United States Patent

Natterer

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[54] SKI-TRAINING DEVICE

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[30] **Foreign Application Priority Data**

Dec. 5, 1968 Austria ..... A 11840/68

[52] **U.S. Cl.** ..... **272/57 B**

[51] **Int. Cl.** **A63b 69/18**

[58] **Field of Search** ..... 272/57 B

[56] **References Cited**

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[57] **ABSTRACT**

A ski-training device is formed with a base, a pair of ski-like boards pivotally mounted by their front ends on a vertical axis in the front zone of the base and at least one flexible, resilient traction element acting upon the middle zone of the boards over at least two guide rollers rotatably mounted in vertical axes in the rear zone of the base. In use of the device to obtain a realistic feel of movement and forces experienced in technique of skiing, the ski-like boards rotate parallel to one another out of a basic position and are biased for return thereto by spring action.

10 Claims, 13 Drawing Figures

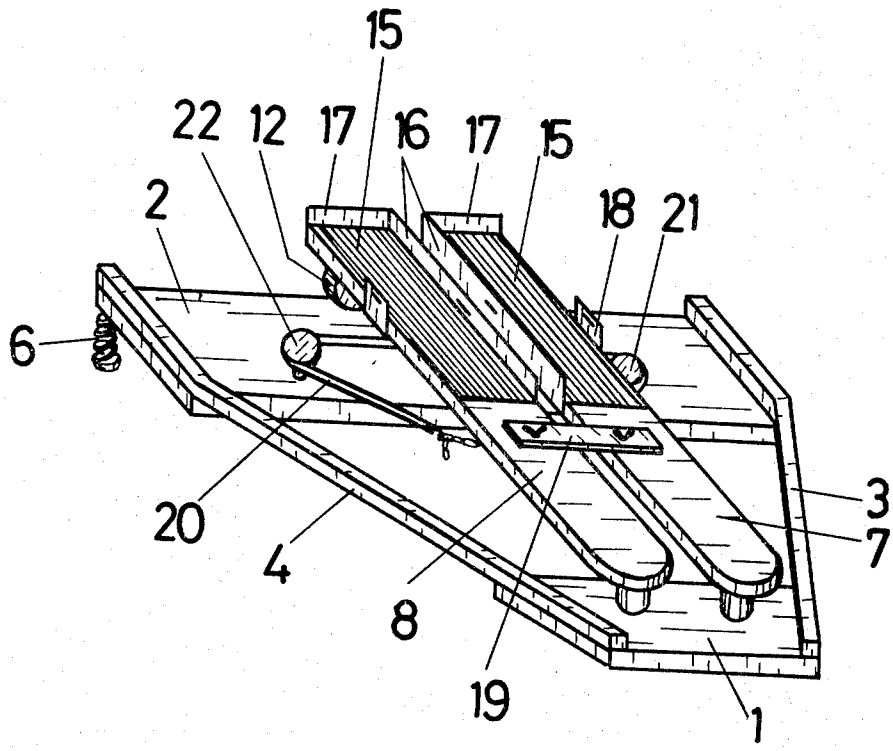

Fig. 1

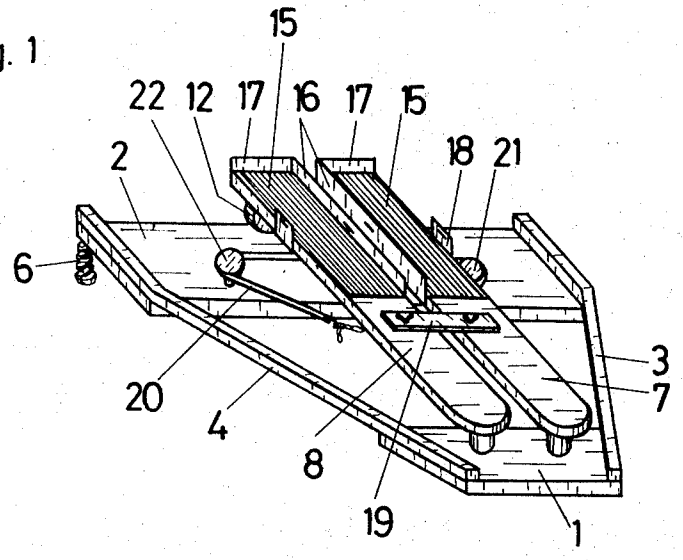

Fig. 2

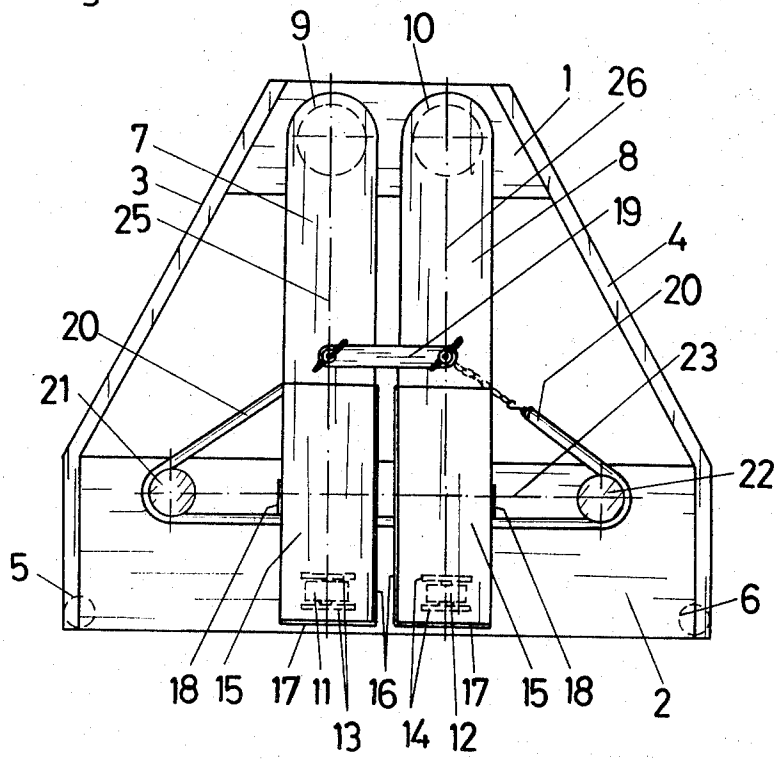

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Fig. 3

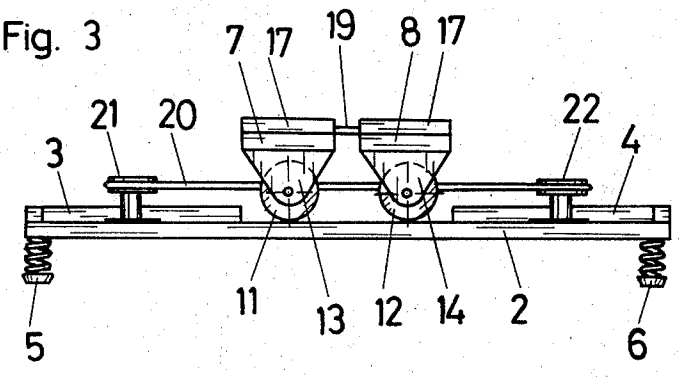

Fig. 4

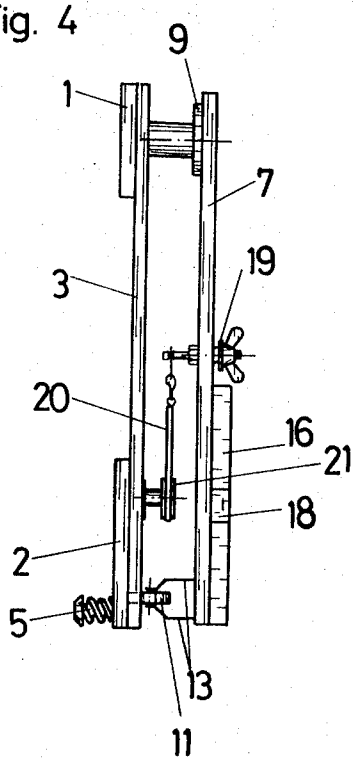

Fig. 5

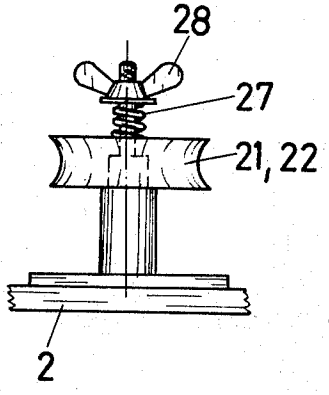

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Fig. 5

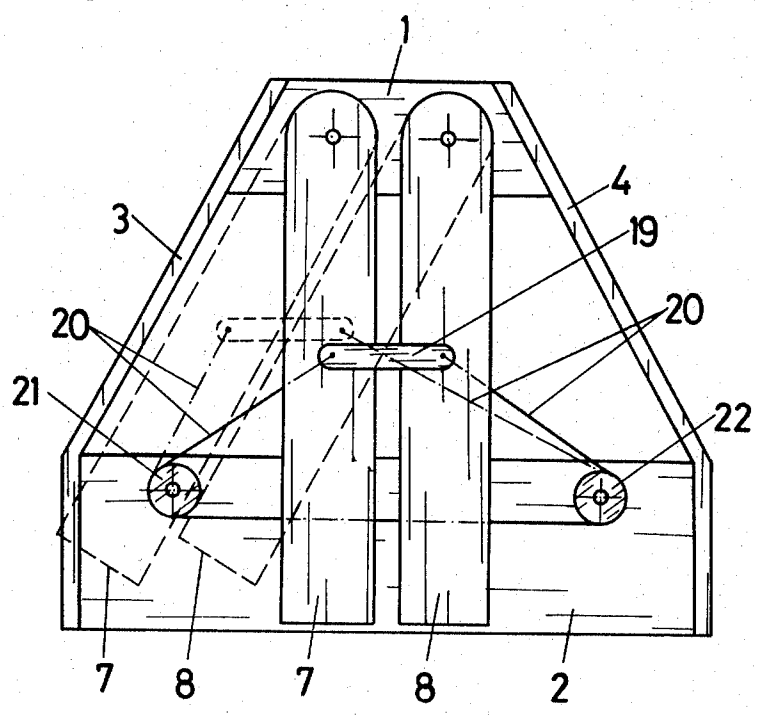

Fig. 7

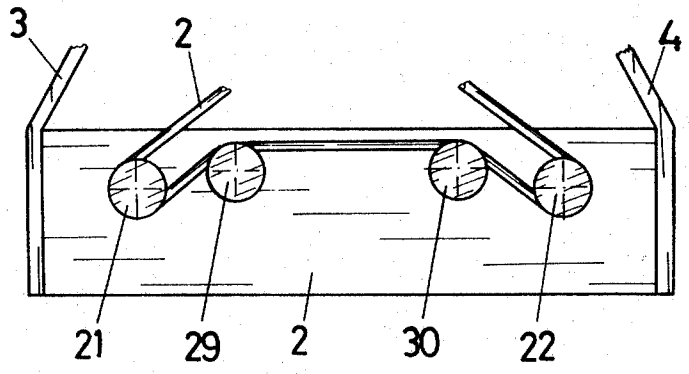

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Fig. 8

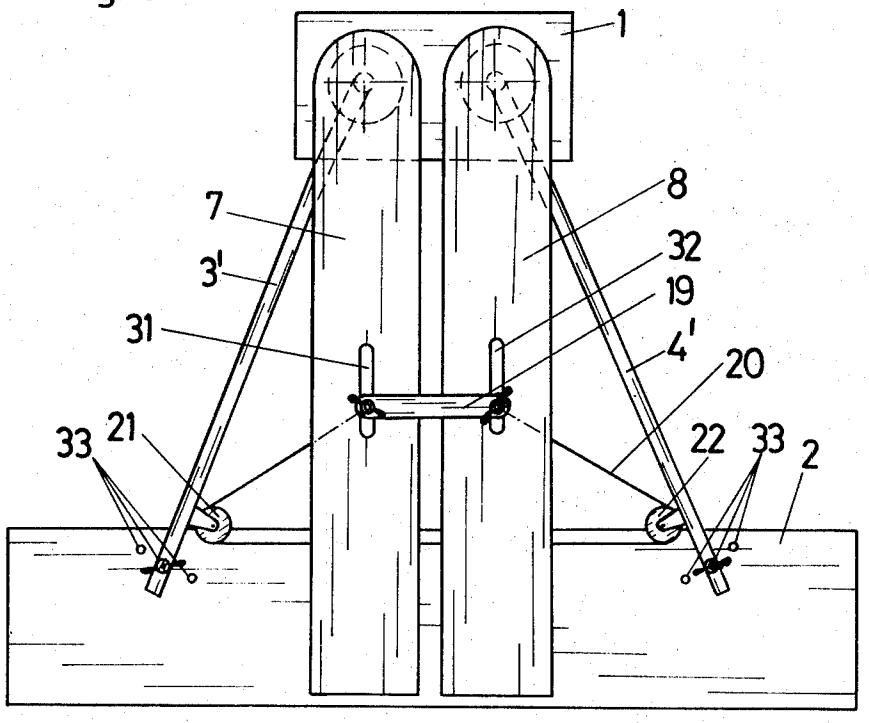

Fig. 9

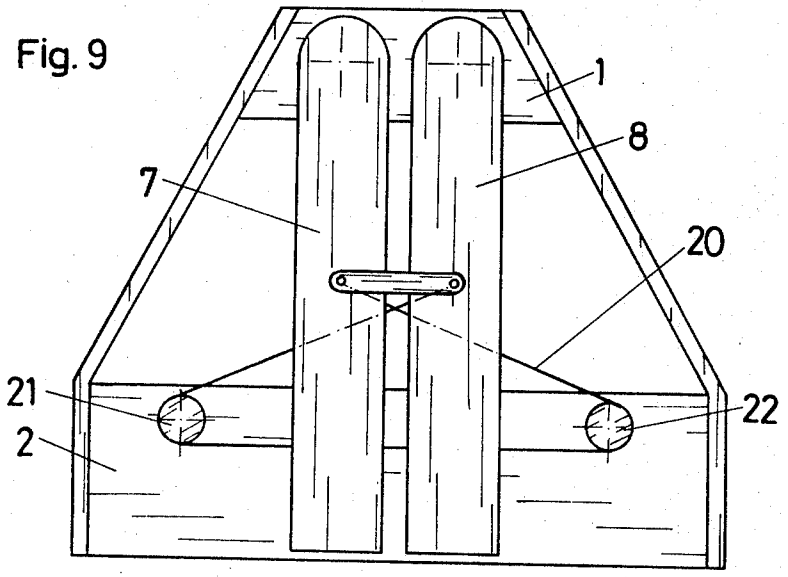

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Fig. 10

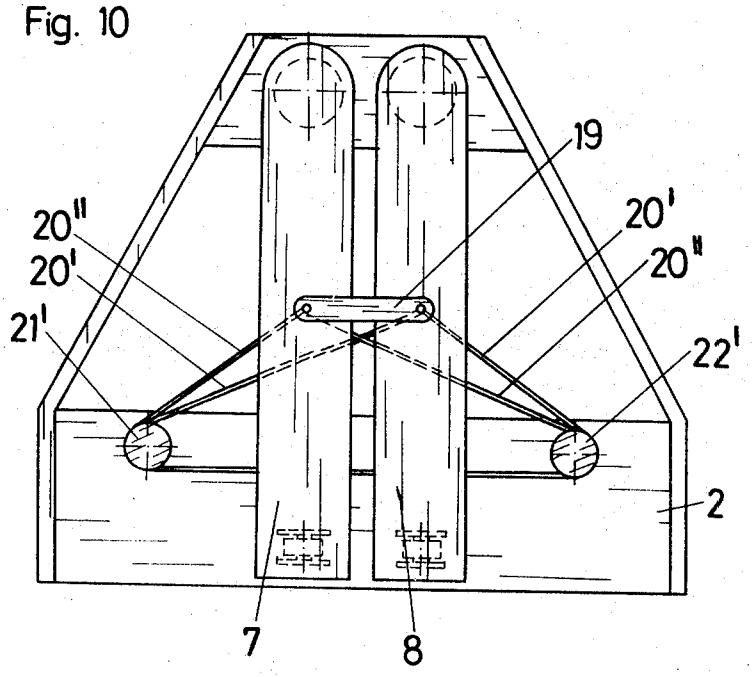

Fig. 11

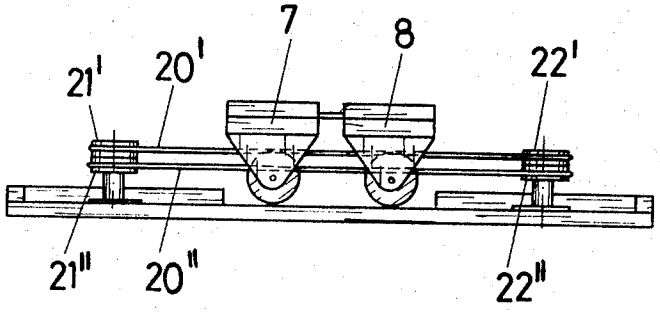

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Fig. 12

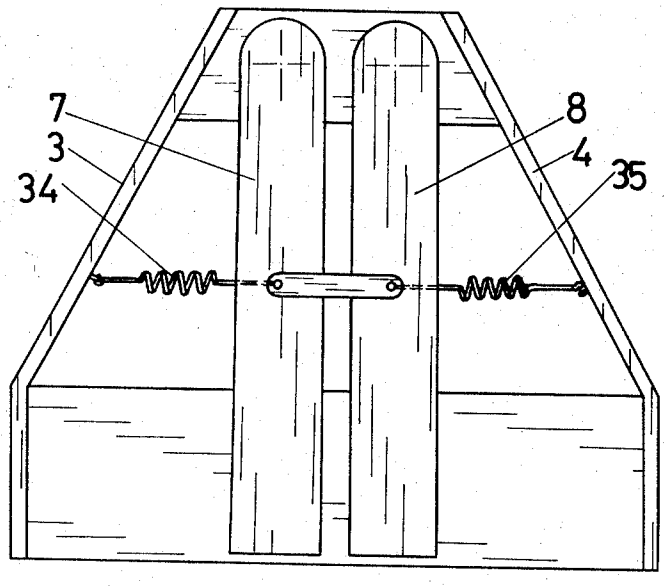
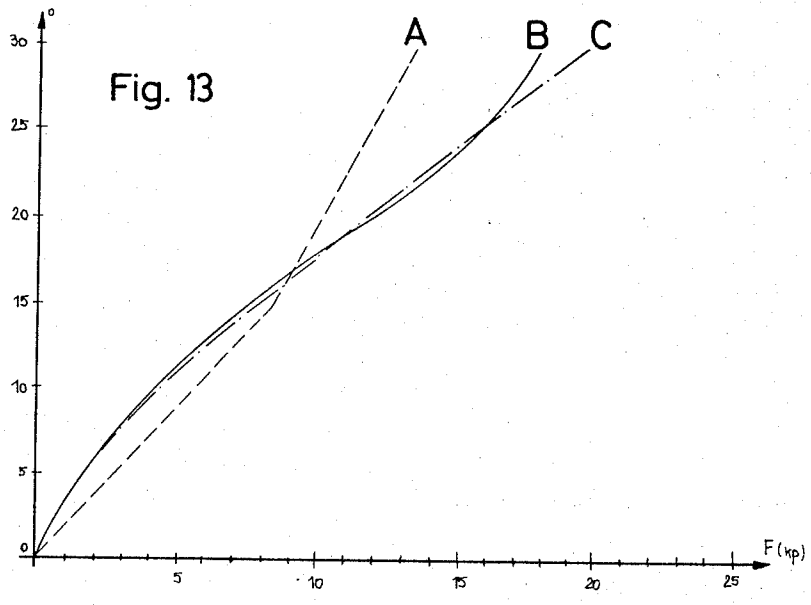


Fig. 13



SKI-TRAINING DEVICE

This invention relates to a ski-training device comprising a base, a pair of ski-like boards pivotally mounted by their front ends about substantially vertical axes in the front zone of said base and supported over rollers by their rear ends in the rear zone of the base, said ski-like boards rotated out of a basic position being returned to said basic position by spring action.

Various ski-training devices are known or have been proposed which serve for carrying out a ski-training without any snow at any random place, especially as a home training. Though all these devices have the purpose of imitating the real conditions of skiing and the technique of skiing, especially of swinging, this is not realized satisfactorily with the known ski-training devices.

It is therefore an object of the present invention to provide a ski-training device which can be used to imitate the most important movements of the modern technique of skiing, especially of the parallel turn and the parallel short swing as well as of the plough, plough turn, and stem swing, in a manner as true to reality as possible.

It is the purpose of the invention to imitate not only the cited movements of the technique of skiing, but also the forces required in a manner as true to reality as possible.

This is realized according to the invention by at least one elongated, flexible, and resilient traction element acting upon the middle zone of said ski-like boards between their front and rear ends, said traction element being guided over at least two guide rollers pivotally mounted about substantially vertical axes in the rear zone of said base, the straight line connecting said guide rollers being at least approximately parallel to the straight line connecting the front axes of rotation of said pair of ski-like boards and lying laterally outside the points of intersection between the straight line projected from the front axes of rotation of said pair of ski-like boards onto said straight line connecting said guide rollers.

Further details of the invention and various embodiments are hereinafter described with reference to the accompanying drawings.

FIG. **1** is a diagrammatic view,

FIG. **2** is a top view,

FIG. **3** is a rear view, and

FIG. **4** is a side view of an embodiment of a ski-training device according to the invention.

FIG. **5** is a diagrammatic view of an embodiment according to FIG. **1**.

FIG. **6** is a variant of a detail of the device according to FIGS. **1** to **4** in side view.

FIG. **7** is a variant of another detail of the device according to FIGS. **1** to **4** in top view.

FIG. **8** is a top view of another embodiment of the invention.

FIG. **9** is a diagrammatic view other than in FIG. **5**.

FIG. **10** is a top view, and

FIG. **11** is a rear view of still another embodiment of the invention.

FIG. **12** is a diagrammatic view of a known device.

FIG. **13** represents a curve of the characteristic features of various ski-training devices.

The ski-training device according to the embodiment in FIGS. **1** to **4** comprises a base consisting of a front plate **1**, a rear plate **2** and two lateral frame parts **3**, **4** connecting both the plates **1**, **2**. The front plate **1** rests directly on the floor, the rear plate **2** over spring supports **5**, **6** located in the outer side zones of the rear plate **2**.

A pair of ski-like boards **7**, **8** are pivotally mounted about substantially vertical axes by their front ends in the front zone of said base, i.e., in the front plate **1**, by means of the pivot pins **9**, **10**. The rear ends of the ski-like boards **7**,**8** are supported on the rear zone of the base, i.e., on the rear plate **2** over rollers **11**, **12** mounted in forked bearing **13**, **14** connected to the ski-like boards **7**, **8**.

The pair of ski-like boards **7**, **8** are provided with a nonslide coating **15** of about a foot length and, if necessary, with lining rails **16** and **17**, **18** in the rear zone. The lateral lining rails **16** and **18** may have slots through which straps or rubber bands for tightening the feet or shoes can be passed.

The pair of ski-like boards **7**, **8** can also be held parallel by a detachable transverse clip **19**. The transverse clip **19** and the ski-like boards **7**, **8** are in hinge connection so that the ski-like boards are not impeded in their rotation about the axes of the bolts **9**, **10**. The device may also be used without any transverse clip **19**. The transverse clip **19** must be removed when ploughing, plough turn movements, etc., are trained.

In the middle zone of the ski-like boards **7**, **8**, both ends of an elongated, flexible, resilient, rope-like traction element **20**, for example an expander spring rope, are attached. The resilient traction element **20** is guided, under tension, over guide rollers pivotally mounted about substantially vertical axes in the rear plate **2**. The straight line **23** connecting the guide rollers **21**, **22** is at least approximately parallel to the straight line **24** of the front axes of rotation of the ski-like boards **7**, **8** and laterally, the guide rollers lie outside the points of intersection between the straight line projected from the front axes of rotation of the ski-like boards **7**, **8** onto the straight line **23** connecting the guide rollers.

FIGS. **1** to **4** show the device in basic position. The training begins in this position. The ski-like boards **7**, **8** are rotated in parallel towards one side by rotational heel push in connection with a downward movement in the ankle and knee joints. At the end of the sideways rotation, for example as soon as the stop (on the frame **3**, **4**) has been reached, this is followed by an upward movement in the ankle and knee joints; the traction element **20** subject to an additional tension during the movement of rotation again causes the ski-like boards **7**, **8** to return in direction of the basic position (midposition). This return movement can be passed over immediately to a movement of rotation of the ski-like boards **7**, **8** towards the other side, again by rotational heel push and a downward movement in the ankle and knee joints. A rhythmic movement of pendulum is produced by these repetitive processes.

FIG. **5** shows in diagrammatic view the basic position of the ski-like boards in rotation in a device according to FIGS. **1** to **4**; besides, the change in course of the traction element **20** during the movement of rotation is shown.

The force required to move the pair of ski-like boards **7**, **8** out of the basic position is composed of the force required to give the resilient tension element **20** an additional tension and the force required to overcome the frictional forces. Frictional forces are produced, above all, between the rollers **11**, **12** and the rear plate **2**, in the bearing of the pivot pins **9**, **10**, in the bearing of the guide rollers **21**, **22** and between the resilient tension element **20** and the guide rollers **21**, **22**.

The ski-like boards **7**, **8** are stabilized in the basic position, above all, due to the frictional forces. This stabilizing effect may be reinforced, for example, by increasing the frictional resistance of the guide rollers **21**, **22**. As shown in FIG. **6**, this is realized by means of a soft helical spring **27** pressing onto the guide roller **21** or **22** from the top and adjustable by a wing nut **28**. A similar effect is produced by locating further rollers **29**, **30** for guiding the traction element **20** on the rear plate **2**, as shown in FIG. **7**, in addition to the guide rollers **21**, **22**. Apart from the frictional forces to overcome and the force required to tension the traction element, a further influence is exerted on the force required by the training person to rotate the ski-like boards **7**, **8** in the case of a base resting on spring supports **5**, **6**. An equal weighting of the pair of ski-like boards **7**, **8** brings with it an equal weighting of both spring supports **5**, **6** so that the rear plate **2** and the surface of the ski-like boards **7**, **8** are horizontal. As soon as the ski-like boards **7**, **8** are rotated toward one side by rotational heel push in connection with a downward movement in the ankle and knee joints, the corresponding spring support **5** or **6** is subject to more stress. This causes a tilting of the rear plate **2** and permits an easier rolling-off of the rollers **11**, **12** in direction of rotation of the ski-like boards **7**, **8**.

In the embodiment according to FIGS. 1 to 4 the tension of the resilient traction element 20 may be modified by removing or adding chain links at the end of the traction element 20.

As seen in FIG. 8, the tension of the resilient traction element 20 can also be adjusted, for example by shifting the point of application on the ski-like boards 7, 8 or by shifting the guide rollers 21, 20 laterally. For this purpose slots 31, 32 are provided in the ski-like boards 7, 8 in which means for tightening the ends of the resilient traction element 20, if necessary together with the transverse clip 19, can be adjusted and fixed, for example by means of wing nuts. The guide rollers 21, 22 are also attached to the frame supports 3', 4' which are provided with a plurality of thread bolts 33 on both sides. Each of the frame supports 3' and 4' is put on a thread bolt 33 and secured by wing nuts.

The invention is not limited to the trapezoidal arrangement of the resilient traction element 20 shown in FIGS. 1, 2, 5 and 8. FIG. 9 is a diagrammatic view of an arrangement of the traction element 20 with crossed ropes (for example in a device according to FIGS. 1 to 4).

It is also possible to attach more traction elements, for example two traction elements 20' and 20'', as seen in FIGS. 10 and 11, to the pair of ski-like boards 7, 8. In this case, two guide rollers 21', 21'' and 22', 22'' rotatable about a common axis are located at the left and at the right of the ski-like boards 7, 8 in the rear zone of the base, for example in the rear plate 2.

The arrangement of the traction elements 20' and 20'' according to FIG. 10 is appropriate for training parallel skiing (with transverse clip 19) and ploughing, plough turns, etc., (without transverse clip 19).

With regard to the forces required during lateral rotation of the ski-like boards 7, 8 the ski-training devices of the invention have a typical feature; the differences in this feature between an arrangement of the traction element 20, for example according to FIG. 5 (trapezoidal arrangement of a traction element) and an arrangement of two traction elements 20', 20'' according to FIG. 10 (two traction elements in triangle arrangement)—when the ski-like boards 7, 8 are moved in parallel—are relatively small. The characteristic features of the various embodiments according to the invention differ considerably as against other known embodiments, for example an embodiment in which the ski-like boards 7, 8 are held in basic position by lateral tension springs 34, 35 guided directly to the frame parts 3, 4, as shown in FIG. 12.

This difference in the features is illustrated in FIG. 13 by the force-angle curves, curve A corresponding to the known embodiment according to FIG. 12, curve B to the embodiment according to FIG. 5, curve C to the embodiment according to FIG. 10. In FIG. 13 the spring force F is represented in the abscissa, the angle of deflection α of the parallel ski-like boards in the ordinate. The nonlinear course of the curves B and C is a better illustration of the real forces in a parallel swing than the course of the curve A. Moreover, the heavy irregularity of the curve A (deflection through about 15°) caused by a complete unweighting of one of the springs 34, 34' (FIG. 12) is not conform to the real conditions.

What I claim is:

1. A ski-training device comprising a base, a pair of ski-like boards pivotally mounted adjacent their front ends about substantially vertical axes in the front zone of said base, at least one roller at the rear end of said boards supporting the said rear end upon the rear zone of said base, at least one elongated, flexible resilient traction element guided over at least two guide rollers that are rotatably mounted about substantially vertical axes in the rear zone of said base, said traction element acting upon said boards between their front and rear ends to bias by spring action return of said boards to a basic position when said boards are rotated out of said basic position, the straight line connecting the centers of said vertical axes in the front zone of said base being approximately parallel to the straight line connecting the centers of said vertical axes of said guide rollers and that portion of said traction element that lies between said guide rollers being laterally outside the points of intersection between straight lines projected from the centers of said vertical axes in the front zone of said base along the longitudinal axes of said boards onto said straight line connecting the axes of said guide rollers.

2. A ski-training device as claimed in claim 11, wherein the guide rollers for the traction element are adjustably arranged on said base.

3. A ski-training device as claimed in claim 11, wherein the point of application of the traction element on the ski-like boards is adjustable in their longitudinal direction.

4. A ski-training device as claimed in claim 11, wherein the ski-like boards are provided with longitudinal slots in their middle zone in which means for tightening the ends of the traction element are displaceable and fixable.

5. A ski-training device as claimed in claim 11, wherein a detachable transverse clip and means for hinge connection of said transverse clip with the ski-like boards are provided in their middle zone between the front and rear ends of the ski-like boards.

6. A ski-training device as claimed in claim 5, wherein means for tightening the ends of said traction element are provided, said means and the means for hinge connection of said transverse clip forming an integral part.

7. A ski-training device as claimed in claim 11, wherein one single traction element guided over guide rollers in the rear zone of the base is provided, whose one end is tightened on one ski-like board, the other end on the other ski-like board.

8. A ski-training device as claimed in claim 11, wherein two traction elements guided over guide rollers in the rear zone of the base are provided, both ends of one traction element being tightened on one ski-like board, both ends of the other traction element on the other ski-like board.

9. A ski-training device as claimed in claim 8, wherein both the guide rollers of the one traction element and the guide rollers of the other traction element are superposed on one axis.

10. A ski-training device as claimed in claim 11, wherein spring supports are provided laterally on the bottom side of the base in the rear zone outside.

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