Claims

What is claimed is:

1. An exercise device comprising:

a base;

a top supported by the base, wherein an inner volume extends downwardly from the top into the base and wherein the top defines an aperture;

a force sensor configured to measure forces on the top by a user;

a motor assembly including a motor and a cable coupled to the motor, wherein the motor is disposed under the top within the inner volume and the cable is extendable through the aperture; and

a controller communicatively coupled to each of the force sensor and the motor, the controller configured to actuate the motor to control a rate at which the cable is extended or retracted against movement of the user, in response to said forces applied to the top by the user as measured by the force sensor during each of extension and retraction of the cable through the aperture.

2. The exercise device of claim 1, wherein the force sensor is a load cell disposed between the base and the top.

3. The exercise device of claim 1 further comprising a plurality of force sensors including the force sensor, wherein the plurality of force sensors is configured to measure forces applied to the top and the controller is further configured to actuate the motor in response to forces on the top as measured by the plurality of force sensors.

4. The exercise device of claim 3, wherein the plurality of force sensors is distributed between the base and the top such that the plurality of force sensors supports the top.

5. The exercise device of claim 3, wherein:

the top comprises a first plate and a second plate; and

the plurality of force sensors comprises:

a first set of force sensors configured to measure a force distribution on the first plate, each of the first set of force sensors positioned at a respective corner of the first plate to measure forces at the respective corner of the first plate; and

a second set of force sensors configured to measure a force distribution on the second plate, each of the second set of force sensors positioned at a respective corner of the second plate to measure forces at the respective corner of the second plate.

6. The exercise device of claim 1, wherein the controller is further configured to actuate the motor in response to at least one of: force produced by the motor on the cable, one or more user settings, one or more forces measured on a structural element of the exercise device, or one or more motor parameter measurements.

7. The exercise device of claim 1, wherein the top comprises an omnidirectional fairlead comprising a plurality of rollers for guiding the cable, the omnidirectional fairlead defining the aperture.

8. The exercise device of claim 1, further comprising a battery electrically coupled to the motor, wherein the controller is further configured to selectively operate the motor in a power generation mode during which power is generated at the motor and transmitted to the battery responsive to extension of the cable.

9. The exercise device of claim 1, further comprising a force multiplying feature accessible from the top, the force multiplying feature configured to fix or route a portion of the cable such that a handle may be coupled to an intermediate portion of the cable disposed between the aperture and the force multiplying feature.

10. A method of operating an exercise device, the method comprising:

receiving, at a controller, a first force measurement from a force sensor communicatively coupled to the controller, the first force measurement corresponding to a first force applied to a top supported by a base, wherein:

an inner volume extends downwardly from the top into the base and a motor is disposed under the top within the inner volume, and

the first force occurs during extension of a cable coupled to the motor and extending out of the base;

changing resistance provided by the motor to extension of the cable in response to the first force measurement;

receiving, at the controller, a second force measurement from the force sensor, the second force measurement corresponding to a second force applied to the top during retraction of the cable by the motor; and

changing a retraction force provided by the motor in response to the second force measurement,

wherein the controller is configured to actuate the motor to control a rate at which the cable is extended or retracted against movement of the user, in response to forces applied to the top by a user as measured by the force sensor.

11. The method of claim 10, wherein actuating the motor is further in response to an exercise parameter, the exercise parameter corresponding to an amount of force to be applied to the cable or a movement speed of the cable.

12. The method of claim 10, wherein the force sensor is one of a plurality of force sensors communicatively coupled to the controller, wherein the first force measurement is one of a first plurality of force measurements respectively corresponding to the plurality of force sensors, the second force measurement is one of a second plurality of force measurements respectively corresponding to the plurality of force sensors, the method further comprising:

receiving, at the controller, the first plurality of force measurements from the plurality of force sensors, wherein changing resistance provided by the motor to extension of the cable is further in response to the plurality of force measurements; and

receiving, at the controller, the second plurality of force measurements from the plurality of force sensors, wherein changing the retraction force provided by the motor is further in response to the plurality of force measurements.

13. The method of claim 12, wherein the top includes a first plate and a second plate and the plurality of force sensors includes a first set of force sensors, each of the first set of force sensors positioned at a respective corner of the first plate, and a second set of force sensors, each of the second set of force sensors positioned at a respective corner of the second plate, the method further comprising:

measuring forces from at least one of the first set of force sensors and the second set of force sensors to determine a force distribution on at least one of the first plate and the second plate, respectively.

14. The method of claim 10, further comprising measuring, at the controller, a sensed parameter comprising at least one of: a load on the motor, a cable speed, a force direction, a user position, and time, wherein actuating the motor is further in response to the sensed parameter.

15. The method of claim 14, further comprising transmitting, from the controller to a remote computing device, exercise data based, at least in part, on the sensed parameter.

16. An exercise system comprising:

an elevated platform supported by a base, wherein an inner volume extends downwardly from the top into the base;

a motor disposed under the elevated platform within the inner volume;

a cable coupled to the motor;

one or more sensors configured to measure one or more sensed parameters including forces applied to the elevated platform resulting from a user manipulating the cable while the user is in contact with the elevated platform; and

a controller communicatively coupled to each of the motor and the one or more sensors to actuate the motor to control a rate at which the cable is extended or retracted against movement of the user, in response to the one or more sensed parameters during each of extension and retraction of the cable.

17. The exercise system of claim 16, wherein the controller is configured to transmit exercise data based at least in part on the one or more sensed parameters to a display device communicatively coupled to the controller.

18. The exercise system of claim 16, wherein the controller is further configured to actuate the motor to vary the force on the cable based on an exercise parameter.

19. The exercise system of claim 18, wherein the controller is configured to be communicatively coupled to a computing device and to receive the exercise parameter from the computing device.

20. The exercise system of claim 16, wherein the controller is further configured to transmit exercise data corresponding to the one or more sensed parameters to a remote computing device.