.

[0021] Final problems remaining are interrelated. Those are problems of stability and density. Once the appropriate geometric shape is achieved to address the spherical shape of the heel, it is imperative that the object remain fixed or relatively fixed to absorb those forces applied by the lower limbs, successfully.

[0022] Thus, the device must have a base component with a high coefficient of friction. Along with said high coefficient of friction, provisions must be such that one may have the capability of adding density to the object. This would serve to further restrict movement of the object and to give the user the ability to accomplish more varied pelvic lifting and mobility exercises.

[0023] A further aspect, to address an extreme force conditions, would be to provide a means of restraining said object via mechanical attachment to some fixed object, for instance the user's chair, thereby stopping all movement across the floor surface completely.

[0024] The function of the density, as mentioned above, plays a role in what can be referred to as the "wind-up" activity. Some have observed that, referring to baseball, it's not the pitch, it's the windup! That is, that a ball can only be thrown as fast as the "wind-up" will allow. Movements which depend on inertia, require a minute receptacle "wind-up" phase before the "inertial" phase may be accomplished, such as pushing a heavy object across the floor. The "wind-

up" phase sets the direction and the degree of effort required to accomplish the movement.

[0025] This fact is true too, for one attempting to lift one's pelvic area above the seat pan or above the floor. Having an object with a relative density would provide the user a "wind-up" phase of movement by incorporating a counterweight. Furthermore, additional mass is also greatly beneficial to the user, because the greater resistance the greater the amount of muscular activity.

THE OBJECT OF THIS INVENTION

[0026] It is widely known and accepted by physical therapists, chiropractors, medical professionals, insurance companies and ergonomic professionals that back pain and chronic backache are at epidemic proportions. Crippling and debilitating millions of our people, taxing both our manpower and our resources. Certainly the role of sitting is clearly contributing to this gigantic problem. Computer use also has contributed greatly to the current level of inactivity, which is now a pronounced staple of our society. Therefore, addressing the anomalies associated with prolonged periods of sitting is of utmost importance. Furthermore, equally important, if not of greater importance, is to reverse those harmful effects of sitting which are afflicting so many of our people right now.

[0027] Is the objective of this invention to provide a "heel cradle" exercise device capable of affording the user the ability to "lift-at-will", his or her pelvic area above the ground or above the seat pan.

[0028] It is a further object of this invention to provide the user with a stable base of support, such that one has the leverage to lift one's pelvic region via exerting force on one's lower limbs.

[0029] Still another object of this invention is to utilize the Earth system of "reflective forces" to direct them through the body in ways that will strengthen the body efficiently and that will reverse those negative effects of gravity that presently exist in so many people.

[0030] It is additionally an object of this invention to establish a mechanism such that the lower limbs can achieve a feeling of "being grounded" with the floor or ground.

[0031] Another object of this invention is to interest a level of density to the lower extremities such that abdominal and back muscles can gain strength productively and effectively without detriment to the user.

SUMMARY OF THE INVENTION

[0032] The objects set forth above, as well as further and other objects and advantages of the present invention are achieved by the embodiments of the invention described herein below.

[0033] The present invention incorporates a base structure, which includes a hollow cavity, having two or more foot pads or legs, comprised of high friction component, on the bottom of the said base unit.

[0034] Said base structure is comprised of an internal cavity having an internal apex with four sidewalls, all sloped at such an angle such that all forces entering the cavity will ultimately end up on the internal apex of the cavity.

[0035] The base unit has a strap or anchoring device to hold the foot fixed in a flexed position.

[0036] In addition, the device has brackets attached to the base unit, to guide the strap. Said strap brackets have a means of attachment incorporated into their design, such that an external anchoring device may be attached to them to hold the base unit a fixed position.

[0037] Also, there is a port or entryway into the cavity of the base unit by which a dense material may be added into the hollow cavity of the base unit to add weight.

[0038] For a better understanding of the present invention, together with other and further objects thereof, reference is made to the accompanying drawings in detail descriptions, and its scope will be pointed out in the attended claims.

BRIEF DESCRIPTION OF DRAWINGS

[0039] FIG. 1 is a front schematic illustration of the heel cradle exercise device and footrest.

[0040] FIG. 2 is a side view of the heel cradle exercise device and footrest.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0041] Reference is now made to FIG. 1 of the drawings, which pictorially represents the heel cradle apparatus and footrest, hereinafter referred to as the heel cradle. FIG. 1 and FIG. 2 are the hollowed out cavity, of the base unit, which is made of high impact, highly durable plastic or similar materials. The unique geometric shape of the heel cradle is the major functional component of this invention. Item 1-2 and 2-2 form the sidewalls of the sloping internal cavity for cradling the heel of the user, item 1-1 and 2-1 are the internal force plate to contact the calcaneus bone, items 1-3 and 2-3 other pathways for the restraining belt, items 1-4 and 2-4 are the combination strap holder and bracket means for anchoring heel cradle to an external fixed location via rope or bungee type restraining mechanism (not shown). Item 1-5 and 2-5 is the pathway for the restraining strap, and is a geometrical arch for adding stability and strength to support for the internal force plate, items 1-1 and 2-1 as above. Item 1-6 and 2-6, are of high friction foot pads to restrict and immobilize the heel cradle for normal operation on normal floor surfaces. Item 1-7 and 2-7 are the restraining strap and buckle, with adjustment means, to lock the foot in a flexed position, item 2-8 is a removable cap to allow access into the hollow cavity of the heel cradle device, to serve to install a dense material to increase the weight of the heel cradle device.

[0042] A further aspect of the present invention is based on the fact that in a seated position our body is compromised, and we lose a specific range of motion. That range of motion is a combination move, which includes a pelvic lift and pelvic rotation, all is done simultaneously. This range of motion is very small, and almost unnoticeable to the human eye, but it is vital to our very existence. The unique geometric design of this invention is such that, the heel has a very low center of gravity as it is contained inside the heel cradle device itself, and then the broad base of support of the heel cradle device in conjunction with the high friction pads are such that it holds the user's foot immobile. The calcaneus

bone is then held in a fixed position, in direct alignment with the lower limb. It is because of this unique position that the user has the ability to achieve that stated, complicated pelvic lift and rotation maneuver, all done simultaneously, otherwise it is impossible.

[0043] To further exemplify the functions of the heel cradle apparatus, there are three unique strategies that work; 1) One's stability is solely based in the stability of one's base of support on the ground. 2) The unique geometry of the internal cavity of the heel cradle establishes a "funnel of forces", thereby directing all forces in or on the walls of internal cavity on to the force plate which is at the lowest apex of said internal cavity. 3) once having locked of foot in a flexed position, the calcaneus bone then being held in a direct linear relationship to the lower limb, allows a third principle to be put at work, which is the lock and load principal. Thus all forces are directed onto the force plate, via the lower limb. And at that point, simultaneously, the resulting or reflective forces of the ground are directed upwards through the entire lower limb, pelvic region, through the back and if supported correctly, through one's shoulders, neck and head.

[0044] It should be noted; that nearly 400,000 years ago, one of our primate ancestors decided to sit in a particular manner, which we have grown accustomed to today. At that point in our history, a flaw in our movement ability took place, which unfortunately still exists presently. By incorporating the unique geometry of the heel cradle exercise apparatus, that flaw, in our movement capacity, will now be eliminated completely.

[0045] Although the present invention has been described with respect to various embodiments, it should be further realized that this invention is also capable of a wide variety of further and other embodiments within the spirits and scope of the attended claims.

What is claimed is:

1) A heel cradle exercise apparatus comprising:

A hollow base structure, having a stable base of support, A geometric internal cavity to force the foot into a flexed position,

A geometric internal cavity designed specifically to hold one's heel at a low center-of-gravity with respect to the base structure.

2) The heel cradle exercise apparatus and footrest as defined in claim 1, wherein said base structure is comprised of high friction foot pads to restrict movement.

3) The heel cradle exercise device and footrest as defined in claim 1, wherein said base structure is comprised of a strapping means lock ankle into a flexed position.

4) The heel cradle exercise apparatus and footrest as defined in claim 1 wherein said base structure is comprised of a strap bracket means with a combined anchoring bracket to be attached to an external fixed location via a rope chain or other fixing means.

5) The heel cradle exercise apparatus and footrest as defined in claim 1 wherein said base structure is further comprised of a means of adding dense material into the internal cavity of the heel cradle base unit.