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(54) Title: SKI EXERCISING AND REHABILITATION APPARATUS

(57) Abstract: A ski-exercising and rehabilitation apparatus of the invention wherein the down-hill-run unit (22), has a system of rotatable rolls (25) mounted with bearings in external clamping beams (20) and (21) and in the central beam (26) so that their rotation axes lie in one arched plane, whereas said central beam (26) is supported on its ends with shock absorbers (27), whereas the ends of external clamping beams (20 and 21) are jointed at one end with the shorter articulated connecting rods (18 and 19) of variable lengths and at the other end with the longer articulated connecting rods (23 and 24) of variable lengths, the other ends of which are rotatably connected with respective discs of the gear wheels (13, 14, 15 and 16) mounted on the front drive shaft (11) and rear drive shaft (12), said external clamping beams (20 and 21) being also jointed to rocking levers (34 and 35) which are connected to actuators (36) mounted in the frame base (1) of the apparatus, whereas the light signs (54), imitating the positions of slalom poles, are located on the track mat (30) of said downhill-run unit (22) in form of bristled track mat banding arcwise the upper drive roll (32) and lower drive roll (31).



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Ski exercising and rehabilitation apparatus

The object of this invention is the apparatus for ski exercising and rehabilitation, intended to serve for both beginning and professional skiers as well as for persons rehabilitated, as it enables exercising of those muscle groups which work during an real downhill
5 run and rehabilitation through massage of feet, imitation of downhill or cross-country run, etc. and an improvement of the apparatus according to additional patent application No. P-352640.

The ski exercising apparatus known from Polish patent application No. 181049 consists of a frame base the main plane of
10 which is slanted at acute angle in respect to the lower plane, whereas a track mat, provided with a springing bristled mat and with running rolls, is located above the frame base and is connected rotatably with that base by means of a lever. Besides, the frame base contains a front drive shaft and rear drive shaft and a springing element stimulating a
15 free movement of skis located between the deck and the main ski fixing element. This apparatus is also equipped with the drive unit consisting of electric motor, worm gear and belt transmissions transferring the drive onto the rear drive shaft and then to the front drive shaft and onto driving element of running rolls.

20 The drawback of the prior-art solution is its low universality, no possibility to use it with various types of ski equipment, for rehabilitation and, what is most important, to use it by beginning skiers, especially children, because the springing element stimulating free movement of skis restricts the free movement with skis and
25 enforces constant concentration of the trainee on commanding the skis.

The objective of this invention is to design an apparatus, which shall enable the skiers a comprehensive exercising at different speeds, including running over uneven terrain of different heights, randomly
30 varying during downhill runs, training for beginners, training on any type of skis, creating of skiing conditions on snow or icy surface, as well as for the rehabilitation of many human organs.

The essence of the apparatus for ski exercising and rehabilitation of the present invention consists in that it has a downhill-run unit
35 containing a system of rotatable rolls with bearings in external clamping beams and in the central beam so that their rotation axes lie

in one arched plane whereas the central beam is supported on its ends with shock absorbers while the ends of external clamping beams are jointed with shorter connecting rods and longer connecting rods of
40 variable lengths the other ends of which are rotatably connected with respective discs of the gear wheels mounted on the front drive shaft and rear drive shaft.

Besides, the external clamping beams are jointed to rocking levers connected to actuators mounted in the frame base of the apparatus. In
45 turn, light signs imitating the positions of slalom poles are located on the track mat of the downhill-run unit in form of a bristled track mat banding arcwise the upper drive roll and lower drive roll below, whereas the damping and cooling nozzles, connected with refrigerating unit, are located in the lower portion under the track mat
50 while monitoring unit and the support poles with handles are mounted in the front part of the apparatus. At least one pole is provided with the control panel electrically connected with the main drive motor, with the drive motor of the upper or lower roll, with the refrigeration unit, with signal lights, monitoring unit, diagnostic apparatus with the
55 control panel, air conditioner and actuators. Preferably the shaft of the drive motor constitutes one of the drive rolls, lower or upper one, and the support poles are connected to each other and to the bow with the safety belt provided with safety cut-out switches on its internal surface while the endless track mat has 5cm long bristles.

60 The improved solution the apparatus for ski exercising and rehabilitation of the present invention is provided with the frequency converter electricity interconnected with the drive motor and, through a transmission, with the upper drive roll and/or lower drive roll, the frame base of the apparatus is provided with wheels, while the side
65 guards of the base are provided with a flange at their upper edge, crosswise to the track mat. Preferably the drive unit of the downhill-run unit is provided with upper electro-drum banded together with the lower drive roll by the bristled track mat, upper and/or lower electro-drum banded by the bristled track mat. It is preferred also that a track
70 slide plate of arcwise longitudinal cross-section similar to circular sector be located between external clamping beams and supported with shock-absorbers in each corner. Said plate is made of material with high resistance to frictional wear and has its upper surface, contacting the track mat, polished. Besides, the ends of external
75 clamping beams and those of the central beam in this unit are jointed with actuators mounted in the lower part of its frame base and the

track mat rims are provided from the bottom with guiding elements, which preferably have a cross-sectional trapeze shape, located in circumferential grooves of the same shape as the guiding elements, made at the ends of driving rolls and/or electro-drums or, when the external clamping beams have slot guides of arcwise contour on their inner surfaces in which the rims of the track mat are located. It is also preferred that the external clamping beams contain in bearings additional rotatable rolls, located on the outside of drive rolls and/or electro-drums, banded with endless carrier belt driven by said band whereas the diameters of the rotatable rolls are smaller than those of the driving rolls and/or of the electro-drums. Besides, in this apparatus the driving rolls and/or the electro-drums and/or additional rolls have cylindrical shapes, or else their ends have truncated cone shapes. Preferably, the apparatus of the invention is provided with skis the lower slide surface of which is made of antistatic material with high resistance to frictional wear, high temperatures, preferably of carbon fiber or Ni-Cr steel.

The basic advantage of the invention is its universality of application enabling the use of carving, traditional (downhill), cross-country and water skis as well as snowboards. The apparatus may be used by both advanced ski trainees and beginners who wish to learn skiing. The apparatus may also be used for physical mobility rehabilitation of tarsal joints, massage of feet through acting on receptors in feet soles, stimulation of blood circulation, as well as cross-country running exercise at various upward and downward slopes. A person under rehabilitation may be subject to health diagnostic such as heart-rate and blood pressure measurement as well as to effort-related health assessment. The apparatus enables also the training of skiing through moguls of variable heights thus serving for training these muscle groups which are working in a real downhill skiing. The apparatus enables also a creation of winter conditions on the bristled tract mat by spraying water over it and then freezing it. Such cycle may be either continuous, variable or intermittent and thus to simulate the real conditions existing on mountain-side slope. It ensures also the safety of exercising because the safety belt restricts its field and, in case of exceeding it, which is tantamount to a loss of balance, safety cut-out switches switch the main and lower-roll drive motors off. The advantage of this invention is also a direct drive of one of the drive rolls, thus eliminating the need for using additional transmissions from the main drive motor. Besides the advantage of

the invention is that a monitoring unit, installed on the stationary strip, visualizes the training on the apparatus synchronized with the virtual world on the screen of monitor and, due to this, one
120 may choose a landscape in real terrain, e.g. skiing in Swiss Alps. The noise of trainee's skiing may also be heard. The training on bristled track mat and light signs on it is shown on the screen as skiing between poles. In this way the trainee may reproduce his/her skiing and check whether his/her exercise contained mistakes or errors.
125 It creates a potential for conducting a slalom hall competition event with the use of the apparatus. One can also read the skiing speed and the mileage as well as show the real downhill ski route. Having independent drives of bristled track mat movement and the speed of the downhill-run unit, various changeable variants may be achieved
130 during the exercise. It avoids the exercising monotony and permits correction of skiing mistakes and errors in a short time. All these advantages of the apparatus of the invention provide safety to the trainee, a feeling of skiing in real conditions without leaving home and without costly, unsafe and long lasting trips in the mountains in search
135 for skiing courses.

Application of castor wheels in the apparatus according to the invention facilitates its placing into a desired location in a specific room whereas the providing of skiing track mat with side V-belts and their driving shafts or electro-drums with grooves of the same profile
140 as the V-belts make the lateral traveling of the track mat impossible. Providing the side guards with flanges crosswise to the track mat, as well as providing the inner walls of external clamping beams with slot guides of arcwise contour also prevents the lateral traveling of the track mat. In turn, the equipping of external clamping bars of the
145 downhill run unit with additional rolls enables banding of drive shafts and electro-drums with costly carrier belt and said rollers with bristled mat driven by said belt, which in turn enables a longer period of service of the carrier belt because in case of local wear of the bristles on the track mat only the much cheaper bristled track mat is subject to
150 replacement.

The application of actuators and frequency converter in the down-hill-run unit drive system enabled elimination of hitherto used shorter and longer connecting rods of variable length as well as the worm gear and belt transmissions, whereas the application of slide plate permitted

155 elimination of electrostatic charges and enabled a considerable
lengthening of ski life, which used to be very short because of high
temperature generated between ski surface and the track mat.

The invention is presented as the examples of embodiments in
figures, where fig. 1 is the axonometric projection of the apparatus
160 with the frame base with its side guards, resting on castor wheels, with
track mat, support poles, safety belt, monitoring unit and the air
conditioner, fig. 2 is the axonometric projection of the frame base of
the apparatus with its drive unit and downhill-run unit after track-mat
and side-guard removal, fig. 3 is the cross section along the A-A line
165 from Fig. 1 of the downhill-run unit with the track mat, fig. 4 is the
top view of the same downhill-run unit of the apparatus, fig. 5 is the
cross section along the B-B line from Fig. 4 of the same downhill-run
unit of the apparatus, fig. 6 is the axonometric projection of the frame
base of the apparatus after track-mat and side-guard removal, with
170 downhill-run unit provided with actuators, drive shafts or cylindrical
electro-drums and the drive unit provided with frequency converter,
fig. 7 is the axonometric projection of the fragment "T" from fig. 2 of
the downhill-run unit provided with drive shafts or cylindrical-and-
conical electro-drums, fig. 8 is the axonometric projection of the
175 frame base of the apparatus after track-mat and side-guard removal,
with downhill-run unit provided with actuators, cylindrical-and-
conical drive shafts as well as the drive unit with frequency converter,
fig. 9 is the axonometric projection of the same frame base of the
apparatus with the downhill-run unit the external clamping beams of
180 which are provided with drive shafts or electro-drums and with
additional rotatable rolls in external bearings, fig. 10 is the top view of
the fragment of the downhill-run unit from fig. 9, fig. 11 is the cross
section along the E-E line from Fig. 10 of the downhill-run unit of the
apparatus with the track mat, fig. 12 is the top view of the fragment of
185 the downhill-run unit provided with drive shafts or electro-drums and
the with slide plate between them, fig. 13 is the top view of the
fragment of the downhill-run unit provided with drive shafts or
electro-drums as well as with additional rotatable rolls and the slide
plate between them, fig. 14 is the cross section along the C-C line
190 from Fig. 6 of the fragment of downhill-run unit with the slot guide of
its track mat, fig. 15 is the cross section along the D-D line from Fig. 9
of the fragment of downhill-run unit with the trapeze guide of its track
mat and fig. 16 is the cross section along the F-F line from Fig. 1 of
the fragment of the apparatus.

195 The apparatus of this invention consists of the frame base 1,
resting on castor wheels 2, provided with a brake with the main drive
motor 3, mounted in said frame base, connected through reducing gear
4 with the worm gear 5. The frame base 1 is formed by the upper
arcwise and slanted side frame beams 6 and 7, with their arc convexity
200 upward. Besides, the frame base 1 has bottom cross bars 8, supportive
vertical beams 9 and bottom side beams 10. The lower part of the
frame base contains in bearings the front and rear drive shafts, 11 and
12, respectively, driven with the main drive shaft 3. Driving chain
wheels, 13 and 14, are mounted on one and the other ends of the front
205 drive 11 and driving chain wheels, 15 and 16, are mounted on one and
the other ends of the rear drive shaft 12. Driving chain wheels, 13, 14,
15 and 16 have the same diameters and constitute chain transmissions
with chains 17. Ends of shorter connecting rods 18 and
19 of variable length are pivoted to chain disks of the driving chain
210 wheels, 13 and 14, mounted on front drive shaft 11, whereas their
other ends are pivoted to external clamping beams 20 and 21 of the
downhill-run unit 22. On the other hand, the ends of longer connecting
rods 23 and 24 of variable length are pivoted to driving chain disks of
driving chain wheels, 15 and 16 mounted on the rear drive shaft 12,
215 whereas their other ends are pivoted to external clamping beams 20
and 21 of the downhill-run unit 22. The downhill-run unit 22 has a
system of rotatable rolls 25 with bearings in external clamping beams
20 and 21 as well as in the central beam 26 supported at its ends by
shock absorbers 27. The central beam 26 is located between two rows
220 of rotatable rolls 28 and 29 constituting a system of rotatable rolls 25.
The downhill-run unit 22 is also provided with endless track mat 30
with 3-cm long bristles as well as with lower drive roll 31 and upper
drive roll 32, constituted by the rotor shaft of drive motor 33. Besides,
the external clamping beams 20 and 21 are jointed with rocking levers
225 34 and 35 coupled with actuators 36 mounted in frame base 1. The
rotatable rolls 28 and 29 have smaller diameters than the upper and
lower drive rolls, 32 and 31, with external pivots 37 are arranged
along the 'I' arc in external clamping beams 20 and 21, while their
internal pivots 38 are arranged along the similar arc in the central
230 beam 26. The endless bristled track mat 30 is installed on the upper
and lower drive rolls, 32 and 31, and supported by with rotatable rolls
28 and 29, thus forming a surface with arcwise contour. Preferably the
section "d", formed between the straight line "c", joining the contact
points of the endless bristled track-mat 30 with the upper and lower

235 drive rolls, 32 and 31, and the contact surface of said track mat with
the rotatable rolls 28 and 29 in the highest point "D" of the track-to-
roll contact located on the line "f" perpendicular to the straight line
"c", is 4 cm. Such location of the endless bristled track mat 30 and
rotatable rolls 28 and 29 enables the training with any type of ski
240 equipment.

There are wetting and cooling nozzles 39 arranged all through the
width of the
endless bristled track mat 30 and connected with the refrigerating unit
40. They first supply water onto the surface of this track mat and then
245 freeze it.

A monitoring unit 45, located in the front part of the stationary strip
41 between the support poles with control panel 43 at the handle 44
and breaker switches, synchronized with the functioning of the entire
apparatus, wherefrom the skiing speed and the number of kilometers
250 passed may be read. The screen of said unit may visualize the real
downhill-run route in the terrain. In turn, a rigid safety belt 48 is fixed
to one support pole 42, to bow 46 located on the rear guard 47 and to
the other pole 42, whereas both the bow 46 and the rigid safety belt 48
and support pole 42, are provided with safety cut-out switches 49
255 enabling total stop of motion of the downhill-run unit in case the
trainee has exceeded his/her field of maneuver. The apparatus is also
equipped with the diagnostic unit for the trainee with control panel 50
installed on the support pole 42 as well as air conditioner 51 located in
the lower part of the apparatus. The side beams 6, 7 and 10 of the
260 frame base 1 are covered by side guards 52 which have flanges 53 on
their internal peripheries crosswise to the endless bristled track mat
30. There are light signals 54 simulating the positions of slalom track
poles on the endless bristled track mat 30.

In other examples of execution of this invention (figs. 6, 8 and 9)
265 instead of drive rolls 31 and 32 mounted on the ends of external
clamping beams 20 and 21 of the downhill-run unit 22, there are the
lower electro-drum 55 and upper electro-drum 56 or upper electro-
drum 56 and the lower drive roll 31 or lower electro-drum 55 and the
lower drive roll 32, whereas said electro-drums, or electro-drum with
270 respective roll, are banded by the endless bristled track mat 30.

In the subsequent examples of execution of this apparatus (figs. 6
and 9) its driving unit is provided with frequency converter 57
installed in the lower part of the frame base 1, electrically connected
with the main drive motor 3 as well as, through a belt transmission

275 58, with the upper drive roll 32 or lower drive roll 31.

In the subsequent examples of execution the ends of drive rolls 31 and 32 and electro-drums 55 and 56 of the downhill-run unit 22 have the shape of truncated cones 59, whereas the ends of external clamping beams 20 and 21 and the central beam 26 of said unit are
280 jointed with actuators 60 installed in the lower part of the frame base 1 (figs. 6-9).

In the other example of execution, presented in fig. 12 and 13, the slide plate 61 for the endless bristled track mat 30 is located between external clamping beams 20 and 21 of the downhill-run unit 22 and
285 drive rolls 31 and 32 or electro-drums 55 and 56 and is supported with shock absorbers 62 in each corner. Said slide plate 61 is made of chromium nickel steel, has elongated arcwise shape similar to circular sector and its upper surface contacting the endless bristled track mat 30 is polished.

290 In a further example of execution (figs. 12, 13 and 15) the rims of the endless bristled track mat 30 are provided at its back side with V-belts 63, located and guided in the circumferential grooves 64 of the same profile as the V-belts 63 made at ends of drive rolls 31 and 32 and/or electro-drums 55 and 56.

295 In the other example of execution (figs. 9 and 14) the external clamping beams 20 and 21 of the downhill run unit 22 have slot guides 65 of arcwise outline on their internal surfaces which take in the rims of the endless bristled track mat 30.

In a further example of execution of the apparatus of the invention
300 (figs. 10 and 11) the external clamping beams 20 and 21 of the downhill-run unit 22 contain in bearings additional rotatable rolls 66 and 67 located on the outside of the driving rolls 31 and 32 and/or electro-drums 55 and 56 whereas the driving rolls, 31 and 32 and/or the electro-drums, 55 or 56 are banded with endless carrier belt 68
305 whereas the additional rotatable rolls 66 and 67 are banded with endless bristled track mat 69 driven with carrier belt 68, whereas the diameters of rotatable rolls 66 and 67 are smaller than those of the drive rolls 31 and 32 and/or electro-drums 55 and 56.

The apparatus of the invention executed in all above described
310 versions is equipped with skis the bottom slide surface of which is made of carbon fiber, whereas in the other embodiment said surface is made of chrome-nickel steel.

The functions of the apparatus are realized in two basic variants: the trainee, positioned on the endless bristled track mat 30, uses the

315 control panel to switch ON the main drive motor 3 and adjusts its slope, then he/she starts the drive motor 33 of the upper drive roll 32 which moves the endless bristled track mat 30 and said mat, in turn, puts into motion a system of rotatable rolls 25 and the lower drive roll 31. The trainee holds the grip handles 44 of support poles 42, begins
320 exercising while performing various maneuvers and motions as are done during downhill skiing. He/she may train slalom skiing because the endless bristled track mat 30 is provided with light signs 54 for such skiing. Without skis, the trainee may run upward or downward, in shoes or
325 without, and perform various rehabilitation exercises, while selecting the slope and speed of the endless bristled track mat 30 to suit his/her weight.

For beginners, especially children, an additional horizontal support bar, not shown on the drawing, may be fixed between the support
330 poles 42. The trainee, while holding it, may concentrate on arranging and lifting of skis, thus getting accustomed to downhill skiing. The apparatus may be used for training of water skiers. For that, the motor 33 is run in a reverse sense of drive rotation. The trainee may watch entire course of his/her maneuvers, and the distance (kilometers)
335 passed, on the screen of the monitoring unit 45 and check what and where mistakes has been made.

In case of training the skiing over moguls the trainee uses the control panel 43 to start the main variable-speed drive motor 3 on which drives the reduction gear 4, worm gear 5 and rear drive shaft
340 12, chain drive wheels 15 and 16 and then chains 17 and drive wheels 13 and 14 transmit the drive to the front drive shaft 11.

Then, from chain wheels 13 – 16, through shorter connecting rods 18 and 19 and longer connecting rods 23 and 24 of variable length, as well as rocking levers 34 and 35, the downhill-run unit 22 is put into
345 shifting and self-aligning motion, thus enforcing the skiing over moguls. The drive motor 33 is also ON and the endless bristled track mat 30 moves in a mode that can be varied during training. Also, during training, the speed of the main drive motor 3 can be varied, the lengths of shorter connecting rods, 18 and 19 as well as 23 and 24, and
350 those of rocking levers 34 and 35, can be changed as well.

As a result, a number of skiing combinations are achievable for the trainee and training satisfaction while the exercising monotony is limited to minimum. The monitoring unit 45 enables reading of skiing speed, and the distance (kilometers) passed in specific time, on the

355 screen. Bow 46 and a rigid safety belt 48 joining the bow with support
poles 42, protect the trainee against balance-loss threatening positions
of the body, whereas the safety cut-out switches 49 protect the trainee
in case of exceeding the motion field on the endless bristled track mat
30. Then, each touch of the rigid safety belt 48 with trainee's body or
360 positioning it in the line of the light (sender-receiver) signal of the
specific cut-out switch shall stop of the apparatus. In both variants the
trainee may have the skiing approximated to winter conditions by
switching ON the refrigeration unit 40. Through damping and cooling
nozzles 39 said unit will freeze water all over the external surface of
365 the endless bristled track mat 30 and will maintain during training any
state of the surface similar to skiing over a snow-covered slope. The
control panel 50 and the diagnostic unit connected to it enables also
reading the health state of the trainee – his/her blood pressure, heart
rate. Also, on starting the air-conditioning unit 51 air is blown onto the
370 trainee thus providing a feeling of skiing in free air, whereas during
skiing over moguls the rotatable rolls 28 and 29 yield, together with
the central beam 26, and then the trainee sags onto the endless bristled
track mat 30. In case of using the electro-drums 55 and 56 of
actuators 60, frequency converter 57, additional rotatable rolls 66 and
375 67 as well as the slide plate 61 the principle of operation of the
apparatus in analogical to that described above.

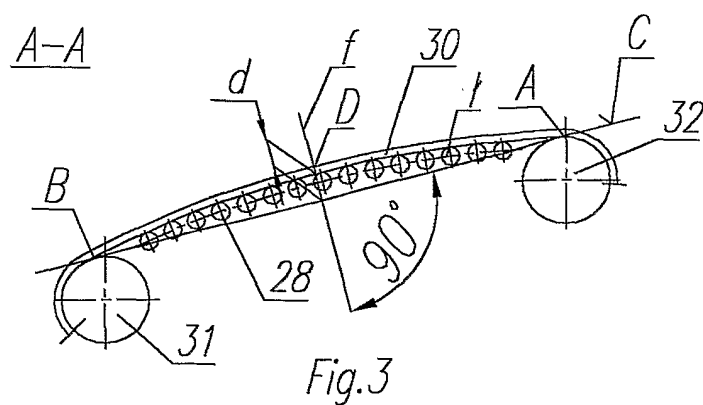
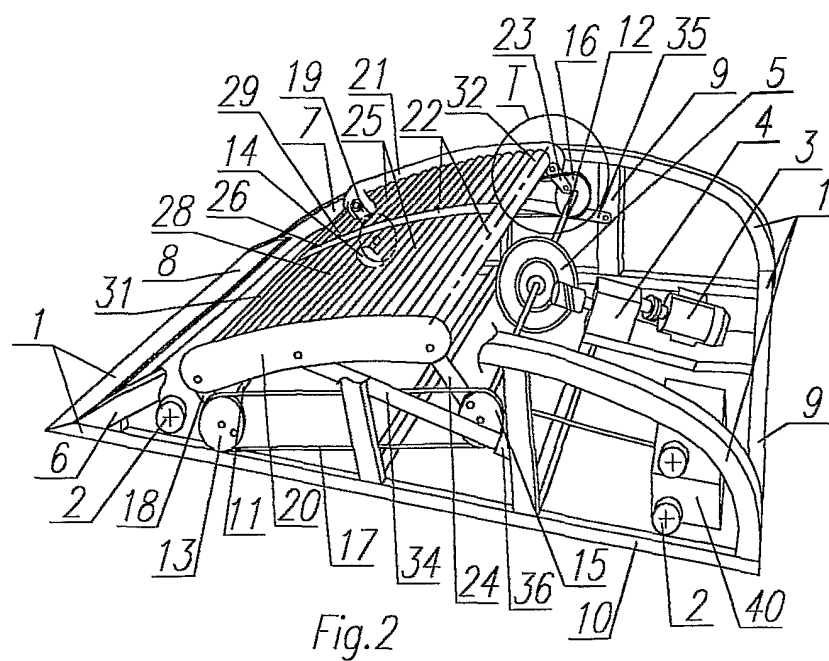
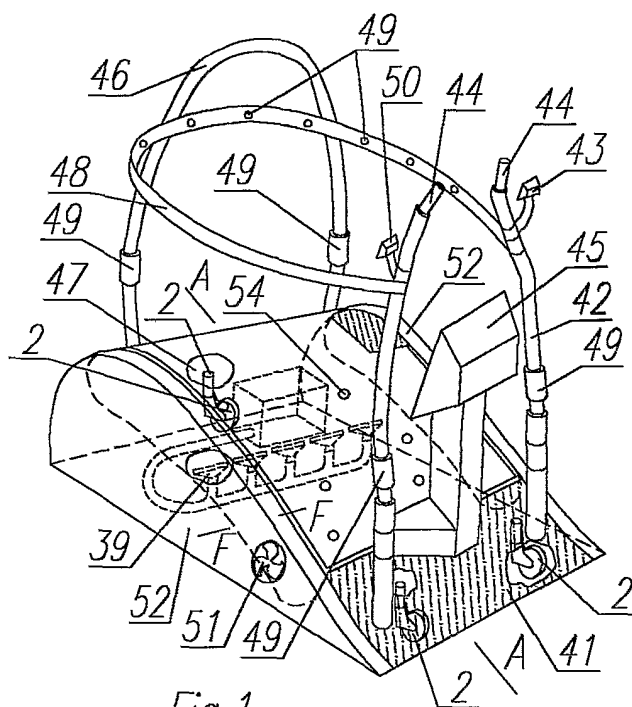
Patent claims

What is claimed is:

1. A ski-exercising and rehabilitation apparatus having a frame base provided with the drive unit mechanically connected with the front and rear drive shafts and a downhill-run unit provided with rotatable rolls banded by a bristled track mat, which upper surface is situated at acute angle to the lower plane of the base of the apparatus and having vertically variable position **wherein** the downhill-run unit (22), has a system of rotatable rolls (25) mounted in bearings in external clamping beams (20 and 21) and in the central beam (26) so that their rotation axes lie in one arched plane, whereas said central beam (26) is supported on its ends with shock absorbers (27), whereas the ends of external clamping beams (20 and 21) are jointed at one end with the shorter articulated connecting rods (18 and 19) of variable lengths and at the other end with the longer articulated connecting rods (23 and 24) of variable lengths, the other ends of which are rotatably connected with respective discs of the gear wheels (13, 14, 15 and 16) mounted on the front drive shaft (11) and rear drive shaft (12), said external clamping beams (20 and 21) being also jointed to rocking levers (34 and 35) which are connected to actuators (36) mounted in the frame base (1) of the apparatus, whereas the light signs (54), imitating the positions of slalom poles, are located on the track mat (30) of said downhill-run unit (22) in form of bristled track mat banding arcwise the upper drive roll (32) and lower drive roll (31).
2. The apparatus according to claim 1 **wherein** damping and cooling nozzles (39), connected with refrigerating unit (40), are located in the lower portion under the track mat (30) while the monitoring unit (45) and the support poles (42) with handles (44) are mounted in the front part of the apparatus, whereas at least one of said poles is provided with at least one control panel (43) electrically connected with the main drive motor (3), with the drive motor (33) of said upper roll (32) or said lower roll (31), with said refrigeration unit (40), said signal lights (54), said monitoring unit (45), with diagnostic apparatus with the control panel (50), air conditioner (51) and actuators (36).
3. The apparatus according to claim 1 or 2 **wherein** the shaft of the drive motor (33) constitutes one of the drive rolls, (31 or 32).
4. The apparatus according to claim 1 or 2 **wherein** the support poles

- (42) are connected to each other and to the bow (46) with the safety belt (48) provided with safety cut-out switches (49) on its internal surface.
5. The apparatus according to claim 1 or 2 **wherein** the endless track mat (30) has 5cm long bristles.
6. The apparatus according to claim 1 **wherein** the drive unit of the downhill-run unit (22) is provided with the frequency converter (57) electricity interconnected with the main drive motor (3) and through the transmission (58) with the upper drive roll (32), whereas the frame base (1) of the apparatus is provided with wheels (2), while the side guards (52) of the base are provided with flange (53) at their upper edges crosswise to the bristled track mat (30).
7. The apparatus according to claim 1 or 6 **wherein** the drive unit of the downhill-run unit (22) is provided with upper electro-drum (56) banded, together with the lower drive roll (31), by the bristled track mat (30).
8. The apparatus according to claim 1 or 6 **wherein** the drive unit of the downhill-run unit (22) is provided with lower electro-drum (55) banded, together with the upper drive roll (32), by the bristled track mat (30).
9. The apparatus according to claim 1 or 6 **wherein** the drive unit of the downhill-run unit (22) is provided with upper electro-drum (56) and the lower electro-drum (55) banded by the bristled track mat (30).
10. The apparatus according to claim 1 or 6 **wherein** the frequency converter (57) is connected through the transmission (58) with the lower drive roll (31).
11. The apparatus according to claim 1 or 6 **wherein** the frequency converter (57) is connected through the transmission (58) with the upper drive roll (32) and with lower electro-drum (55).
12. The apparatus according to claim 1 or 6 **wherein** the frequency converter (57) is connected through the transmission (58) with the lower drive roll (31) and with upper electro-drum (56).
13. The apparatus according to claim 1 or 6 **wherein** the slide plate (61) for the bristled track mat (30) is located between external clamping beams (20) and (21) of the downhill-run unit (22), whereas said slide plate has arcwise longitudinal cross-section similar to circular sector and is supported with shock absorbers (62) in each of its corners.

14. The apparatus according to claim 13 **wherein** the slide plate (61) is made of material of high resistance to frictional wear, preferably of chromium nickel steel and its upper surface contacting the bristled track mat (30) is polished.
- 80 15. The apparatus according to claim 1 or 6 **wherein** the ends of external clam-ping beams (20 and 21) and those of the central beam (26) in this unit are jointed with actuators (60) mounted in the lower part of the frame base (1).
16. The apparatus according to claim 1 or 6 **wherein** the rims the
85 bristled track mat (30) are provided on the bottom side with guiding elements (63), which preferably have a cross-sectional trapeze shape, located in circumferential grooves (64) of the same shape as said guiding elements (63), made at the ends of driving rolls (31 and 32) and/or electro-drums (55 or 56).
- 90 17. The apparatus according to claim 1 or 6 or 15 **wherein** the external clamping beams (20 and 21) have slot guides (65) of arcwise contour on their inner surfaces in which the rims of the track mat (30) are located.
18. The apparatus according to claim 1 or 6 or 15 or 17 wherein the
95 external clam-ping beams (20 and 21) of the downhill-run unit (22) contain in bearings additional rotatable rolls (67) located on the outside of the driving rolls (31 and 32) or/and the electro-drums (55 or 56), whereas the driving rolls (31 and 32) and/or the electro-drums (55 or 56), banded with endless carrier belt (68), whereas the addi-
100 tional rotatable rolls (67) are banded with the endless bristled track mat (69) driven with carrier belt (68), whereas the diameters of the rotatable rolls (67) are smaller than those of the driving rolls (31 and 32) and/or of the electro-drums (55 and 56).
19. The apparatus according to claim 1 or 6 or 18 **wherein** the driving
105 rolls (31 and 32) and/or the electro-drums (55 or 56) and/or additional rotatable rolls (67) have cylindrical shapes.
20. The apparatus according to claim 1 or 6 or 18 **wherein** the ends of driving rolls (31 and 32) and/or the electro-drums (55 or 56) have truncated cone shapes (59).
- 110 21. The apparatus according to claim 18 or 19 **wherein** the ends of additional rotatable rolls (67) have truncated cone shapes (59).
22. The apparatus according to claim 1 equipped with skis, the lower slide surface of which is made of antistatic material with high resistance to frictional wear, high temperatures, preferably of carbon
115 fiber of Ni-Cr steel.



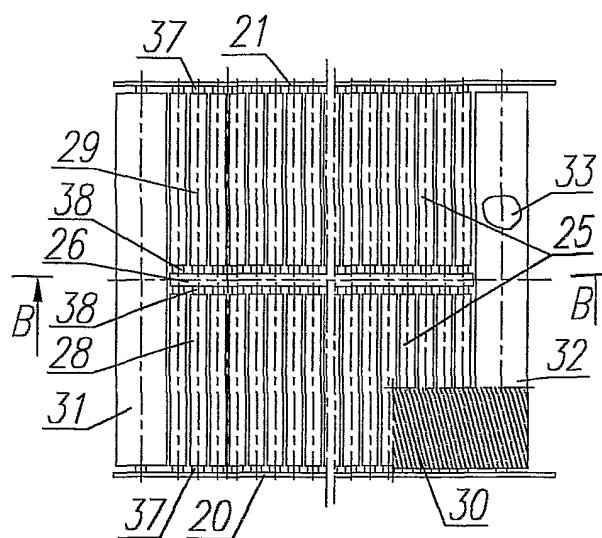


Fig. 4

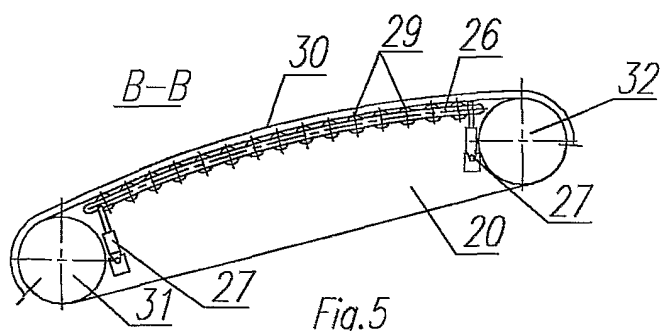


Fig. 5

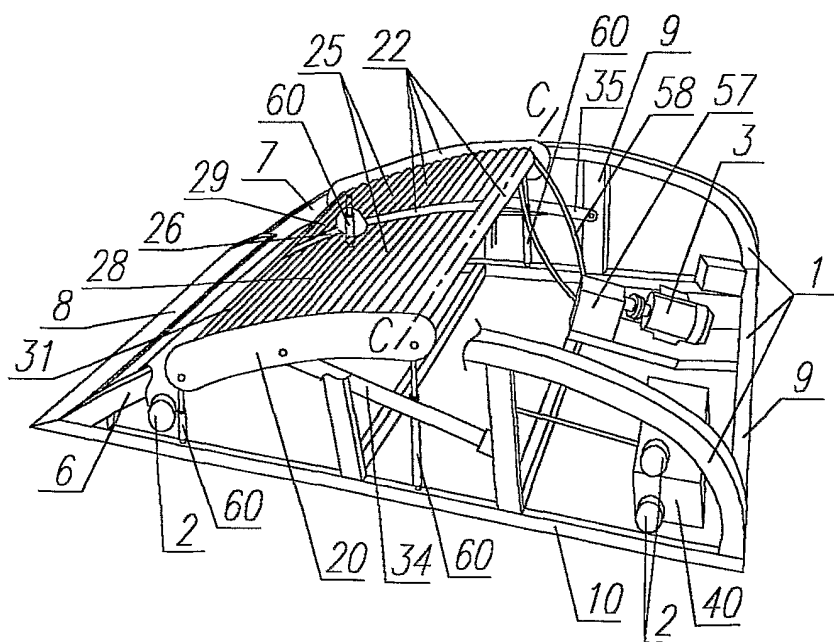


Fig. 6

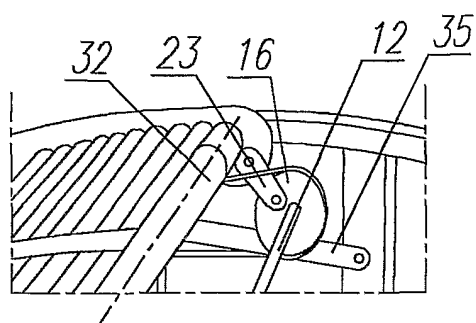


Fig. 7

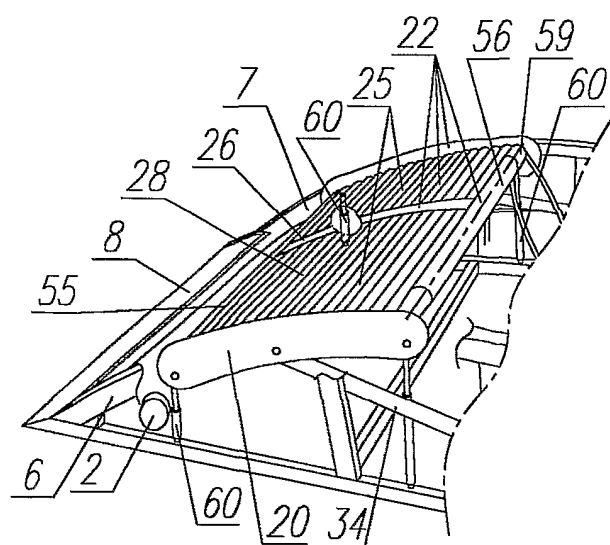


Fig. 8

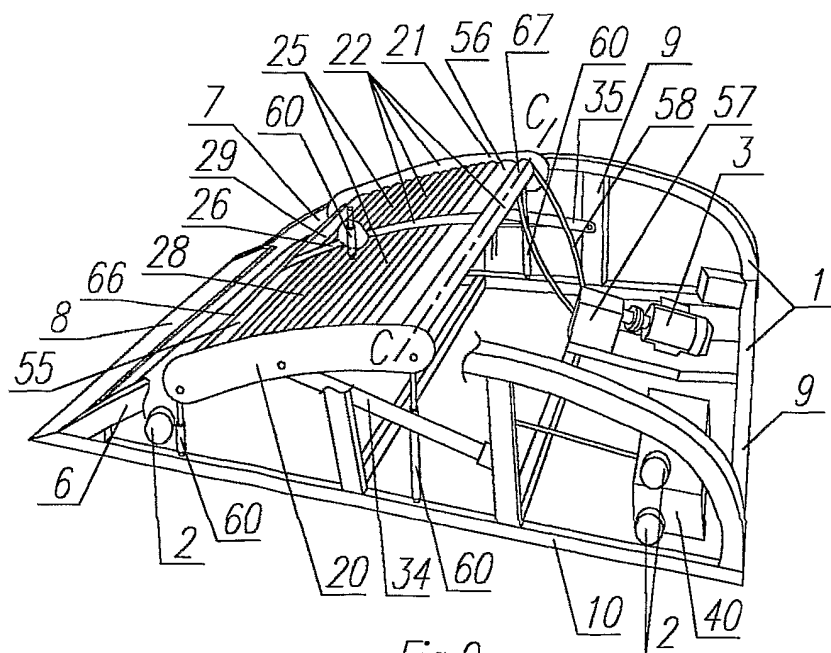
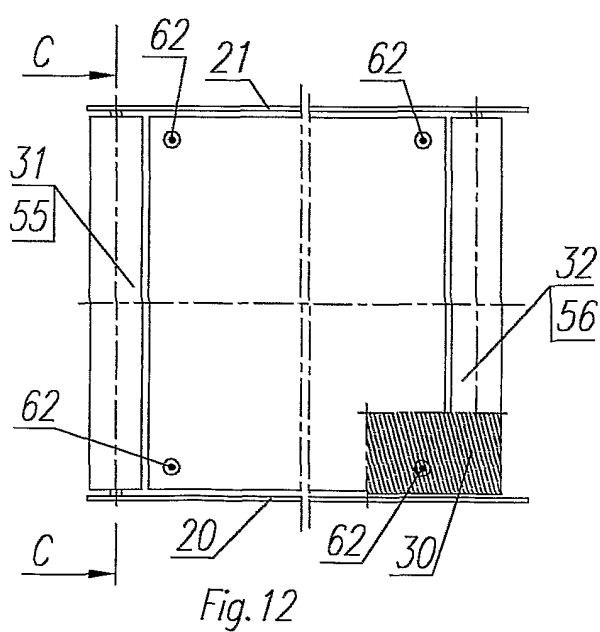
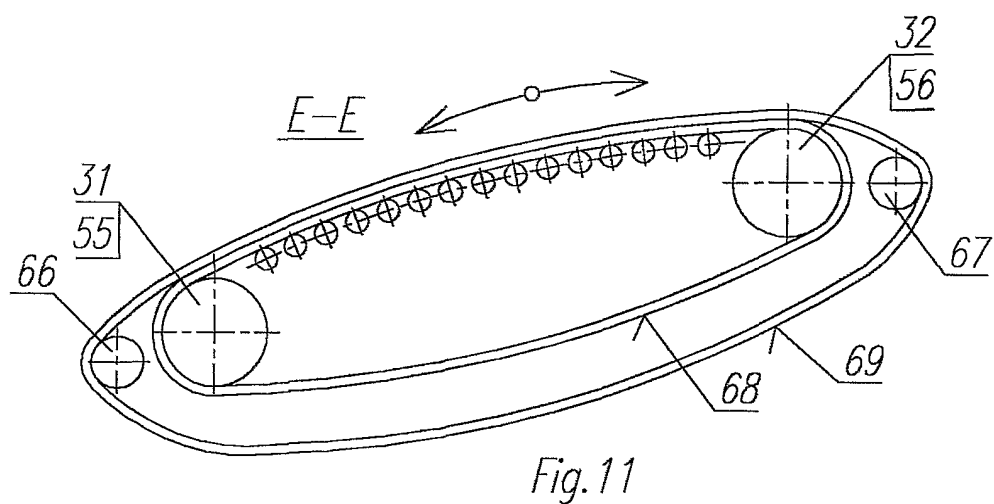
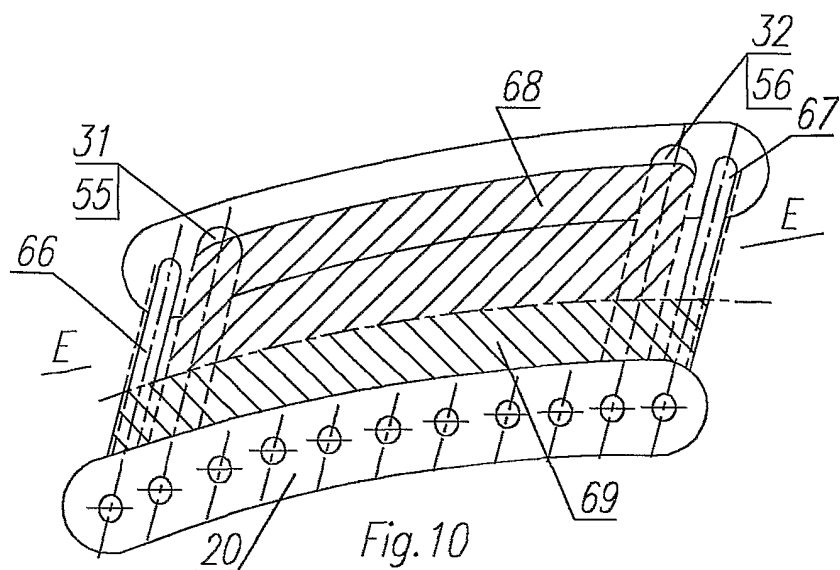


Fig. 9



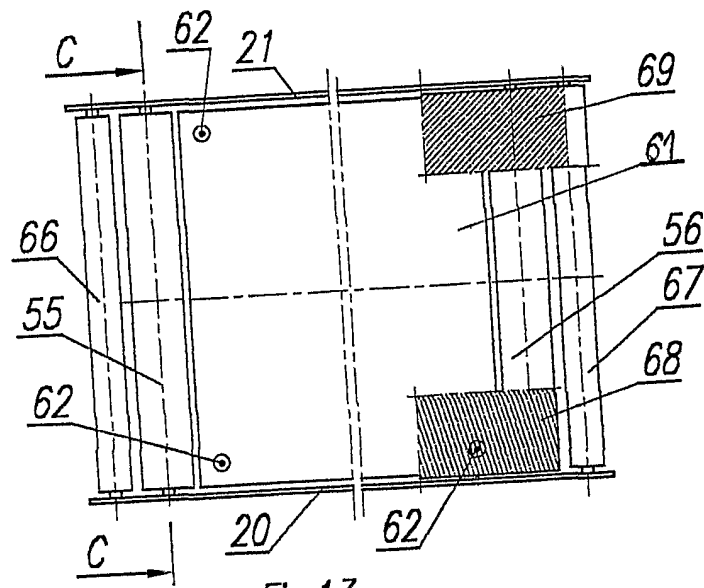


Fig. 13

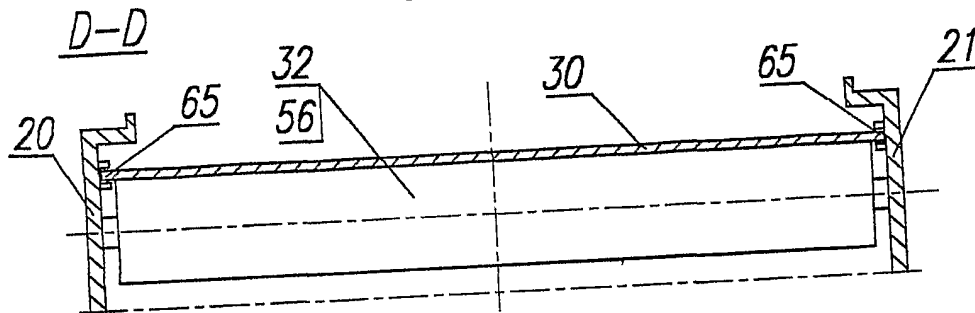


Fig. 14

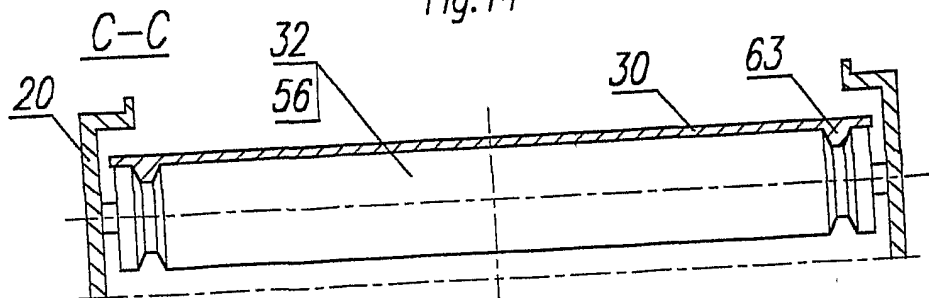


Fig. 15

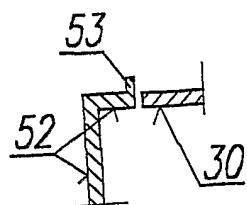


Fig. 16