

AN APPARATUS FOR PHYSICAL EXERCISES

Field of the Invention

The present invention relates to an apparatus for physical exercises. More particularly, the present invention relates to an apparatus for performing abdominal exercises.

Background of the Invention

An abdominal crunch is an exercise performed to train muscles located at human abdominal area for strength and aesthetic appearance. To perform an abdominal crunch, a person lies prone on a flat surface with knees raised and bent downwards and feet pressing against the flat surface and head rested on both arms which are extended sideways, bent at elbows and placed under the head. The person then contracts his or her abdomen and at the same time raises his or her upper back and brings his or her chest closer to the knees while bending at the abdomen. Then the person lowers his or her back to the flat surface and repeats the movement up to a desired amount of repetitions. This motion causes the abdominal muscles to contract and extend and repeated contraction and extension improves strength of the muscles and expends calories stored in body.

Traditional abdominal crunch exercises places a person performing such exercise at a certain amount of risk for injury and posture-related problems. Pulling motion places excessive strain on lower back and neck regions which can lead to injury. Overworked and tight abdominal muscles can restrict expansion of ribcage, which inhibits proper breathing. Further, having overly tight abdominal muscles can lead to poor posture, whereby the abdominal muscles pull breastbone towards pubic bone, and compresses internal organs which creates a distorted carriage with head and shoulders jutting forward. Over time, this poor posture can become rigid. Further, the exercise is not efficient as hip flexor muscles extending from hip to abdomen are primarily used for movement and not rectus abdominis muscles that run the length of the abdomen or other abdominal muscle groups.

Abdominal exercise machines are common in the market where they assist in performing abdominal crunches to allow user to perform exercise in a more efficient and safer manner.

US 6,186,926 B1 discloses a seated abdominal exercise machine comprising a frame, a seat mounted to the frame, a backrest attached to the frame rearwardly to the seat, arm and head supports, handles, and a plurality of transfer members which are pivotally interconnected. A user sits on the seat provided and reclines on the backrest while pulling handles located overhead downwards to perform abdominal exercises. The plurality of interconnected transfer members work to allow a full range of motion for performing the abdominal exercise.

US 5,577,987 discloses an abdominal exercise device being a singular frame structure having head and arm supports, handles and rocker arcuates for the device to pivot back and forth during an abdominal exercise. The device is placed on a ground surface and a user rests his head and arms on the supports while lying on a surface and the device assists abdominal exercise by supporting head and arms of the user while the user performs the exercise.

US 2012/0100973 A1 discloses a an abdominal exercise device having a rail on which a cushion slides and rotates, thereby giving additional movement for rotation whereby a user slides from side to side and twists from one side to another to perform abdominal exercises.

Prior art devices only assist in performing abdominal crunches which does not completely mitigate the above set of problems. Furthermore, fitness experts recommend that core region of body which include upper and lower abdominal regions, lower back muscles and pelvic muscles should be exercised for balanced strength and functionality. Having a balanced core exercise promotes good posture, reduces injury, and improves the effectiveness of other exercises such as weightlifting.

As such, there exists a need for a device that allows user to perform abdominal exercises safely and to engage overall core muscles during an exercise.

Summary of the Invention

The present invention relates to an apparatus for performing abdominal exercises, the apparatus comprising a frame for providing a stable base for operation of the apparatus, a seat for a user to rest onto, a resistance adjustment
5 means for adjusting level of resistance for operation of the apparatus and a joint mechanism for bearing loads and providing rotational movement, wherein the resistance adjustment means is operable to resist movement of the joint mechanism located at centre point of the frame, characterized in that an arm connected to the joint mechanism located at centre point of the frame is rotatable
10 at centre point of the frame by means of the joint mechanism and the seat is linearly connected to the arm and is linearly traversable about the arm and the seat is further rotatably connected to the arm.

Brief Description of the Drawings

The drawings constitute a part of this specification and include an exemplary or
15 preferred embodiment of the invention, which may be embodied in various forms. It should be understood, however, the disclosed preferred embodiment is merely exemplary of the invention. Therefore, the figures disclosed herein is not to be interpreted as limiting, but merely as the basis for the claims and for teaching one skilled in the art of the invention.

20 Figure 1 shows an abdominal exercise machine being a preferred embodiment of the present invention.

Figure 2a shows an exploded view of the abdominal exercise machine of Figure 1.

Figure 2b shows a magnified exploded view of a seat shown in Figure 2a.

Figure 2c shows a magnified exploded view of an arm and a joint mechanism
25 shown in Figure 2a.

Figure 2d shows a magnified exploded view of a resistance adjustment means shown in Figure 2a.

Figure 2e shows a magnified exploded view of a frame and a pair of handles shown in Figure 2a.

Figure 2f shows a cross sectional view of a seat connected to a seat joint mechanism.

- 5 Figure 2g shows a cross sectional view of a joint mechanism connected to a central shaft.

Figure 3 shows the abdominal exercise machine of Figure 1 with seat and arm removed.

Figures 4a and 4b show top and bottom isometric views of a seat and arm.

- 10 Figure 5 shows a person operating the abdominal exercise machine of Figure 1.

Detailed Description of the Drawings

Detailed description of preferred embodiment of the present invention is disclosed herein. It should be understood, however, that the embodiment is merely exemplary of the present invention, which may be embodied in various forms.

- 15 Therefore, the details disclosed herein are not to be interpreted as limiting, but merely as the basis for the claim and for teaching one skilled in the art of the invention. The numerical data or ranges used in the specification are not to be construed as limiting.

- Figure 1a shows a preferred embodiment of the present invention wherein an apparatus being an abdominal exercise machine comprises of a frame (10), handles (12), seat (14), arm (16), circular rail (18) and a resistance adjustment means (20). The frame (10) houses all components and provides a stable base for operation of the apparatus. The arm (16) is connected to centre point of the frame (10) via a joint mechanism (22). The arm (16) rotates about the centre point of the frame (10) with outer end of the arm (16) having a roller (which is shown in subsequent figures) which travels on the circular rail (18). The handles (12) allow a user to hold onto them for support while operating the apparatus and are extendable sideways to accommodate size of user, wherein a larger bodied user
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would push out handles (12) for a more convenient grip while a smaller bodied user would withdraw handles (12) to achieve the same. A resistance adjustment means (20) is provided at one of the handles (12) for user to adjust desired amount of resistance by operating the resistance adjustment means (20). It is appreciated that the resistance adjustment means (20) is operable without being attached to the handle (12). Non-slip foot covers (26) made of non-slip material such as rubber, silicone and polyurethane or combination thereof are provided to increase friction between feet (24) of apparatus and ground surface to prevent the apparatus from sliding or moving around during operation of the apparatus. It is imagined that any variation in number of feet (24) may be possible or that frame (10) of the apparatus engages ground surface by means of a single, solid base without any feet without departing from scope of invention.

Figure 2a shows an exploded view of the preferred embodiment of the present invention, while Figure 2b shows a magnified exploded view of a seat, Figure 2c shows a magnified exploded view of an arm, Figure 2d shows a magnified exploded view of a resistance adjustment means while Figure 2e shows a magnified exploded view of a frame and handles.

With further reference to Figures 2b and 2c, seat assembly comprising of a seat (14), a shaft (14b) connected to seat joint mechanism (14c) and a roller bracket (14a) with rollers (14d) connected to the shaft (14b) and seat joint mechanism (14c). Bolts (28) secure the shaft (14b) to the seat (14). The seat joint mechanism (14c) allows the seat (14) to rotate at the shaft (14b) while rollers (14d) allow the seat (14) roll freely in a linear direction. Various components within the seat joint mechanism (14c) will be explained further in Figure 2f.

The seat (14) is linearly connected to an arm (16) on which it is linearly traversable. Further, the seat (14) is also rotatable about its own vertical axis at any point along the arm (16) by means of the seat joint mechanism (14c). The arm (16) is also connected to a joint mechanism (22) which in turn is connected to a central shaft (30) located at centre point of the frame (10) to allow the arm (16) to rotate about centre point of the frame (10). A roller (16a) is located at the bottom of the arm (16) and the roller travels on the circular rail (18). The roller (16a)

functions to help bear load of a user together with the joint mechanism (22) during operation of the exercise apparatus. This is to prevent the arm (16) from deflecting under load.

With further reference to Figure 2d, a resistance adjustment means (20) comprises
5 of a lever (20a), brake cable (20b), and a brake pad (20c). The lever (20a) and brake pad (20c) are connected via the brake cable (20b) and the brake pad (20c) encircles the joint mechanism while the lever (20a) can be held freely with one hand or attached to a handle. In the preferred embodiment, the resistance adjustment means (20) is attached to the handle. The lever (20a) is operable to
10 apply braking force against joint mechanism by the brake pad (20c) or to release joint mechanism based on force exerted on the lever (20a).

With further reference to Figure 2e, handles (12) are configured to fit into slots (32) formed on the frame (10) so that the handles (12) can be laterally extended and retracted within the slots (32). In this embodiment, the handles (12) are detachable
15 to allow for ease of storage to reduce the apparatus to a compact form. Alternatively, the handles (12) are foldable and locked into position by a latch, screw or bolt.

While the frame (10) in the preferred embodiment is rectangular in shape, it is envisioned that a minimal, skeletal frame (not illustrated) can be used to provide
20 the same amount of stability and rigidity while being lighter in weight.

Figure 2f shows a cross section view of the seat (14) connected to the seat joint mechanism (14c). Bolts (28) fasten the seat (14) to a frame from which a shaft (14b) protrudes. The shaft (14b) is positioned below the seat (14) and protrudes downwards wherein the shaft (14b) meets the seat joint mechanism (14c).
25 Contained within the seat joint mechanism (14c) is a ball bearing (34) is secured to the shaft (14b) by means of a lock ring (14g) clamped around a groove (14h) formed on the shaft (14b). The lock ring (14g) holds the ball bearing (34) in place to prevent the ball bearing (34) from moving vertically along the shaft (14b) during operation of the apparatus. The ball bearing (34) is further secured to its position

by a cover (14e) covering the seat joint mechanism (14c). A washer (14f) fills the space between the cover (14e) and ball bearing (34).

Figure 2g shows a cross section view of the central shaft (30) protruding upwards from the central shaft base plate (30a). The joint mechanism (22) is rotatably
5 secured to the central shaft (30) by means of a nut (22b) which also secures a ball bearing (34) contained within the joint mechanism (22). It can be seen that the central shaft (30) tapers to a wider diameter below the ball bearing (34) and the taper prevents the ball bearing (34) from sliding down the central shaft (30). At
10 bottom end of the central shaft (30), a plurality of washers (22c) are placed to support the joint mechanism (22) and prevent the joint mechanism (22) from tilting in any direction as it rotates. A cover (22a) seals the joint mechanism (22) to prevent infiltration of foreign matter into the joint mechanism (22).

Ball bearings (34) are used as a preferred means to support loads and facilitate rotation in the joint mechanism (22) and seat joint mechanism (14c), however,
15 other types of rotational joints known to a person skilled in the art such as swivel joints or ball joints are envisioned to be also suited for the application of supporting loads and facilitating rotation.

Figure 3 shows the apparatus with the seat and arm removed to expose the joint mechanism (22) and resistance adjustment means (20). The joint mechanism (22)
20 rotates freely about central shaft (hidden from view) and applying braking force against the joint mechanism (22) will retard movement of the joint mechanism (22), which in turn retards movement of the arm (not illustrated in this figure). When no force is exerted to squeeze the lever (20a), the brake cable (20b) is slack and there is no braking force acting on the joint mechanism (22) by the brake pad
25 (20c). Squeezing the lever (20a) will cause the brake cable (20b) to become taut and in turn pull together both ends of the brake pad (20c). This will cause the brake pad (20c) to tighten around the joint mechanism (22) and apply braking force against the joint mechanism (22) and therefore creates mechanical friction and therefore retards movement of the joint mechanism (22). This in turn creates
30 resistance for a user using the apparatus for exercise in order to increase difficulty of the exercise. As more force is applied by the user to squeeze lever (20a), more

braking force is consequently applied against joint mechanism (22) which increases resistance and therefore the exercise becomes more challenging. The user is free to apply the necessary force to achieve desired level of difficulty to perform the exercise. This means of providing resistance is preferred as the user
5 can instantaneously increase or decrease resistance of exercise performed on the apparatus by squeezing or releasing the lever (20a) as compared to other types of mechanism such as a dial-adjustment mechanism which requires repeated twists of a dial to increase or decrease resistance.

Other means of providing resistance include using brakes with a dial-adjusted
10 mechanism (not illustrated) wherein the brake is moved closer to or further from the joint mechanism by turning the dial. Turning the dial to cause the brake to tighten around the joint mechanism will increase resistance of activity while turning the dial to cause the brake to loosen around the joint mechanism will decrease resistance of the activity.

15 Still another means of providing resistance include using a dial adjusted mechanism to move a magnet closer or further to the joint mechanism (not illustrated). Moving the magnet closer to the joint mechanism creates a resistive magnetic force between the magnet and joint mechanism which resists movement of the joint mechanism without physically contacting the joint mechanism. Moving
20 the magnet further from the joint mechanism lessens the resistive magnetic force. It is envisioned that still other means of providing resistance can be used without departing from the scope of the invention.

Figure 4a and Figure 4b show top isometric view and bottom isometric view of the seat (14) which is connected to the arm (16) via a roller bracket (14a). The seat
25 (14) is linearly traversable on the arm (16) by means of the rollers (14d) set into grooves (16b) formed at sides of the arm (16). As the rollers (14d) protrude inwardly into the grooves (16b) at sides of the arm (16), the seat (14) does not fall off during vigorous operation of the apparatus.

The seat (14) is layered at the top with a non-slip material such as rubber, silicone
30 or polyurethane or a combination thereof to prevent user from sliding off the seat

during operation of the apparatus. It is envisioned that the seat (14) can be padded with cushioning material such as foam or rubber for comfort and also equipped with restraining means such as safety belts to further prevent user from sliding off the seat during operation of the apparatus.

- 5 Figure 5 shows a user seated on the apparatus. Seat (14) has two different freedom of motion which is rotational movement (A) about its own vertical axis and linear movement (B) towards and away from centre point of the frame (10), limited by length of arm (16). The arm (16) is rotatable about the centre point of the frame (10) (C). Combining these freedoms of movement (A, B, C), the user is able to
10 trace any elliptical motions (D) bound by these freedoms of movement using their hip and core muscles for exercise.

Commercially available exercise equipment for abdominal exercises typically centre on only one degree of motion which is either rotation around a vertical axis, i.e. twisting motion or rotation around a horizontal axis, i.e. abdominal crunch
15 motion. Performing exercises using these motions are not effective as only a small area of the abdomen is exercised and these motions place excessive strain on a user's back which could lead to injury. By combining different freedoms of movement, the apparatus allows a user to perform an elliptical motion (D) for exercising which allows for more muscle groups to be exercised instead of just
20 abdominal muscle group and as twisting or crunching motions are eliminated by performing elliptical motion (D), risk of spinal injury is likewise mitigated.

To perform an exercise using the apparatus, the user sits on the seat (14) provided and holds onto the handles (12) for stability. Feet of the user are extended outwards and pressed against surface of the ground. The user then
25 traces elliptical motions using hip and core muscles while seated to exercise these muscle groups. By squeezing or releasing the resistance adjustment means (20), the user can increase or decrease resistance of the apparatus and therefore increase or decrease difficulty of the exercise.

Dimensions of a preferred embodiment of the apparatus is given as below:

Height of handle:	350mm
Width of frame from left to right:	900mm
Depth of frame from front to back:	830mm
5 Arm length:	450mm
Radius of circular rail:	250mm
Height of feet:	50mm

Claims

1. An apparatus for performing abdominal exercises, the apparatus comprising:
 - a frame (10) for providing a stable base for operation of the apparatus;
 - 5 a seat (14) for a user to rest onto;
 - a resistance adjustment means (20) for adjusting level of resistance for operation of the apparatus; and
 - a joint mechanism (22) for bearing loads and providing rotational movement;
 - 10 wherein the resistance adjustment means (20) is operable to resist movement of the joint mechanism (22) located at centre point of the frame (10), characterized in that:
 - i) an arm (16) connected to the joint mechanism (22) located at centre point of the frame (10) is rotatable at centre point of the frame (10) by means of the joint mechanism (22); and
 - 15 ii) the seat (14) is linearly connected to the arm (16) and is linearly traversable about the arm (16) and the seat (14) is further rotatably connected to the arm (16).
- 20 2. The apparatus as claimed in Claim 1, wherein the arm (16) is connected to the joint mechanism (22) at terminal end of the arm (16).
3. The apparatus as claimed in Claim 1, wherein the resistance adjustment means (20) produces resistance in the form of mechanical friction between
25 resistance adjustment means (20) and joint mechanism (22).
4. The apparatus as claimed in Claim 1, wherein the resistance adjustment means (20) comprises of:
 - i) a lever (20a);
 - 30 ii) a brake cable (20b); and
 - iii) a brake pad (20c)

wherein squeezing the lever (20a) pulls the brake cable (20b) taut which tightens the brake pad (20c) around the joint mechanism (22) while releasing the lever (20a) slackens the brake cable (20b) which loosens the brake pad (20c) around the joint mechanism (22).

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5. The apparatus as claimed in Claim 1, wherein the seat (14) is connected to the arm (16) via a roller bracket (14a) and is linearly traversable about the arm (16) by means of rollers (14d) connected to the roller bracket (14a), the rollers (14d) rolling in grooves (16b) formed on the arm (16).

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6. The apparatus as claimed in Claim 6, wherein the seat is rotatable at the arm (16) about its own vertical axis by means of a seat joint mechanism (14c) attached to the roller bracket (14a).

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7. The apparatus as claimed in Claim 1, wherein the seat (14) is made of non-slip material.

8. The apparatus as claimed in Claim 7, wherein non-slip material is selected from a group consisting of rubber, silicone and polyurethane or combination thereof.

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9. The apparatus as claimed in Claim 1, wherein the apparatus further comprises of handles (12) for user to hold onto during operation of the apparatus.

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10. The apparatus as claimed in Claim 9, wherein the handles (12) are laterally extendible and retractable.

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11. The apparatus as claimed in Claims 3 and 9, wherein the resistance adjustment means (20) is connected to the handle (12).