Ski Simulator

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

[0001] The present invention relates to the sport of skiing. More particularly, the present invention pertains to a ski training simulator.

SUMMARY OF THE INVENTION

[0002] One of the challenges a novice skier faces is to overcome the psychological barrier that prevents the body from leaning forward during the flexing, but which allows the skier to perform more sharp turns along the arc of the smaller radius. When skiing along the arcs, the centrifugal force and centripetal acceleration keep the skier's body in the inclined position. These forces enable the skier to achieve positions that would otherwise be impossible to maintain in the same position while standing on the ground without movement.

[0003] Presently, a common way to teach the fundamentals of skiing is with a set of ski poles that are used to demonstrate proper positioning. A ski instructor will often use ski poles or other supporting devices in an attempt to demonstrate the correct positioning of the body, and to reproduce the inclination used during real skiing. The position of the body when supported by ski poles more closely resembles the correct inclined position, but still does not achieve the desired results. After a static demonstration using ski poles or other supports, instructors usually move to a dynamic

demonstration on the run. Typically, that part of the coaching is the most challenging and lengthy.

[0004] Several devices have been disclosed in the art that attempt to teach and train skiers to use the proper techniques when skiing. Some of these apparatuses disclose a device wherein the turning movements are simulated by moving the skier's feet left and right while standing on a platform, while the skier balances himself or herself using poles planted on the floor or ground. One shortcoming of this method is the inadequacy of the feet and body movements with regard to simulating conditions in terms of changing the direction of skis. This is due in part to a technical solution being the only translatory/linear motion of the carrying element with the platform.

[0005] Other devices in the prior art disclose methods of teaching and training skiers that utilize a rotating platform with the supporting surface for feet, skis or snowboards that move plane-parallel, left-right, rectilinearly or along an arc on the supporting unit, or along an arc on the supporting unit made as a beam. These devices allow for training the feet with skis, are able to take any position, allow the skis to be oriented in any direction, and can simulate the change of direction. Such devices, however, provide an ineffective method of training for skiers who wish to improve skiing technique, who do not possess the correct skills, and who do not know how to properly position their feet along the longitudinal axis of the skis during the left-right motion. With these apparatuses, the impact on the skier does not reproduce the real situation, and does not provide a way to repeat the exercises multiple times in order to generate correct skills.

[0006] Still other devices disclose slalom simulators that include a base platform with ski bindings, which have the ability to move left and right and simultaneously rotate clockwise and counterclockwise. The devices, however, provide an incomplete simulation of all movements of a skier and lack of imitation of centripetal acceleration. As a result, the real conditions of skiing are not fully simulated.

[0007] The present invention overcomes the limitations inherent in the devices disclosed in the prior art with a design that can be used by novice skiers and ski instructors to demonstrate and help learn the essential constituent parts of skiing. The device comprises multiple sets of platforms, located between the main platform and the rotating left-right platforms with ski bindings. Different platforms are installed with the possibility of rotation around their axis, each of which imitates the position of the slope, position or movement of skis, or the skier’s body. The platforms are mounted on top of each other using a set of coasters or bearings, such as cylindrical bearings of various diameters. The platforms can be made from profile steel or other strong/rigid materials or alloys. Each platform is equipped with a system of elastic/spring elements that return a platform to the neutral position when the applied pressure is released. The device further includes a harness that can be made from nylon straps, and a dynamic suspension connected with counterweights, springs, or bungee cords. The harness can be mounted on the body of a skier's center of gravity and connected to the ceiling or frame through a set of pulleys and elastic elements.

BRIEF DESCRIPTIONS OF THE DRAWINGS

[0008] Although the characteristic features of this invention will be particularly pointed out in the claims, the invention itself and manner in which it may be made and used may be better understood after a review of the following description, taken in connection with the accompanying drawings wherein like numeral annotations are provided throughout.

[0009] FIG. 1 shows a side view of the present invention with the tilting platform.

[0010] FIG. 2 shows a view of the rotation of the platform to the left during a right turn.

[0011] FIG. 3 shows a view of the platforms in a neutral position with ski bindings.

[0012] FIG. 4 shows a view of the sliding platforms simulating an increasing distance between skis during the turns.

[0013] FIG. 5 shows a view of a skier with a harness connected to the suspension with a spring as an elastic element.

[0014] FIGS. 6-10 show multiple views of a prototype of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0015] Referring now to FIG. 1, there is shown a side view of the present invention with the tilting platform. The device comprises multiple sets of platforms that rotate around their axis, their location on each other, and imitate the appropriate motions utilized during skiing. Lateral motion of the base platform 1 holds the other platforms 2, 3, 4, 6, 8, and 10 along the arced guides/rails 11, which in turn simulates an angular movement of the body during the turns. The rotating platform 2 is located on the base platform 1 and mounted by the bearing 12. In the preferred embodiment, the bearing 12 comprises a supporting axis with a set of coasters or bearing types. The rotation of the rotating platform 2 around the vertical axis imitates the changing of the direction of the slope relative to the skier's body.

[0016] The tilting platform 3 is mounted to the rotating platform 2 using hinges that allow for a change of the angle "β" between the platforms 2 and 3. This imitates the angle of the ski slope. At the beginning and ending of training, the tilting platform 3 is placed in a horizontal position, because in the inclined position, the device would be difficult to stand on for securing the ski boots without any additional supporting devices. The angle "β" can be changed through a mechanism. In the preferred embodiment, an electric motor and remote control are used to change the angle "β."

[0017] Referring now to FIG. 2, there is shown a view of the rotation of the platform to the left during a right turn. The upper platform 4 is located on the tilting platform 3 and mounted by a bearing. Rotation of the upper platform 4 on the tilting platform 3 with the angle "γ" around the axis perpendicular to the platform 3, simulates

the changing of the positions of the skis' centers (ski bindings, boots) relative to the direction perpendicular to the direction of the slope. The angle "γ" is equal to the angle between line *"a-a"* passing through the skis' centers and the line *"b-b"* perpendicular to the direction of the slope "α", which is simulated by the tilt of the platform 2. The angle "γ" changes during the turns. In the neutral position, left and right skis are equally positioned to the direction of the slope. During a left turn, the left foot is slightly forward in relation to the right ski in the direction of the slope. This orientation is reversed during a right turn.

[0018] On the tilting platform 3 are mounted two additional platforms 5, 6, which are utilized for left and right skis, and can move progressively and laterally along the bearing 3. The additional platforms 5, 6 and bearing 3 imitate the increasing distance "J" between centers skis during the turns, as shown in FIG. 4.

[0019] Referring now to FIG. 3, there is shown a view of the platforms in a neutral position with ski bindings. The platforms 7, 8 are mounted on the platforms 5, 6 respectively, which are secured by the bearings of a smaller diameter. The platforms 7, 8 rotate around their axis perpendicular to the platforms 5, 6 and imitate rotation of skis or boots around the vertical axes perpendicular to the slope during the turns. Platforms 9, 10 are mounted on the platforms 7, 8, which can be executed in the form of skis, and rotate around two axes parallel to the plane of the skis, and matching with the left and right edge of the skis. This is accomplished with hinges that simulate skis and their tilting.

[0020] The ski bindings 15 are mounted to the platforms 9, 10. As shown in FIG. 1, the axes of rotation of the platforms 2, 3, and 4 are shifted in relation to each other at certain distances, so that when the skier inclines to the left or right during the turns and applies pressure to the left or right, the platform 1 moves along the arced guides/rails, and the platforms 2, 3, and 4 rotate in the appropriate direction.

[0021] Referring now to FIG. 4, there is shown a view of the sliding platforms simulating an increasing distance between skis during the turns. Each platform is equipped with a system of elastic/spring elements that return a platform to the neutral position when the pressure releases. Stiffness/resistance of the spring elements is determined so that by the increasing pressure from the skier, the platforms begin to move in a certain sequence. The platform with a greater stiffness/resistance rotates after the platform with a lesser stiffness.

[0022] Beginners can use the mechanism that synchronizes the rotation angle of skis around a vertical axis so that they are always parallel to each other even while the distance between them is increasing. This consists of a longitudinal bar, located on the center between the ski and parallel to them. The rear end of the bar is jointed to the rear end of the left ski with a bar, and the front end is jointed to the right ski with a transversal bar. The axis of rotation of the bar is located at its center and perpendicular to the platform 4. The bar is mounted on the platform 4 so that it can progressively move left and right along a vertical plane passing through the centers of the skis. If the skis are turning without increasing the distance between them, the axis remains motionless. While distance between skis is increasing at *"J"*, the axis

additionally moves at a distance, thereby allowing the skis to remain parallel to each other during turns and spreading.

[0023] Referring now to FIG. 5, there is shown a view of a skier with a harness connected to the suspension with a spring as an elastic element. In a normal ski run, skiers usually do not use poles. The poles are used during movement on the flat ground or for climbing up a hill. They are not traditionally used while skiing, therefore, any ski simulators that utilize poles as a supporting device does not imitate the actual experience of skiing. Because it is impossible to reproduce the centrifugal force and centripetal acceleration in any device without real movement, the main purpose of a ski simulator is reproduction of movement, body position, and work of certain muscle groups as closely as possible to the real conditions.

[0024] In order to allow the skier to practice skiing without the use of poles for support, a harness 20 with a suspension is used in the present invention. The suspension must be dynamic, so that the body moves continuously and changes its position. Therefore, the distance between the attachment point on the body and the attachment point on the ceiling or frame is changing continuously as well. Vertical amplitude is small, but it still exists, so there should be no slack. This is accomplished with pulleys 21 that are connected to the springs 22, bungee cords, or counterweights.

[0025] A harness 20 is worn so as to not impede the trainee's movements. The mounting points should be in the center of body gravity, or a little lower and behind in the area of the hips, closer to the buttocks. The suspension attaches to the harness at the rear side of the body, which will not hamper the motions of the trainee. This is a

key feature of the present invention, which distinguishes this type of harness from all known harnesses that are designed to keep the body hanging vertically, such as those used by climbers or steeplejacks. This is accomplished with special mounting points that are far above the center of gravity of the body.

[0026] The distance between attachment points on the ceiling or frame is approximately equal to the amplitude of the horizontal movement of the trainee's body. This distance can be adjusted depending on height, weight, training level, trainee's aggressiveness, etc., because different people would incline, flex, extend, move left-right with different amplitudes. In this way, the suspension and attachments allow for elastic elements with lesser stiffness to be utilized. By using pulleys, the workload applied to elastic elements decreases. A suspension can therefore stretch twice as much as the amplitude of the body motion, and at the same time, the tension changes are negligible, thereby allowing the tension to remain the same. In addition, the direction of tension remains nearly the same when the trainee moves left or right. Finally, when the body moves left and right, the pulleys, and attachment points on the harness remain roughly at the same level. In this way, the present invention provides a way for novice skiers and ski racers to learn the fundamentals of the sport.

[0027] The foregoing descriptions of specific embodiments of the present invention have been presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the present invention to the precise forms disclosed, and obviously many modifications and variations are possible in light of the above teaching. The exemplary embodiment was chosen and described in order to best explain the principles of the present invention and its practical application, to thereby

enable others skilled in the art to best utilize the present invention and various embodiments with various modifications as are suited to the particular use contemplated.