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Ferguson

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[54] **PROGRAMMED SKIING SIMULATOR, TRAINER AND EXERCISER**

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[52] **U.S. Cl.** ..... **272/57 B**
[51] **Int. Cl.** **A63b 69/18**
[58] **Field of Search** ..... 272/57 B; 35/29 R

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[57] **ABSTRACT**

A programmed skiing simulater, trainer and exerciser. The machine comprises an inclined board over which two simulated skiis move. Each of the skiis is both pivotable and slidable at one end on slide-ball-pivot points. The other end of each ski also rides on a similar ball-pivot point, mounted on a wheel carriage, enabling the ski end to swing in a wide curve from one side to the other, in a programmed arc. The skiis are provided with tubular slotted tracks underneath, thus permitting them to tilt from side to side and slide on the pivot points while turning. By interchanging the wheel carriages with a differently designed "avalement" wheel carriage different movements may be performed.

7 Claims, 12 Drawing Figures

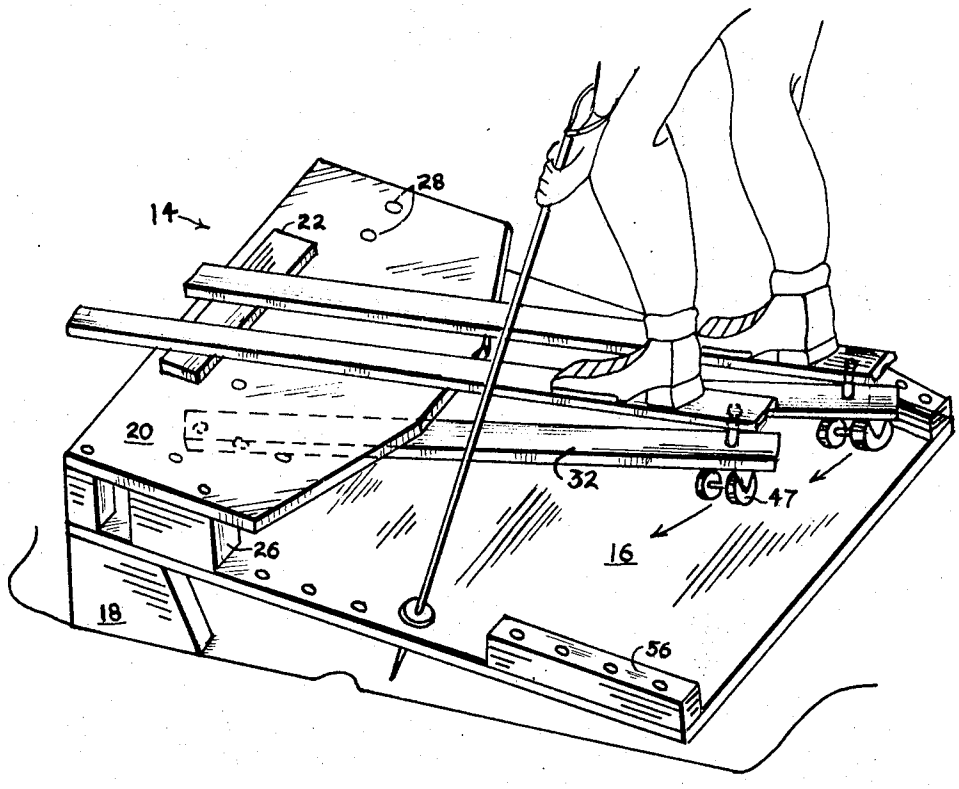


FIG. 1

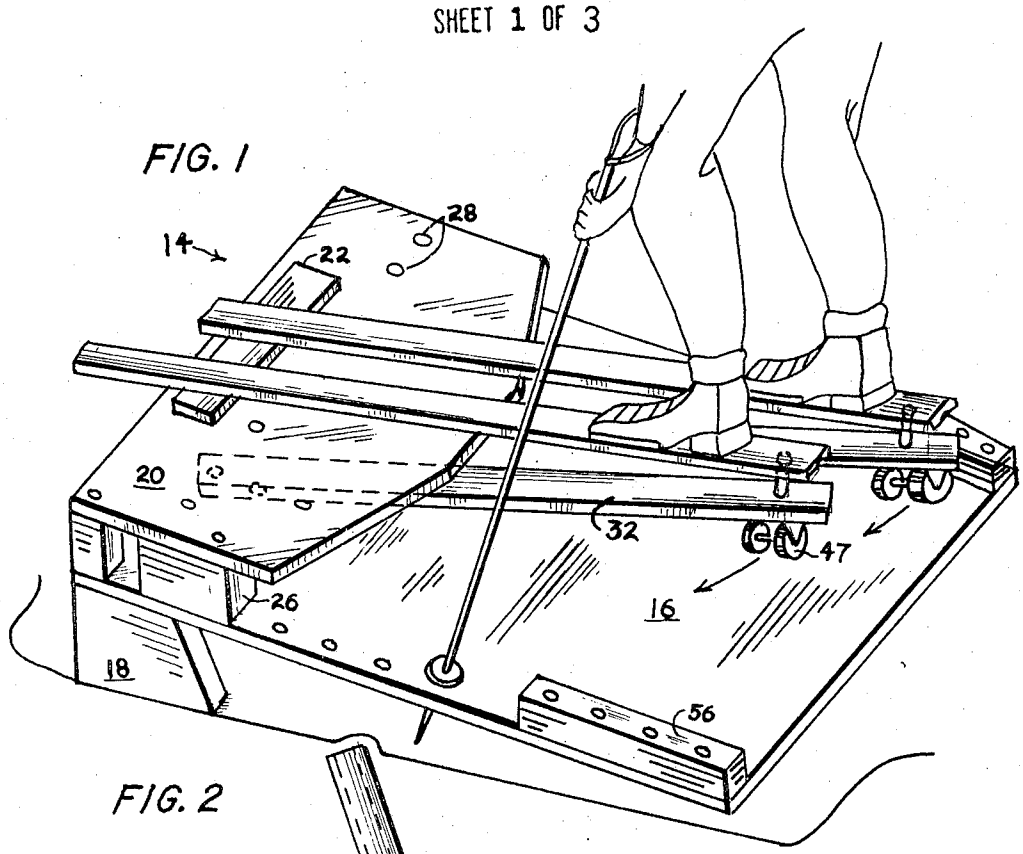


FIG. 2

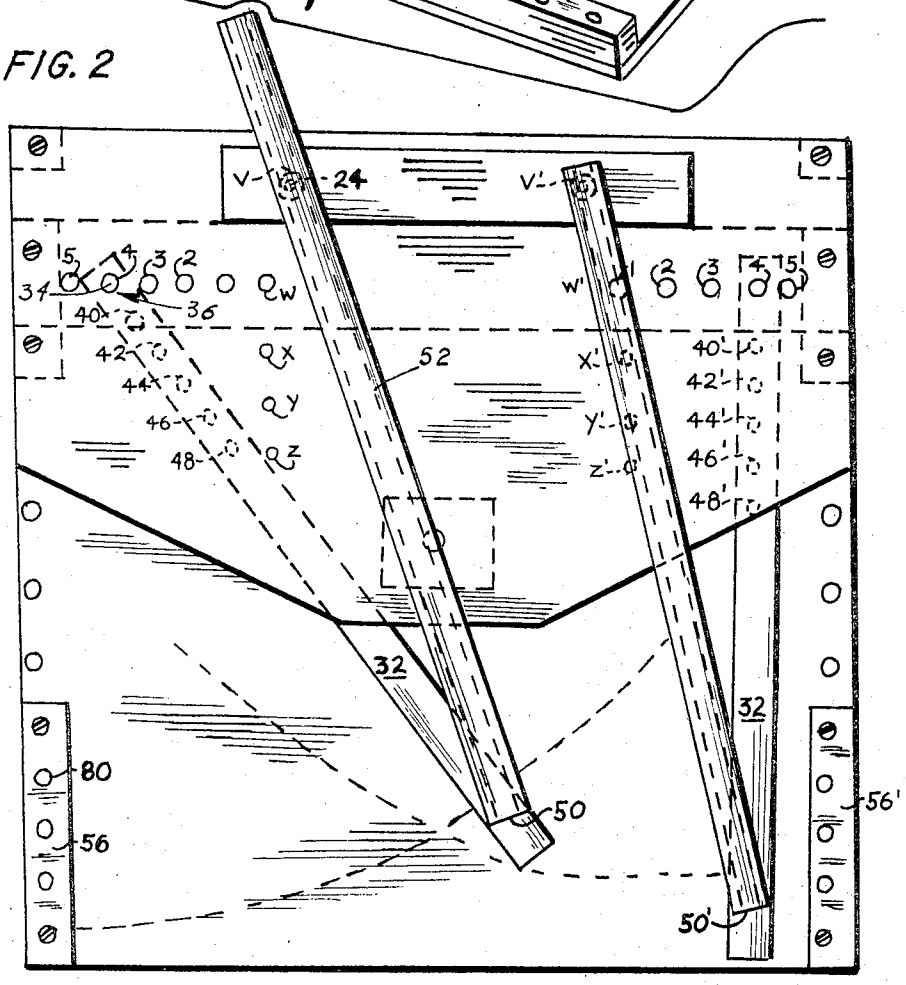


FIG. 3

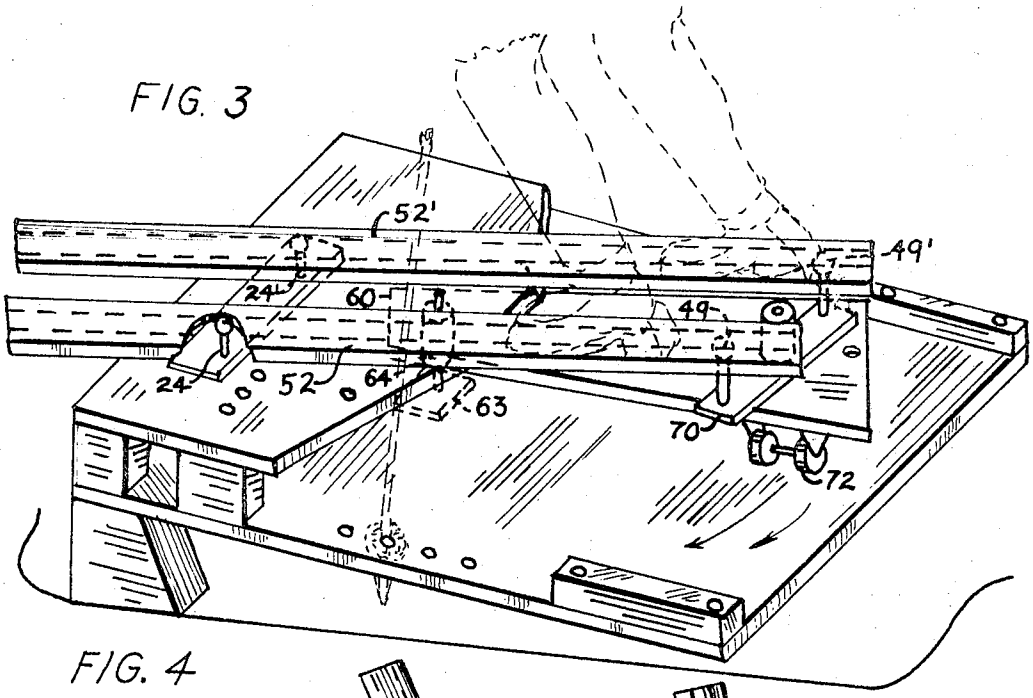
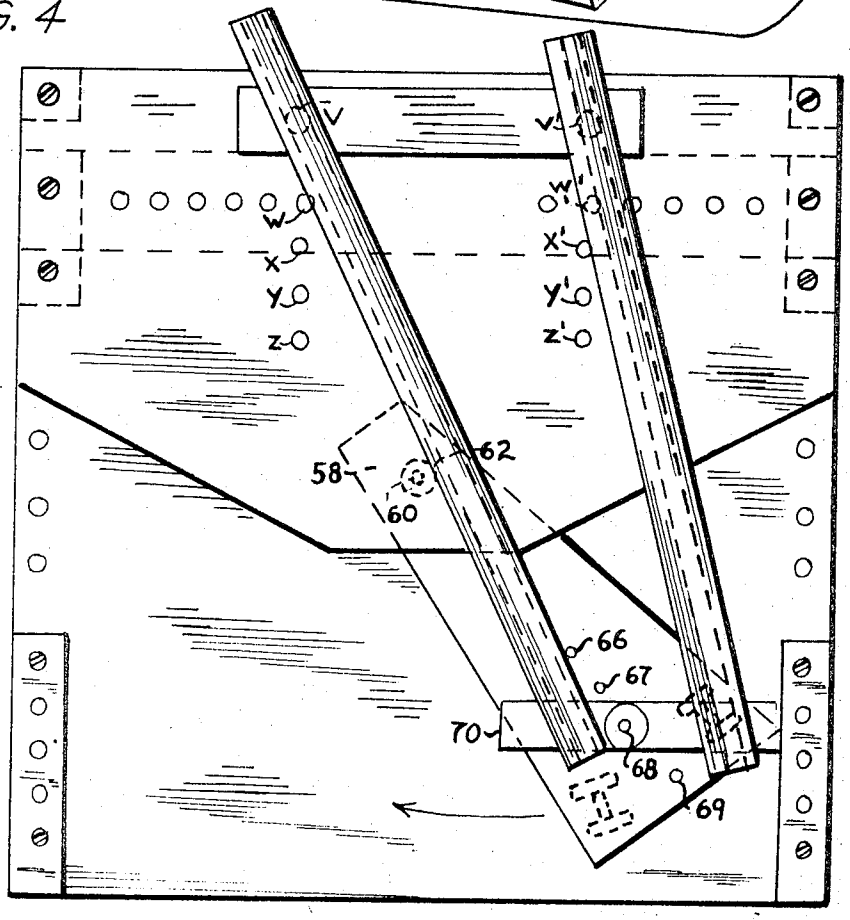


FIG. 4



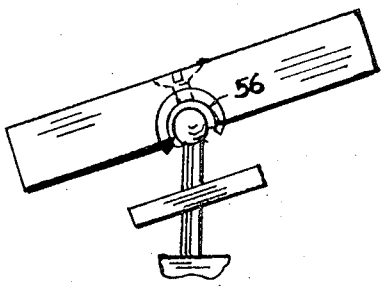


FIG. 5

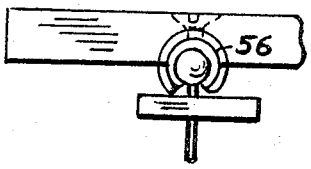


FIG. 6

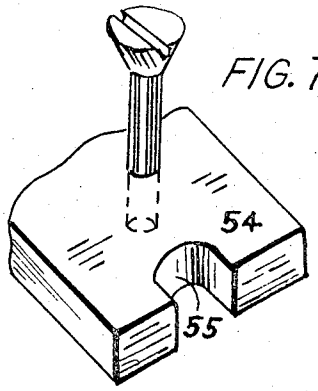


FIG. 7

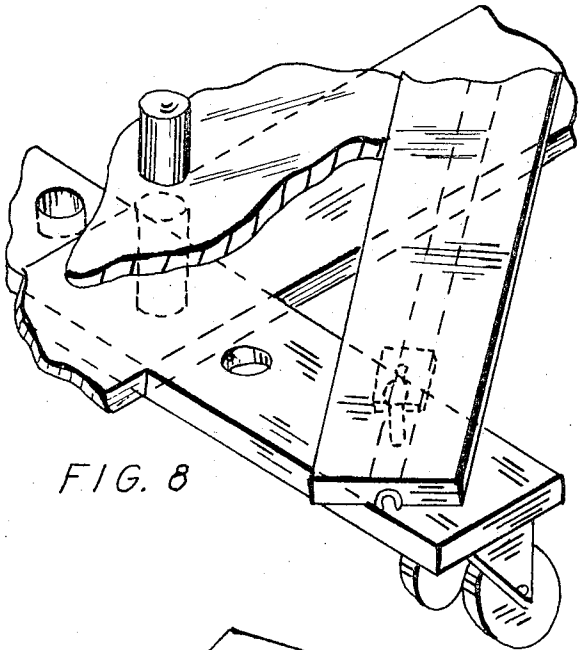


FIG. 8

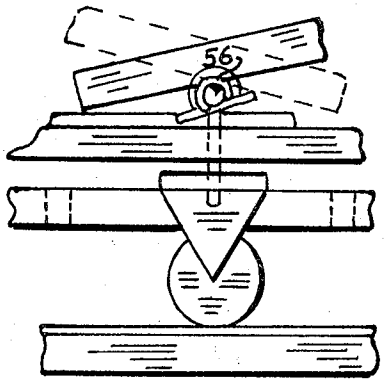


FIG. 9

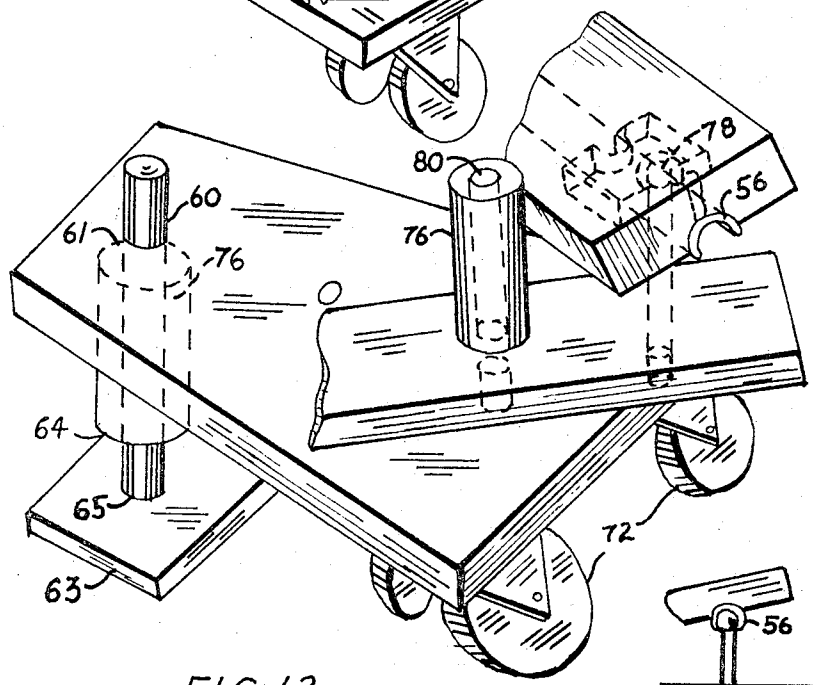


FIG. 10

FIG. 11

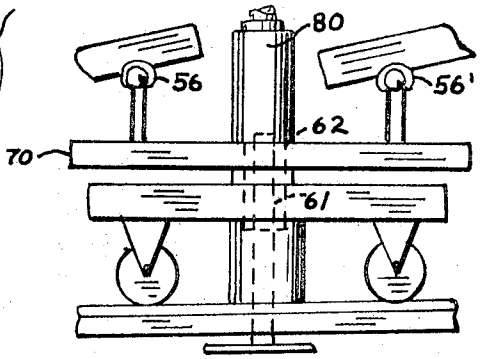
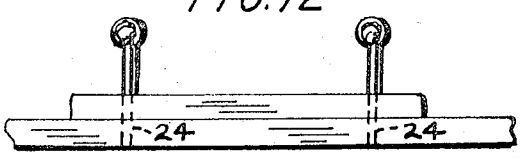


FIG. 12



PROGRAMMED SKIING SIMULATOR, TRAINER AND EXERCISER

SUMMARY OF THE INVENTION

The object of the present invention is to provide a machine which will enable its user to perform at home, most of the varied positions required for different techniques of skiing for training and exercise purposes.

Another object of the invention is to provide a machine in which by repositioning certain parts by means of "programmed" holes, different degrees and speeds of movement may be achieved. Further by interchanging parts with an avalement accessory, an entirely different series of ski movements may be performed. These new movements may also be programmed to vary the size of the swinging arc, the speed of the movements and the degrees of ski twist, i.e., the angle of skiis relative to the "fall line" of the ski slope.

It is a further object of the invention to provide a machine which will enable the user to set the machine so that each movement starts at an "easy" exercise, and then can be progressively varied to learn more difficult exercises. Thus the user is enabled to learn to perform each movement easily and rhythmically, continuously, as a trainer and an exerciser.

Yet another object of the invention is to provide a machine with which each movement can only be performed in a precise and correct manner, which will not perform random movements, but precisely programmed exercises.

The machine is basically an inclined hard-surfaced board over which two simulated skiis move. The operator stands on the skiis. Each of the skiis is connected to the board at one end by slide ball-pivot points so that each other end is free to swing in a wide curve from one side to the other. This other end of ski, rides on a wheel carriage, which moves in a prescribed programmed arc, which arc can be varied in size. In addition, each ski has slotted tubular tracks underneath, secured parallel to the length of the ski, permitting each ski to independently slide forward or backwards about each slide-ball-pivot point. In this manner, as each ski is turned, swinging from side to side, the ski is forced to move forward or backwards, on the tubular tracks, as the other end swings in a wide curve. Each ski can also be tilted sideways (edged) for more advanced skiers; or locked horizontally, thus making it easier for beginners.

Since this machine is used by operators facing in opposite directions for different training movements, neither end of the ski is denoted as front or rear. The front end of each ski is that end which the operator faces, according to the exercise being performed.

By interchanging the wheel carriage beneath each ski, with a different avalement carriage, different movements may be performed.

By increasing the inclination or steepness of the skiing board, the tempo of the turning movements can be speeded up. The skiing board legs are designed to enable the steepness of the board to be varied.

The tracks may suitably be made of longitudinally slotted steel tubes, the width of the slot being slightly larger than the thickness of the pin which carries the slide-ball, to enable the ski, fastened to the tracks, to "edge" or tilt slightly from side to side. By unscrewing the legs, fastened with wing nuts (not shown), and rotating one-fourth turn, the skiing board can be made steeper. An increased board inclination speeds up the tempo of the swinging skiis. Thus by changing the steepness of the board, the action is speeded up or slowed down, according to the needs and ability of the user. Beginners will start with low slope position.

These and other important objects and features of the invention will become apparent from the following description and the accompanying drawing. It should be understood, however, that these are given by way of illustration and not of limitation and that various changes in detail construction of the parts may be made within the scope of the invention.

In the drawing:

FIG. **1** is a perspective view of the programmed skiing simulator, trainer and exerciser employing the pair of wheel carriages;

FIG. **2** is a top plan view thereof;

FIG. **3** is a perspective view of the device using an accessory avalement carriage;

FIG. **4** is a top plan view of the device shown in FIG. **3**;

FIG. **5** is a sectional view of a ski illustrating the ability of the skis of the device to "edge" or tilt;

FIG. **6** is a view similar to that of FIG. **5**, but with the ski in "locked" position;

FIG. **7** shows the reversible lock device used with the skiis;

FIG. **8** is a partial cutaway perspective view of one of the wheel carriages and one of a pair of skiis used.

FIG. **9** is an end view of the wheel-carriage, with the slide-ball-pivot point, and one edged ski;

FIG. **10** is a detail of the machine employing the avalement carriage, with rotating bridge, and only one ski shown;

FIG. **11** is an end view of the avalement carriage, rotating bridge, and both edged skiis shown, also rubber bumper in center and

FIG. **12** is a view of the slide-ball-pivot point holder, slide-balls and two pins beneath.

Referring now to the drawing in detail, the device according to the invention, generally indicated by the reference numeral **14**, comprises a hard surface inclined skiing board **16** supported at one end by a pair of interchangeable legs such as **18**, detachably secured to said one end. Thus by changing the position of these legs, the height of the high end of board **16** can be varied. Higher height increases the tempo of ski movements. The design of this variable height leg is not a prime part of this patent, as numerous leg patterns may be used. The skiing board can be of any desired size, starting with 4 × 4 feet or 3 × 4 feet or any reduced scale of these sizes. The board is raised at one end with interchangeable legs, permitting the high end to be either 9 or 12 inches or more from floor level. Higher height increases the tempo of the ski movements.

Above the board, is supported a programming deck **20** with a series of spaced holes, extending in a direction from high to low ends in a series of pairs of holes V,W,X,Y,Z and V′,W′,X′,Y′ and Z′. In these holes are inserted the pins **24** of the ski pivot slide-ball holder **22**. The underside of the pin holder **22** has a pair of round protruding pins **24** which insert in each pair of the holes, with the holder always being kept parallel to the front of the skiing board. This holder is interchangeable into holes V,V′ through Z,Z′. The lower ends of the underside pins **24** are flush with the underside of the programming deck, so as to be clear of the swinging ends

of ski carriages. The weight of the operator holds the slide ball holder in selected holes. Between the programming deck and the skiing board is erected a bridge **26.** A second series **28** of pairs of programming holes, **1,2,3,4,5** and **1',2',3', 4', 5'**, run across the deck, directly above the bridge. These holes are aligned directly above a corresponding number of holes in bridge **26,** (not shown).

Arranged on the top of this bridge but under the programming deck **20** are the two ski carriages **32, 32'**. The carriages are held between the bridge and deck by two ski carriage pivot pins **34,34'**, inserted through the deck, through holes in the carriages and then through the bridge, to rest on the top of the skiing board. These pins are removed by reaching under the bridge and pushing up. A series of holes **36,40,42,44,46,48** and **36',40',42',44',46',48'**, in each carriage, permit the size of the swing arc of the carriage ends to be varied, by using these holes as pivot centers. On the underside of the swinging ends of the carriages are mounted pairs of skateboard type wheels such as **47,** or suitable fixed casters, wheel type, or ball transfer type, oriented so that each ski carriage can independently swing in an arc about each carriage pivot pin. The wheels do not swivel but each wheel must turn independently on its own axis. On the top side end of each ski carriage, above the wheels, are fastened carriage ball points **49,49'**. These ball-points are slipped into tubular slots **50,50'**, at the ski end, thus permitting the two simulated skiis **52,52'** to rotate at this point, as the carriages are swung in arcs. Secured to the underside of the skiis and running to their other ends are tubular slotted tracks, **56,** which ride on the pivot slide balls. Stops **54,** about 4 inches inside prevent the skiis from sliding down past these carriage ball points. The stops are reversible, one side having a notch **55** which locks the skiis horizontally for beginners; the other side permitting the skiis to tilt (edge) from side to side.

As the wheeled ski carriages are swung from side to side in arcs prescribed by the programmed positions **36,36'** through **48,48'**, **1** through **5,** and **1'** through **5'**, the skiis are also swung from side to side. Since the pivot points of the skiis are different from the pivot points of the carriages, the skiis are forced to make backwards and forward movements on the tracks parallel to the length of the ski. This is the essential principle of this invention. Uphill ski is always forced to advance ahead of the downhill ski, irrespective of the direction the operator faces. The amount of lead one ski has over the other, depends on how far apart the ski pivot carriage pins are from each other in any pair of programming holes **1** through **5** and **1'** through **5'**.

The amount of twist the skiis take, is governed by the pivot slide ball point holder pins **24** in positions V through Z and V' through Z'. The size of the arc the skiis rotate through, governed by length of ski carriage used, controlled by holes **36, 36'** through **48,48'**. The speed of the movement can be varied by using shorter arcs, or using a steeper board with larger arcs.

The operator can stand on the skiis in a variety of positions, turned in either direction, facing high or low ends, according to the training exercise chosen from an appropriate direction hand book. Rubber protector bumpers **56,56'** on lower right and left edges of board prevent skii carriages from swinging off the board.

As shown in FIGS. **3** and **4,** the ski carriages **32,32'** described in FIGS. **1** and **2** are removed completely from the skiing board, by removing the two ski carriage pivot pins **34,34'**.

The accessory avalement ski carriages **58** is then placed in position, by dropping a different, slightly longer avalement carriage pivot pin **60** through deck hole **62,** through the corresponding hole **61** in carriage **58** and support **64** beneath carriage, and then completely through the matching hole **65** in board. A stop beneath the board **63** holds pin from going completely through. The top of pin **60** is flush with the top surface of the programming deck. The pin is removed by a special hook (not shown).

The other holes in this avalement carriage **66,67,68,69** are programming positions for the pivot pin of rotating bridge **70.** This bridge enables skiis **52,52'** to be held parallel to each other as avalement carriage **58** swings in an arc from side to side. As the avalement carriage swings from a central vertical position up to a high horizontal position, or beyond, the skiis' ends are carried up with it. The bridge is held parallel to front and back of board at all times thus holding skiis parallel to each other. The other ski forward ends are automatically pushed forward a considerable distance on the forward ski slide-ball-pivot points as required in modern avalement-style skiing. Wheels **72** are mounted under the avalement carriage **58** radially oriented to turn with arc center at pivot pin **60.** Wheels may be replaced with ball-down industrial transfer. These wheels do not swivel, but each separate wheel turns on its own axle, independent of each other. As gravity pulls the carriage backwards, the carriage overswings beyond center and the skiis start a new turn in the opposite direction. A continuous rhythmic motion of alternately turning left to right and back, is easily maintained.

Moving rotating bridge pivot pin backward or forwards in holes **66,67,68,69** in the bridge changes the size of the swinging arc and amount of avalement (forward movement of skiis).

With practice, uphill ski can be slipped on the ball and track slightly forward of the downhill ski, relative to each other, alternating in each turn. A rubber center bumper **76** prevents an overturning of the bridge **70.** A stop pin **78** dropped through a hole in the low end of the ski and track, prevents the ski from being pushed off its pivot ball. The stop pin is withdrawn when carriages are being changed.

On all turns, balance can be aided by inserting tips of standard ski poles in non-skid holes **80** on sides of skiing board. The skiing board is covered by sheet metal **82** for longer wear and smoother operation of wheel ball-transfers.

OPERATION OF THE MACHINE

FIGS. 1 and 2

Carriage pivot-pins in choice of pair of programming deck positions **1** to **5** and **1'** to **5'**. Changing pivot pins from **1** to **5** and **1'** to **5'** on programming deck increases the amount the uphill ski tip will lead (advance ahead of) the downhill ski tip as the ski tails swing from side to side. Each ski is alternately forced into the lead position by the wheel carriage, while the other ski relatively retards, thus training the user to advance the uphill ski as each turn is made. Left ski leading for left turn, right ski leading for right turn. Beginner will start with small lead. The correct lead ski for each turn is automatically forced to lead by the swinging carriage.

Carriage pivot-pins in choice of a pair of programmed carriage positions **34** to **48** and **34'** to **48'**.

Changing pivot-pin position from **34** to **48** and **34'** to **48'** on the carriage increases the size of arc swinging end achieves. Beginners will start with small to medium arc.

Ski slide-ball pivot in programming deck positions V to Z and V' to Z'.

By moving the ski slide-ball-pivot slide holder from V through Z and V' to Z' the degree of twist of the ski is increased. Beginners will start with smaller twist.

With operator facing high end.

The following skiing maneuvers can be performed each in sequence and rhythmically:
Successive Snowplow movements
Successive Snowplow turns. Stem Turns to left and right alternately, Stem Christies, Parallel Christies, Short Swing Turns, Wedeln Turns, each to the left and right alternately, and continuously.

Operator facing low end.

The following ski maneuvers can be performed, each in sequence and rhythmically.
Skating Steps to right and left alternately.
Open Front Christies; Step Turns; Parallel Modern Turns; rotating about heels; Step Out Parallel Slalom Turns, rotating about heels, swinging toes; all turns to right and left alternately and continuously.

From this position, operator facing low end, the operator can learn skating turns, pushing out with one foot and following up to final parallel position with the other foot. This action when practiced from side to side, gradually develops into the new style, open front, step off Christie Turns as used by slalom skiers at the 1972 olympics.

The ski inside each turn is always forced to lead by the action of the carriage, as required by correct ski practice, the size of the lead is variable, being controlled by the position of the pivot pins. The left ski leads for a left turn, the right ski leads for a right turn. It is impossible for the wrong ski to lead. This controlled automatic lead works correctly, irrespective of which direction the operator faces, or which style of turn is being practiced.

In all the foregoing turns, irrespectively of which direction the operator faces, the correct uphill ski advances automatically, forcing operator to properly shift weight to downhill ski to maintain balance. Body angulation becomes automatic, otherwise turn with balance cannot be performed. All turns are done in rhythmic sequence, because as soon as any part of the first turn is completed, gravity forces the carriage to roll back, past start and beyond, thus initiating each succeeding new turn.

It is because the slide ball pivot point at one end of each ski, and the pivot pin of each respective carriage is in a different position, making the radius of swing of ski and carriage different, that the ski is forced forward or backwards as the carriage rotates in arcs from side to side.

Alternate Avalement Accessory

FIGS. **3,4,10** and **11**

By removing stop-pin **78** and simply sliding the skiis forward they are detached from the ski carriages. The pivot pins are removed by pushing up from beneath the carriages through the bridge, ski carriage and programming deck, completely detaching the carriages from the skiing board and bridge.

The avalement ski carriage is attached by dropping a longer pivot pin **10** through hole in programming deck **62**, through corresponding hole in carriage **61** and carriage support **64** to nestle in hole **65** in skiing board beneath; a wooden stop **63** under board prevents pin from going complete through. Top of pin is flush with surface of deck. Pin is removed when required by special hook and hole in top of pin (not shown). Tracks of ski are slipped in to slide-ball-pivot points. Track on other ski ends are then inserted into avalement rotating bridge ball points, FIGS. **3,4,10** and **11** by sliding in from end, after slide-ball-point is inserted in track avalement rotating bridge can be placed in a choice of programmed positions **66,67,68,69** to control size of swinging arc.

Operator facing high end.

The following ski maneuvers can be performed, in sequence and rhythmically.

Interlinked avalement parallel turns, with tips of skiis moving forward a considerable distance, as carriage is swung from side to side. When ski pivot slide pin holder is moved from V' to Z', degree of twist in turn is increased. Ski can be either "edged", or locked horizontally for beginners.

Beginner will start with position V'

Rotating bridge must be kept parallel to front-back of skiing board by feet. As turn is made rotating bridge holds skiis parallel to each other. Rubber bumper **76** is to aid preventing overturning of bridge by feet.

Skii slide-turns about tips with heels swinging.

Operator facing low end.

Interlinked avalement parallel turns with skiis automatically being pushed forward extreme distance, from position of previous turn, ending in position of completed turn. Skiis turn about heels, with toes swinging.

In both these turns the ski carriage automatically creates avalement position forcing the skiis forward, as the operator swings the carriage from side to side.

In all turns, slide ball points, inserted into slotted tubular tracks, permit skiis to be alternately edged, so that edges facing inside of turn is tilted down. Left edges down for left turns, right edges down for right turn.

When using this equipment with either the pair of wheel carriages, or with the avalement accessory, the unweighting action required for all these turns is correct, ending each turn in a down position, rising from this position to down again at the end of the new turn. The rise and fall is actually achieved by the skiing board slope. Because the ski carriage rises at the end of each turn, the knees are forced to bend. As the carriage comes down to the lower end of the board, the feet must go down with them, straightening the knees. Relatively speaking, this is the maximum rise position, at the precise correct moment of the turn. This rise and fall action is automatic, the operator being unable to do otherwise, as the skiis swing from side to side.

By facing in the opposite direction, the new style Square Turns can be achieved. By facing this opposite way, the operator can only maintain balance, by sitting

slightly backwards, putting the weight on the heels as required for deep powder snow.

When the operator faces in this opposite direction, with either set of attachments, the end of each swing is the end of the turn just completed, and the start position of the new turn. In this position, the knees are flexed, as required in modern French Style skiing.

With the avalement carriage programmed for small arcs, the action simulates Short Swing, Serpentine Wedeln and linked snake-like Jet Turns. As the size of the swinging arcs are increased, the simulated turns increase into Banked Turns, Tempo Turns and Carved Turns, and the maximum arcs feels to the operator as if he were achieving perfect Mambo Turns, the body being forced to angulate over to maintain balance.

Edging of skiis during turns is made possible by the fact that the width of the slot in the tracks, is wider than the width of the pins holding the pivot-balls. This enables the tracks and the skiis above them to be tilted or edged sideways in either direction no matter what degree of position of each turn is being made. For beginners the skiis can be locked in a horizontal position, with lock FIGS. **5,6** and **7.**

I claim:

1. A ski simulator, trainer and exerciser machine comprising in combination, a skiing board, adjustable support means secured to the underside of one end of said board for maintaining said skiing board in an inclined position, a programming deck mounted on said one end of the skiing board and spaced parallel therefrom, a bridge spaced intermediate of said skiing board and said programming deck, ski carriage means pivotably mounted intermediate said skiing board and said prgramming deck, roller means secured to said carriage means for pivoting said carriage means on said skiing board, a ski pivot slide-ball holder adjustably secured on said deck, a pair of simulated skiis pivotable on said carriage means and on said slide ball holder, said bridge and said ski carriage means each being provided with a plurality of spaced programming holes means adapted to engage any selected one of said holes in said bridge and any selected one of said holes in said ski carriage means for adjustably securing said ski carriage means at predetermined stations.

2. The machine as claimed in claim **1,** said carriage means comprising a pair of elongated members, having free ends provided with fixed ball point pivot pins, said pair of simulated skiis having underside portions of slotted tubular cross-section slidably and tiltably mounted on said fixed ball-point pins.

3. The machine according to claim **2,** wherein said programming holes are on said pair of elongated members and are arranged longitudinally thereof, the holes in said programming deck in said bridge and in said ski-pivot slide-ball holder extending substantially transversely to said longitudinally carriage members, said programming board being further provided with a plurality of spaced pairs of holes extending in a path at right angles to said transverse holes.

4. The machine as claimed in claim **3,** further provided with a pair of reversible stop plates securable to the free ends of said carriages, said stop plates being respectively formed with notches for locking the skiis horizontally on said carriage means.

5. The machine as claimed in claim **1,** wherein said skiing board is provided with a pair of detents for limiting the lateral displacement of said free ends of the simulated skiis.

6. The device according to claim **1,** wherein said skiing board is provided with a plurality of non-skid holes for inserting tips of ski poles.

7. The machine according to claim **1,** wherein said carriage means comprises an avalement carriage member adjustably pivotable with one end about an axis intermediate said programming deck and said ski board, a rotating bridge adjustably pivoted on the other end of said carriage member and displaceable in an arcuate path relative to said axis, said pair of simulated skiis being pivoted with one of their ends to said rotating bridge and adjustably pivoted with their other ends to said ski pivot slide ball holder.

* * * * *