What is claimed is:

1. An omnidirectional treadmill comprising:

a frame;

a plurality of cross beams coupled to one another to form a continuous loop having a substantially flat upper surface;

a cross-beam drive mechanism mounted to the frame and coupled to the plurality of cross beams to drive the continuous loop;

a single conveyor belt helically wound around each cross beam and passing between each adjacent cross beam at an underside thereof; and

a conveyor-belt drive mechanism coupled to the conveyor belt.

2. The omnidirectional treadmill of claim 1, wherein the plurality of cross beams are coupled to one another by being mounted on first and second drive chains, the first drive chain mounted between a first pair of sprocketed wheels and the second drive chain mounted between a second pair of sprocketed wheels, a first end of each cross beam mounted to the first drive chain and a second end of each cross beam mounted to the second drive chain, opposing ones of the first and second pair of sprocketed wheels each mounted on a common axle supported by the an axle frame coupled to the frame.

3. The om nidirectional treadmill of claim 1 further comprising a drive motor coupled to one of the common axles of the sprocketed wheels.

4. The omnidirectional treadmill of claim 1 wherein each cross beam has a hole formed in one side face at a selected position along its length and a rod extending out of a second face opposing the first face at the selected position, the rod of each cross beam extending into the hole of an adjacent cross beam.

5. The omnidirectional treadmill of claim 1 further comprising a belt drive motor coupled to the single conveyor belt.

6. The omnidirectional treadmill of claim 1 further comprising a tilt actuator coupled between the frame and the axle frame to tilt the substantially flat upper surface of the continuous loop at an angle disposed for a horizontal plane.

7. The omnidirectional treadmill of claim 6 wherein the axle frame is mounted to the frame at a pair of opposed pivot points.

8. The omnidirectional treadmill of claim 1 further comprising a user harness mounted to the frame.

9. The omnidirectional treadmill of claim 1 further comprising:

a dynamic control interface includes a floating frame having sliding attachments to four vertical supports, a single cable traveling to all four of the vertical supports via pulleys to force the floating frame to remain level relative to the omnidirectional treadmill; and

an actuator coupled to one of the vertical supports to control the amount of vertical force exerted on the floating frame.

CLAIMS:

1. An omnidirectional treadmill comprising:

a frame;

a plurality of cross beams coupled to one another to form a continuous loop having a substantially flat upper surface, each of the plurality of cross beams having an inner surface and an outer surface;

a cross-beam drive mechanism mounted to the frame and coupled to the plurality of cross beams to drive the continuous loop;

a single conveyor belt passing across the outer surface of each cross beam and helically passing from a first end of the inner surface of each cross beam to a second opposite end of the inner surface of an adjacent cross beam; and

a conveyor-belt drive mechanism coupled to the conveyor belt.

2. The omnidirectional treadmill of claim 1 wherein the plurality of cross beams are coupled to one another by being mounted on first and second drive chains, the first drive chain mounted between a first pair of sprocketed wheels and the second drive chain mounted between a second pair of sprocketed wheels, a first end of each cross beam mounted to the first drive chain and a second end of each cross beam mounted to the second drive chain, opposing ones of the first and second pair of sprocketed wheels each mounted on a common axle supported by an axle frame coupled to the frame.

3. The omnidirectional treadmill of claim 2 wherein the cross-beam drive mechanism comprises a drive motor coupled to one of the common axles of the sprocketed wheels.

4. The omnidirectional treadmill of claim 1 wherein each cross beam has a hole formed in one side face at a selected position along its length and a rod extending out of a second face opposing the first face at the selected position, the rod of each cross beam extending into the hole of an adjacent cross beam.

5. The omnidirectional treadmill of claim 1 wherein the conveyor-belt drive mechanism comprises a belt drive motor coupled to the single conveyor belt.

6. The omnidirectional treadmill of claim 2 further comprising a tilt actuator coupled between the frame and the axle frame to tilt the substantially flat upper surface of the continuous loop at an angle disposed from a horizontal plane.

7. The omnidirectional treadmill of claim 6 wherein the axle frame is mounted to the frame at a pair of opposed pivot points.

8. The omnidirectional treadmill of claim 1 further comprising a user harness mounted to the frame.

9. The omnidirectional treadmill of claim 1 further comprising:

a dynamic control interface including a floating frame having sliding attachments to four vertical supports, a single cable traveling to all four of the vertical supports via pulleys to force the floating frame to remain level relative to the omnidirectional treadmill; and

an actuator coupled to one of the vertical supports to control the amount of vertical force exerted on the floating frame.