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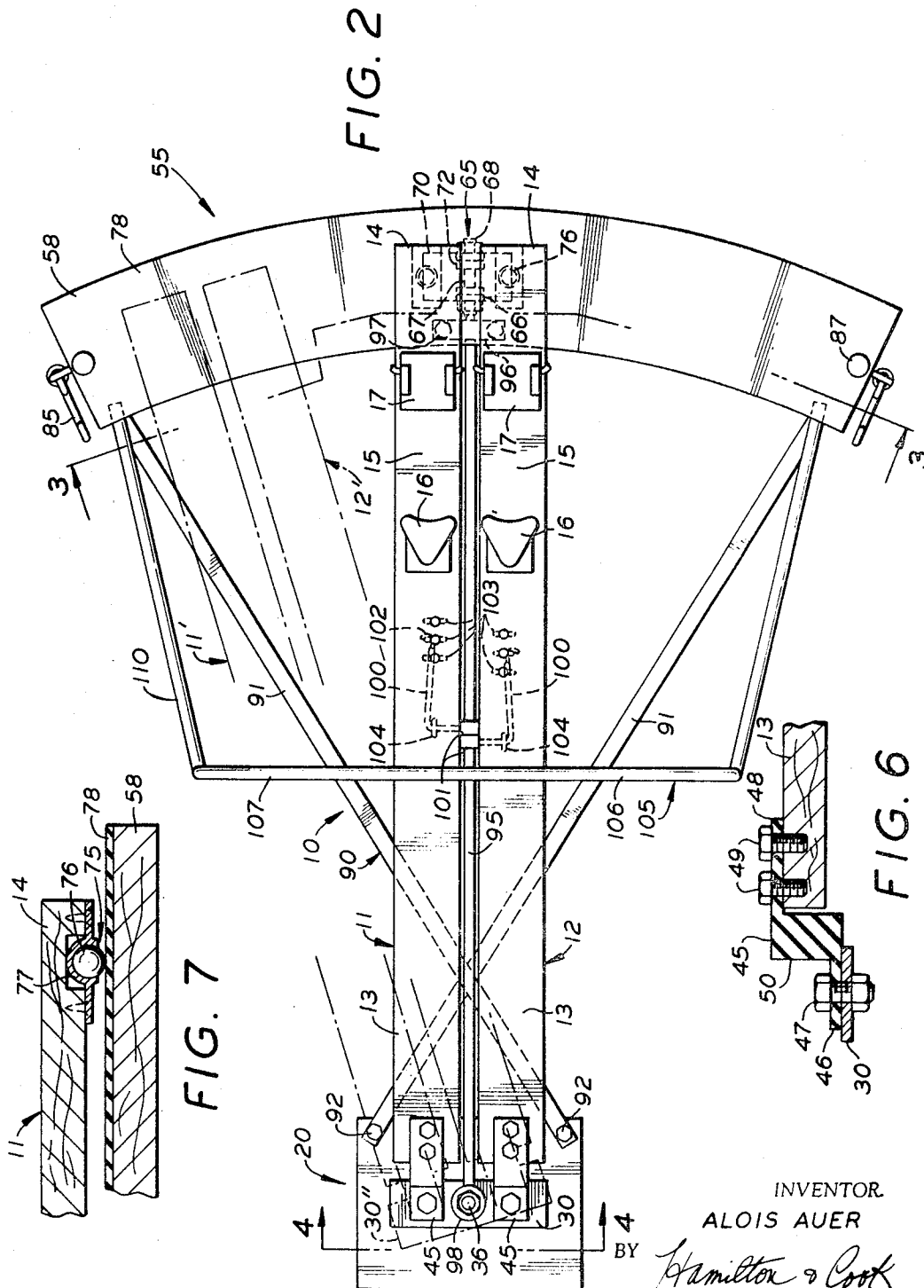
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SKI SIMULATOR APPARATUS

Filed Sept. 12, 1966

3 Sheets-Sheet 2



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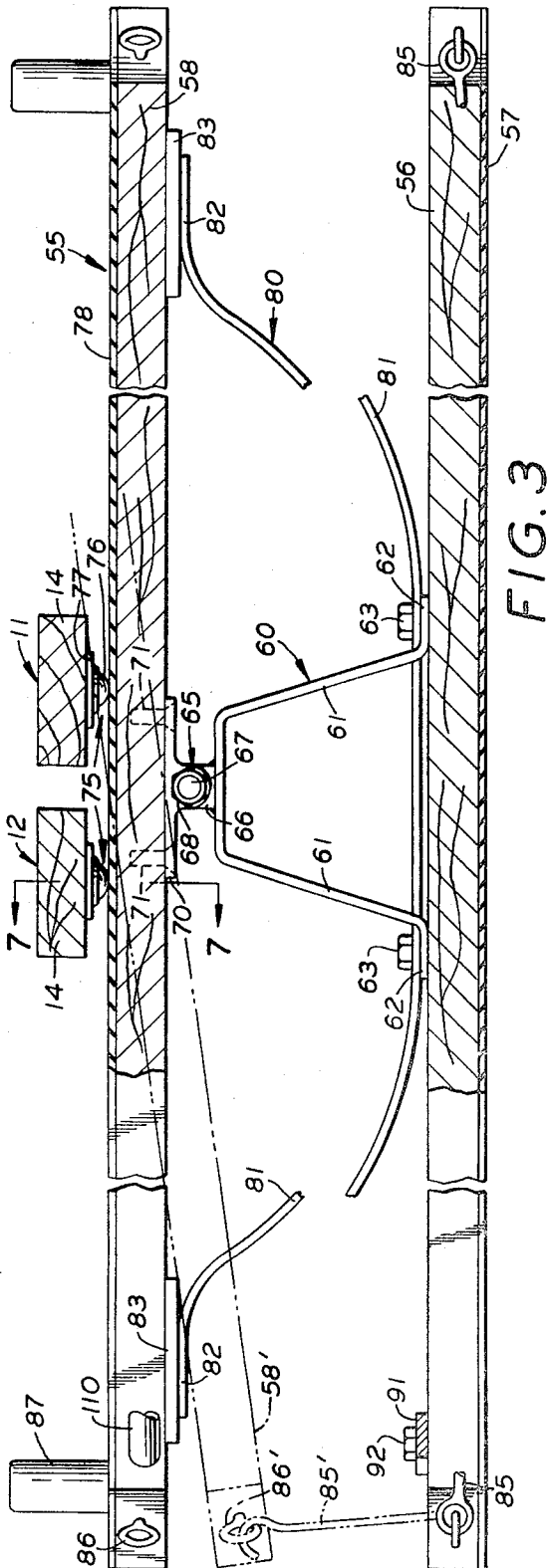


FIG. 3

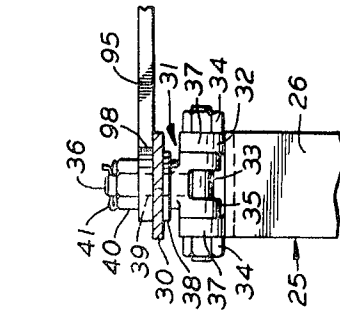


FIG. 5

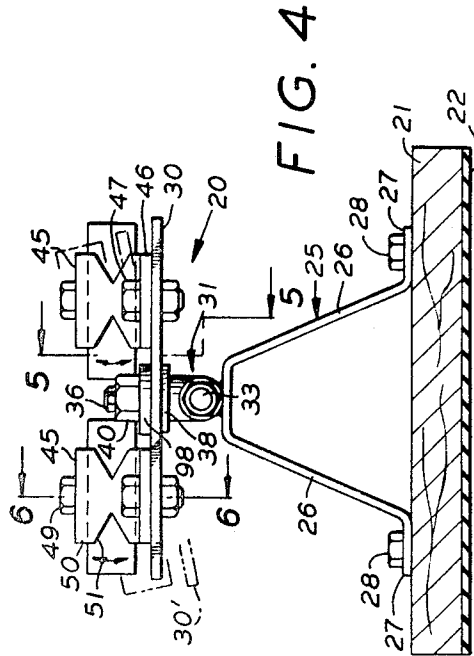


FIG. 4

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SKI SIMULATOR APPARATUS

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9 Claims

ABSTRACT OF THE DISCLOSURE

A snow ski simulator apparatus with ski-like members for supporting the feet of a skier and having forebody and tail portions, a support device for positioning the forebody portions including a tie element construction individually mounting each of the forebody portions and a hinge joint pivotally mounting the tie element construction, a pivoting support device having a platform engaging the tail portions, and a torque bar connecting the tie element construction and the platform to maintain them in substantially parallel planes, whereby actions and reactions of actual skiing conditions are substantially realistically simulated.

The invention relates generally to apparatus for simulating the performance of snow skis. More particularly, the invention relates to apparatus simulating the performance characteristics of snow skis sufficiently realistically to provide training and exercise for skiers. Specifically, the invention relates to portable ski simulating apparatus which provides actions and reactions for a mounted skier tantamount to the performance characteristics of snow skis in conditions of actual use.

Although numerous advances have been made in recent years, skiing facilities are not yet readily available to a great percentage of the increasing number of snow ski aficionados. Snow making machines have increased the number of skiing days in areas having a limited annual snowfall or intermittent thawing periods, and an expanding interest in skiing has prompted the expansion of existing facilities and the development of new areas. Still, however, many skiers have an opportunity to ski only a few days per year due to weather conditions, lack of facilities, or the distance from their homes to a ski area.

The lack of skiing opportunity and practice for numerous persons has prompted an appreciable interest in exercises and associated apparatus for conditioning and training body muscles employed in skiing. However, for the most part, the resultant products have constituted merely adaptations of existing techniques and devices. An exemplary device is the bongo board which constitutes a small cylindrical roller with a balance board atop. Although devices of this nature may in some cases provide exercise, they cannot train body muscles for the coordination required in skiing.

In addition to the requirement for conditioning devices, the increasing number of new skiers has accelerated the demand for training devices which can be employed to teach basics to beginners and improve the technique of more advanced skiers. Devices of this nature commonly employ foot rests or platforms which may be mounted on a sloping base and be capable of pivoting and tilting motions. The lack of acceptable realism or feel of the slope and the limited motion capabilities severely restrict the value and usefulness of devices of this nature.

Accordingly, a principal object of the present invention is to provide ski simulator apparatus which provides substantially realistic reproduction of the primary forces and counter-forces on snow skis experienced by a skier during maneuvers under conditions of actual use.

Another object of the invention is to provide ski simulator apparatus having sufficiently realistic motion to ex-

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ercise and train muscles in the way they are employed in actual skiing with the resultant conditioning benefit.

A further object of the invention is to provide readily portable and partially collapsible ski simulator apparatus which can be employed indoors or outdoors, independent of the incidence of snow, and in a space limited environment.

An additional object of the invention is to provide ski simulator apparatus which is suitable for teaching beginners basic maneuvers and safety considerations including the correction of errors in technique in some instances, as well as serving for instruction of advanced skiers in detailed matters of technique.

Still another object of the invention is to provide a ski simulator which is safe for operation by novices and experts alike.

Still a further object of the invention is to provide a ski simulator which has a reasonable original cost, is easy to store and erect, and requires little maintenance or service.

Various other objects and advantages will appear from the following description taken in conjunction with the attached drawings, and the novel features will be particularly pointed out hereinafter in conjunction with the appended claims.

In the drawings:

FIG. 1 is a fragmentary view in linear perspective of a ski simulator apparatus according to the present invention and shown fully erected in preparation for operation.

FIG. 2 is a top plan view of the ski simulator apparatus of FIG. 1, with the ski members shown paralleling the fall line and depicted in phantom lines at a random angle to the fall line.

FIG. 3 is an enlarged fragmentary section view taken substantially on line 3-3 of FIG. 2 and showing details of the ski tail support assembly of the ski simulator.

FIG. 4 is an enlarged fragmentary section view taken substantially on line 4-4 of FIG. 2 and showing the ski forebody support assembly.

FIG. 5 is a fragmentary section view taken substantially on line 5-5 of FIG. 4 and showing details of the hinge joint portion of the ski forebody support assembly.

FIG. 6 is a fragmentary section view taken substantially on line 6-6 of FIG. 4 and showing details of the resilient mounts connecting the ski forebody and the ski forebody support assembly.

FIG. 7 is a fragmentary section view taken substantially on line 7-7 of FIG. 3 and showing the friction means joining the ski tail and the ski tail support assembly.

Referring now to the drawings and particularly FIG. 1 thereof, an exemplary embodiment of a ski simulator apparatus according to the present invention is generally indicated by the numeral 10. A skier operating the ski simulator 10 for purposes of exercise or training supports his weight primarily on the two skis, generally indicated by the numerals 11 and 12, with the right foot on the ski 11 and the left foot on ski 12. Each of the skis 11, 12 has a forebody 13 and a tail 14, which are preferably of shorter individual and combined lengths than an actual snow ski in keeping with the objective of providing a compact, portable construction.

Intermittent forebody 13 and tail 14, the skis 11, 12 have binding areas 15 which detachably secure the feet of a skier. In order to provide optimum control of the skis 11, 12 and support for the skier's ankles, standard ski boots are preferably employed and attached by toe pieces 16 and heel plates 17 in each of the binding areas 15. Although standard snow ski bindings provide optimum attachment, other devices designed to hold ski boots or shoes reasonably rigid may be employed successfully for purposes of the present invention.

The skis 11, 12 may be made of wood, metal, plastic,

or suitable combinations; however, the material need not be grooved, cambered, or provided with other refinements for purposes of the present invention. The width, thickness, and material characteristics of the material can be designed to give the skis 11, 12 the flexibility characteristics of soft, stiff, or medium skis, as desired. Thus, the skis 11, 12 may be designed to provide a highly realistic feel during the maneuvers described hereinafter which can be executed on ski simulator 10.

Referring now to FIGS. 1 and 4, the forebodies 13 of skis 11, 12 are movably secured to a ski forebody support assembly, generally indicated by the numeral 20. The forebody support assembly 20 preferably has a base 21 which seats against the floor or ground to provide a stable foundation. The underside of base 21 may have an attached non-skid sheet material 22 which prevents undesired movement during operation and protects a floor or other surface from undue abrasion.

Extending upwardly from the base 21, a frame, generally indicated by the numeral 25, constitutes the primary vertical spacing and positioning component of the forebody support assembly 20. As shown, the frame 25 is generally A-shaped with diverging legs 26 having angular attachment flanges 27 at the lower extremities thereof. The flanges 27 are detachably secured to the base 21 by machine screws 28 or other suitable fastening means.

At the upper or apex portion of frame 25, a gimbaled tie element 30 having a capability for separate or concurrent rotational and rocking movements on right angle intersecting axes is suitably mounted. The tie element 30 is rockingly or pivotally mounted by means of a hinge joint, generally indicated by the numeral 31. Referring particularly to FIGS. 4 and 5, the frame 25 has spaced collars 32 constituting the fixed members of the hinge joint 31 and supporting a shaft 33 which is longitudinally secured by nuts 34 or comparable fastening means at either end thereof. The moving member of hinge joint 31 is a tie pin 35 which may be generally T-shaped with a shank 36 and one or more sleeves 37 which freely rotatably encase the shaft 33. As shown, the tie pin 35 has two spaced sleeves 37 interposed just interiorly of the collars 32 of frame 25 in order to prevent undue motion or play axially of shaft 33 and rotatably about the shank 36. The shank 36 of tie pin 35 may be provided with an enlarged flange or washer 38 which provides a seating surface for the tie element 30. An exemplary rocked or tilted position is depicted by the phantom line showing in FIG. 4 as tie element 30'.

The rotational capability of tie element 30 is about the axis of the shank 36 of tie pin 35. This motion potential is achieved by providing a bore 39 (FIG. 5) in tie element 30 of slightly greater diameter than the diameter of shank 36. The tie element 30 is held axially fixed without rotational restraint on shank 36 by means of a threaded nut 40 rotatably fixed on tie pin 35 by a cotter key 41, or other similar fastening means. An exemplary rotational positioning appears in FIG. 2 where the tie element 30 is shown in position 30'.

The gimbaled tie element 30 spaces and joins the forebodies 13 of skis 11, 12 in a semi-rigid connection for the purpose of allowing the skis 11, 12 to be tilted or rolled a limited amount about their longitudinal axes to achieve edging. The semi-rigid or restricted flexible connection is accomplished by means of resilient mounts 45 which are freely rotatably attached to tie element 30 on either side of the bore 39 receiving shank 36 of tie pin 35. As viewed in FIG. 6, the resilient mounts 45 are generally Z-shaped with lower projecting legs 46 freely rotatably attached to tie elements 30 by machine bolts 47 and upper projecting legs 48 rigidly attached to the forebodies 13 of skis 11, 12 by machine screws 49. Intermediate lower projecting legs 46 and upper projecting legs 48, the resilient mounts 45 have a body portion 50 which is sufficiently laterally flexible to allow the attached skis 11, 12 to be laterally rolled or tilted. As shown, the

body portions 50 of the mounts 45 have opposed V-shaped notches or grooves 51 on the longitudinal sides or edges. This construction provides reasonable lateral flexibility or rotation in either direction until the surfaces of a notch 51 come into contact and produce additional torsional resistance to further tilting of the skis 11, 12. Although the functions of mounts 45 might be accomplished by a variety of elements or material having limited lateral flexibility, the disclosed structure is advantageously constructed of a rubber composition in the manner disclosed to provide graduated lateral flexibility and slight longitudinal flexure to transmit a more realistic feel to the skier during certain maneuvers.

In addition to the forebody support assembly 20, the tails 14 of skis 11, 12 engage a tail support assembly, generally indicated by the numeral 55. Referring now to FIGS. 1-3, inclusive, tail support assembly 55 preferably has a base 56 with a non-skid sheet material 57 attached to the underside thereof, comparable to the base 21 of forebody support assembly 20. Spaced upwardly of the base 56 is a platform 58 which is preferably at a slightly greater height than the tie elements 30 to give the skis 11, 12 a desired downward slope from tail to forebody in simulation of a downhill contour and for a further purpose to be hereinafter detailed. The platform 58 pivots or rocks longitudinally about an axis preferably substantially medially of the length thereof where supported by a frame generally indicated by the numeral 60, which may be similar to the frame 25. As shown, the frame 60 is generally A-shaped with diverging legs 61 having angular attachment flanges 62 at the lower extremities thereof. The flanges 62 are detachably secured to the base 56 by machine screws 63, or other suitable fastening means.

The platform 58 pivots about the upper or apex portion of the frame 60 on a hinge joint, generally indicated by the numeral 65, which may, as shown, be substantially identical to the hinge joint 31. The frame 60 has spaced collars 66 constituting the fixed members of hinge joint 65 and supporting a shaft 67 which is longitudinally secured by nuts 68 or comparable fastening means at either end thereof. The moving member of hinge joint 65 is a plate 70 which is rigidly attached to the underside of platform 58 by machine screws 71. The plate 70 has two spaced sleeves 72 interposed just interiorly of the collars 66 of frame 60 in order to prevent undue motion or play axially or laterally about shaft 67.

The platform 58 provides direct support and positioning for the tails 14 of skis 11, 12 which must be slidably movable longitudinally and laterally, while preferably supporting a majority of the weight of a skier due to the location of binding area 15. The desired frictional relationship may be established by providing a bearing assembly, generally indicated by the numeral 75, in the underside of the tails 14. Although a number of different bearing designs may provide acceptable performance, the requirement for rolling in two directions either separately or concurrently makes the use of one or more roller bearings a preferred form of the invention. As shown, a single roller bearing 76 is mounted in a housing 77 imbedded in the underside of the tail 14 of each ski 11, 12 (FIG. 7). It is an important feature of the present invention that the bearing assemblies 75 are located substantially laterally medially of the tails 14 (as viewed in FIG. 3) and projecting a distance downwardly therefrom to ensure that the skis 11, 12 will edge when the skier's ankles are rotated laterally in either direction.

The motion of the skis both slidably and rotationally for purposes of edging is facilitated by the presence of a coating or sheet material 78 applied to the upper surface of platform 58. It has been found that a hard rubber composition or rubber coated elastomer provides a suitable sliding surface for bearing 76, while giving sufficient frictional resistance or holding power when engaged by the tails 14 during edging.

An important factor in the realistic simulation provided by the ski apparatus 10 is the pivoting or vertical displacement of platform 58 dependent upon the position and weight on the skis 11, 12 thereon. The pivoting is accomplished by the above described hinge joint 60 operating in conjunction with a spring member, generally indicated by the numeral 80. The primary component of spring member 80 is a leaf spring 81 which is rigidly attached substantially medially of its length to frame 61 by the machine screws 63. The load-supporting portions 82 of spring 81 are preferably disposed substantially parallel to platform 58 when it is in a horizontal position, displaced a distance outwardly from the hinge joint 65, and maintain uniform pressure on platform 58 to keep it in a horizontal position when the skis 11, 12 are equally weighted and placed equidistant to either side of the hinge joint 65. If desired, contact blocks 83 may be interposed between the load-supporting portions 82 of spring 81 and the underside of platform 58 to afford a suitable sliding surface and dampen any noise caused by sudden engagement or disengagement. Hard rubber is one type of material which accomplishes these purposes and provides a long service life. It should be understood that coil springs could be employed instead of the leaf spring 81 or as an adjunct serving as overload springs for heavier skiers.

From the above description, it is readily apparent that the skis 11, 12 may be pivoted about tie pin 35 and machine bolts 47 to position the tails 14 as desired on the platform 58. When both skis 11, 12 are displaced to one side of the platform 58 as depicted in the phantom line positions 11' and 12' in FIG. 2, the weight of the skier would pivot the platform 58 about hinge joint 65 causing it to assume a depressed orientation, as shown in phantom line position 58' in FIG. 3, thereby simulating the change in position on a ski slope as hereinafter explained. Since it may be desired for instructional purposes to keep the platform 58 in a pivotally depressed orientation, a hook 85 and eye 86, or similar selective securement means, may be attached at both sides of the base 56 and platform 58, respectively. In the platform position 58', one hook 85 and eye 86 are shown engaged in phantom line positions 85' and 86'.

In order to keep the tails 14 of skis 11, 12 properly supported throughout their travel, the platform 58 may be slightly curved, as shown, in a manner approximating the radius of curvature of tails 14, or rectangular and of slightly greater dimensions. The base 59 may be of identical configuration to minimize construction costs. Since the skis 11, 12 freely pivot about their forebodies 13, they are capable of movement outwardly of the lateral extremities of the platform 58. For purposes of safety and continuity in operation, a stop 87 is positioned near each lateral extremity of platform 58 to restrict travel of the skis 11, 12.

The forebody support assembly 20 and tail support assembly 55 are spaced and joined in fixed relation by a framework, generally indicated by the numeral 90. As shown, the framework 90 consists of crossed spacing bars 91 attached to the bases 21 and 56 by machine screws 92 and joined at their intersection by a machine bolt 93. Although other structures would give equivalent performance, the disclosed design is advantageous in carrying out the object of providing a collapsible and portable construction.

In order to provide coordinated pivoting or rocking of the platform 58 and the tie element 30, a torque bar 95 also links forebody support assembly 20 and tail support assembly 55. Since most of a skier's weight rests on the platform 58, this linkage is necessary to ensure that the tie element 30 assumes a substantially identical angular position. As best seen in FIG. 2, one end of the torque bar 95 is rigidly attached to the underside of platform 58 by means of a cross brace 96 secured by machine screws 97. The other end of torque bar 95 has a collar 98 which is rigidly attached to tie pin 35 by securement on the

shank 36 between the tie element 30 and the nut 40. Thus, the angular positioning elements for the forebodies 13 and tails 14 of skis 11, 12 are maintained in substantially identical angular positions during operation.

For purposes of the present invention, the torque bar 95 is preferably attached to platform 58 by brace 96 substantially at the pivot point or hinge joint 65, thereby serving as the fall line marker for the ski simulator 10. In addition to the travel restrictions imposed on skis 11, 12 by the stops 87, it is necessary to a realistic simulation that the tails 14 meet progressively increasing resistance as they are displaced laterally outwardly in either direction from the fall line. This requirement is met by elongate resilient members 100 attached to the torque bar 95 and to the skis 11, 12. One end of each resilient member 100 is rigidly attached to the torque bar 95 by a clamp 101 to prevent movement longitudinally thereof. The resilient members 100 are preferably adjustably attached to skis 11, 12 to provide a selection in the force range, as by a hook 102 secured longitudinally of the resilient members 100 and engaging any one of a plurality of spaced catches 103. The catches 103 and any additional guides 104 controlling the directivity of resilient members 100 may be conventional screw-in eyelets. Although any of a number of resilient materials may be employed for the resilient members 100, an oversized rubber band or strip material will carry out the objectives of the present invention.

In order to provide a skier with hand holds simulating the support derived from ski poles during certain maneuvers and providing a safety support for a skier when balance is lost or impaired, the ski simulator 10 may be provided with a handle bar assembly, generally indicated by the numeral 105. The handle bar assembly 105 has an inverted U-shaped member 106 with a horizontal bar 107 of slightly greater length than the width of a skier's shoulders having vertical tubular hand grips 108 at either end thereof approximating the size and position of ski poles. The U-shaped member 106 is preferably movably supported by a tubular L-frame having horizontal bars 110 rigidly imbedded in or attached to the platform 58 and vertical bars 111. Thus, when a skier's weight is shifted so as to cause the platform 58 to pivot, the hand grips 108 are moved through an identical angle, thereby tending to shift the shoulder level of a skier to a proper position paralleling the slope as simulated by the platform 58. The hand grips 108 preferably slidably engage with the vertical bars 111 and are vertically adjustably held by set screws 112 to compensate for skiers of different heights.

A skier preparing for training or exercise on the ski simulator 10 dons ski boots and attaches them to the toe pieces 16 and heel plates 17 at the binding areas 15 of skis 11, 12. The handle bar 105 is then vertically adjusted so the skier's hands, when substantially properly positioned to grasp ski poles, engage the handle grips 108. Prior to actual attachment of the ski boots, the ski simulator must be fully erected, if it has previously been torn down for purposes of storage or transportation. In this regard, it should be noted that the removal of the machine screws 92 in framework 90 and the machine screws 97 of cross brace 96 breaks the apparatus into three easy to handle components comprising the framework 90, the forward support assembly 20 with skis 11, 12, and the tail support assembly 55.

In operation, the ski simulator 10 provides sufficiently realistic characteristics to constitute a valuable training aid for methodology and finished technical forms. The following examples of basic technical form and the related action and reaction provided by the ski simulator 10 serve to illustrate some of the advantageous characteristics. In the straight running or schussing position, the skis are flat on the snow and close together, weight is equally distributed on both skis, and the body is slightly flexed and substantially perpendicular to the skis. A simulated

position may be achieved by placing skis 11, 12 parallel to each other and to the fall line (torque bar 95), where they are maintained closely spaced by the tie element 30. The body of the skier may then be properly flexed and positioned perpendicular to the skis 11, 12 which slope forwardly downwardly only slightly, as previously indicated.

In the transition from schussing to a straight snowplow position under actual skiing conditions, the ski tails are displaced outwardly with the skis assuming a position at equal angles to the fall line and properly edged, with the tips in close proximity. In simulation, the skis 11, 12 are positioned by a skier at the desired angle to the fall line, with the tips or forebodies 13 fixed correctly in closely spaced relation by the tie element 30 to positively eliminate a common error. The maintenance of the platform 58 in a level or horizontal position signifies equal angularity between each of skis 11, 12 and the fall line, while resilient member 100 provides increasing resistance to the angular displacement of each ski from the fall line. Insufficient edging will cause the skis 11, 12 to sideslip or move laterally on the bearing assembly 75, as is experienced under actual skiing conditions. To accomplish a snowplow turn from the straight snowplow position, more weight is transferred to the ski to become the outside ski of the turn and the upper body is angled thereover. When this motion is effected on the ski simulator, the apparatus responds by a pivoting of the platform 58 lowering the ski to which the weight is transferred in recognition of the newly assumed position of the skier on the slope and by an amount dependent upon the original angulation of the skis to the fall line and the proportion of the skier's weight transferred. Thus, the skier experiences resistance to his motion provided by the spring member 80 and the reaction to proper execution in the form of pivoting of platform 58. Since weight distribution and transfer are acknowledged to be major control factors in turning under all skiing techniques, it is particularly significant that the ski simulator 10 provides realistic performance in this important fact.

Another basic technical form in skiing is the traverse which is employed in crossing a slope, is characterized by closely spaced parallel skis which must be properly edged to maintain control, and requires that the uphill ski be slightly advanced with the upper body angled over the heavier weighted lower ski. As simulated, the positioning of both skis 11, 12 to one side of the fall line pivots platform 58 about hinge joint 65 and pivots the coordinated tie element 30 to place both the forebodies 13 and tails 14 on an incline approximating a hill crossing. The ski tips or forebodies 13 are properly fixed in close proximity by the tie element 30; skis 11, 12 must be properly edged to maintain them in stable parallel relation. In addition, the authentic ski positioning allows detailed attention to proper body angulation and ski weighting, with upper body and shoulder positioning prompted by the pivoting of hand grips 108 through the same angle as platform 58. It should also be noted that displacement of the skis 11, 12 through appreciable angles to the fall line results in the forebodies 13 being higher than the tails due to the lowering or depression of the platform 58. This gives a skier on simulator 10 the identical feel and angular relationship between the knees, ankles and skis 11, 12 as is experienced on a slope where forward lean is employed.

An important technique for changing direction in a traverse is the stem turn. This maneuver is initiated by stemming the uphill, unweighted ski to engage the opposite edge, transferring weight to the stemmed outside ski, and a leaning outside while bringing the inside ski to a parallel position assuming a new direction of traverse. As adapted to the ski simulator 10, the edging of the uphill ski is released and it is slid outwardly on the bearing assembly 75 across the platform 58. The opposite edge of the stemmed ski must then be engaged due to the slope of platform 58 prior to the transfer of weight, the outside lean, and the

parallel positioning of the inside ski. It should be noted that the proper sequential execution of steps on the ski simulator 10 is essential to a successful conclusion just as under actual conditions.

An important technique for positioning the skis at an angle to the direction of travel to cause sideslipping is the heelthrust. This maneuver is executed by a quick lowering of the body to unweight the skis while simultaneously pushing the heels sideways into a controlled sideslip. On the ski simulator 10, the sideslip motion is carried out by the bearing assembly 75 traversing across the platform 58. The effect of various degrees of heelthrust as related to angularity to the fall line before institution of the motion produce varying degrees of turn on the slope as indicated by the amount of angulation of the skis 11, 12 to the fall line and the resultant proportional displacement of the platform 58. Also, the proper edging and weight distribution are as important as under actual skiing conditions. The stops 85 are particularly important as a safety device in this maneuver to restrict lateral traverse if control is momentarily lost.

In addition, the ski simulator 10 provides realistic characteristics in more advanced technical forms such as christie turns. In a stem christie, the uphill ski is stemmed from a traverse position, weight is transferred to the stemmed, outside ski, the inside ski is brought parallel, and turning power is applied by heelthrust. As adapted to the ski simulator 10, the stem christie starts in the traverse position and the stemming and weight transfer are carried out as described above in relation to the stem turn. The additional turning motion produced by heelthrust is carried out as described in side-slipping above. The parallel christie turn differs from the stem christie only in that the skis are at all times maintained parallel and stemming does not take place. Instead of stemming, the edges are changed and weight is transferred by a hop or jump, prior to the application of turning power by heelthrust.

From the above generalized description of certain of the basic technical forms, it is evident that similar realism is achieved in other maneuvers such as the parallel christie with a check, the short swing, the wedeln, and other variations. The important aspects of weight transfer, unweighting, edge control, and body angulation may be executed and evaluated in terms of the reactions produced by the ski simulator 10. Further, the great similarity of these motions and reactions to actual ski conditions results in constructive exercise and conditioning for the muscles employed.

A preferred form of the invention has been shown and described in sufficient detail to enable one skilled in the art to practice the invention and recognize its capability in carrying out the objects. Since various modifications in details, material, and arrangements of parts are within the spirit of the invention herein disclosed and described, the scope of the invention should be limited solely by the scope of the attached claims.

What is claimed is:

1. A snow ski simulator apparatus comprising, a pair of ski means adapted to engage and support the feet of a skier, forebody means and tail means on each of said ski means, support means positioning said forebody means, tie element means on said support means individually mounting each of said forebody means, hinge joint means on said support means pivotally mounting said tie element means, pivoting support means having a platform engaging said tail means, and torque bar means connecting said tie element means and said pivoting support means, thereby maintaining said tie element in a plane substantially paralleling the plane of the platform of said pivoting support means.

2. Apparatus according to claim 1, wherein mount means join each of said forebody means and said tie element means in spaced, semi-rigid relation.

3. Apparatus according to claim 2, wherein said mount means pivotally attach said forebody means to said tie

element means and are constructed of resilient material, whereby said ski means may be rolled to a limited extent for edging.

4. Apparatus according to claim 1, wherein said hinge joint means has a tie pin constituting the moving element of said hinge joint means and rotatably mounting said tie element means, whereby said tie element may move separately or concurrently about two axes.

5. Apparatus according to claim 1, wherein said pivoting support means comprises, spring means normally biasing said platform into substantially horizontal orientation and fastening means selectively securing said platform in a position at an angle to the horizontal.

6. Apparatus according to claim 1, wherein, said torque bar means extends substantially parallel to the pivot axis of said platform, resilient means attached to said torque bar means bias said ski means toward the pivot axis of said platform means, and stop means restrict the travel of said ski means on said platform outwardly of the pivot axis thereof.

7. Apparatus according to claim 1, wherein said tail means of said ski means have bearing means adapted to rollingly engage said pivoting support means.

8. Apparatus according to claim 1, wherein said ski means each comprise an elongate member having a binding area and having toe piece and heel plate adapted to detachably secure a ski boot; said forebody means extending in one direction from said binding area and having a resilient mount attached thereto; said tail means extending in the other direction from said binding area and housing an extending roller bearing; said support means comprises, a base, a frame extending upwardly from and attached to said base, a tie pin pivoting about said frame in a hinge joint and having a projecting shank, and a gimbaled tie element rotatably attached to said shank of said tie pin and pivotally holding said resilient mount,

said resilient mount being notched to give said ski means graduated pivotal resistance; and said pivoting support means comprising, a second base, a second frame extending upwardly from and attached to said second base, a rigid framework spacing and joining said base and said second base, said platform pivotally mounted on said second frame in a hinge joint and vertically positioned slightly above said gimbaled tie element, a leaf spring normally biasing said platform into substantially horizontal orientation, a torque bar attached to said gimbaled tie element and said platform providing uniform pivoting, a rubber coating on said platform allowing rolling motion by said roller bearing and edging by said ski means, a pair of stops for said ski means projecting from said platform outwardly of the pivot point, hooks and eyes on said second base and said platform securing said platform in a position at an angle to the horizontal, and a pair of hand holds attached to said platform and extending vertically upwardly proximate to said forebody means.

9. Apparatus according to claim 1, having hand hold means movably suspended by attachment to said pivoting support means.

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