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(71) Applicant *(for all designated States except US)*: **BRIGATI S.r.l.** [IT/IT]; Via Del Combattente, 16, I-24030 Carvico (BG) (IT).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **BRIGATI, Angelo** [IT/IT]; Via Predazzi, 5, I-24030 Carvico (BG) (IT).

(74) Agents: **GIAVARINI, Francesco** et al.; Via Melchiorre Gioia, 64, I-20125 Milano (IT).

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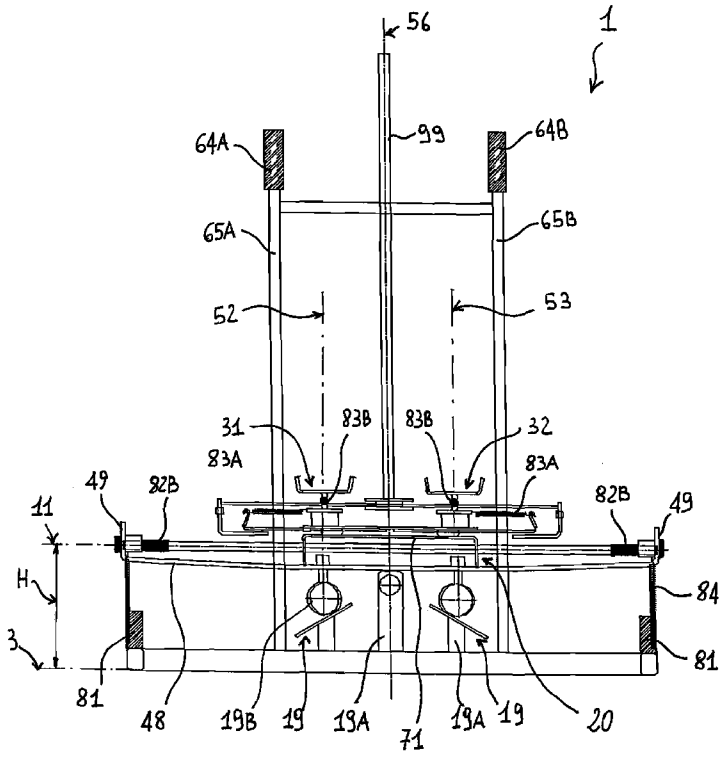

(57) Abstract: The present invention relates to a training device (1) to be used for exercising skiing techniques and more in particular for learning and perfecting the technique necessary for the discipline of slalom. The training device (1) according to the invention comprises a guide element (10) mounted so that it can turn on a supporting structure (2) for preserving a first freedom of rotation (4A) about a first axis of rotation (51) substantially parallel to a resting surface (3). A slide (20) is coupled in a slidable way to the guide element (10) for preserving a freedom of translation (5) with respect to said element. A first platform (31) and a second platform (32) are mounted on the slide (20) so as to preserve a second freedom of rotation (4B), respectively, about a second axis of rotation (52) and a third axis of rotation (53) substantially parallel to one another. Said platforms (31) and (32) are mounted on the slide (20) so as to preserve also a third freedom of rotation (4C), respectively, about a fourth axis of rotation (54) and a fifth axis of rotation (55). The device (1) further comprises elastic means (81, 82A, 82B, 83A, 83B) interposed for counteracting the freedom of translation of the slide (10) and the freedom of rotation of the guide element (10) and of the two platforms (31, 32).

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TRAINING DEVICE

DESCRIPTION

The present invention relates to a training device to be used for training in the activity of skiing and more in particular for learning and perfecting the techniques necessary for the speciality of slalom.

As is known, amongst the various alpine-skiing disciplines, slalom is certainly one of the most difficult to practise since it entails learning a particular technique. The basic feature of this technique consists in applying different levels of pressure on the skis to control the direction and acceleration. In practice, the skier exerts a certain pressure on the internal edge of the ski so that this will assume a curvature inwards, which enables the skier to change direction. In order to make a turn during a descent, the skier hence has to apply weight on the outer ski, at the same time taking weight off the inner one. Once the turn has been completed, the skier can advantageously repeat the process in the other direction, thus turning in the opposite direction. The radius and speed at which the turn is made depend upon the inclination, the pressure exerted on the skis, and obviously the conditions of the snow.

As is evident from what has been mentioned above, acquisition and maintenance of the technique calls for a lot of practice and a continuous training aimed not only at keeping the body muscles reactive, but above all at maintaining a correct position during slalom. For this reason, training devices have been developed the main purpose of which, at least in the intentions, is to enable the skier to maintain and/or improve his technique above all in those periods of the year in which it is evidently not possible to train on ski slopes, for example, on account of the lack of snow.

The above training devices, at least in their essential form, comprise a supporting structure, mounted on which are two mobile platforms, which define a resting surface for the feet of a user. Usually, the platform is rendered mobile through a plurality of kinematic chains that allow one or more degrees of freedom, with respect to the structure, in order to enable the skier to simulate some of the movements typical of slalom.

The patent application no. US 4342453 provides a first example of these devices traditionally used for off-slope training of skiers. In its essential structure, the device in question comprises a pair of ski-shaped elements supported at the back by an adjustable support and at the front by a slide rendered mobile along a horizontal guide. The adjustable support provides an inclination upon the ski-shaped elements such that it basically simulates a slope, whilst reaching of the end-of-travel position by the slide has the aim – or at least this is the intention, though not

satisfactorily realized – of enabling the user to simulate the position for performing the turn.

The device just described presents evident functional limits in so far as its structure is rather "rigid" since its parts are provided with an insufficient number of degrees of freedom to reproduce correctly the position that a skier has to assume during slalom. In particular, since the guide is clearly horizontal, it does not enable the skier to incline his legs correctly with respect to his trunk when the slide reaches the end-of-travel position. In fact, on account of the structural constraints to which they are subjected, the ski-shaped elements assume the same inclination, so "inducing" the skier to apply thereon identical pressures. Basically, during exercise, said device does not enable the skier to exercise properly in changing inclination of his legs, i.e., in performing the movement that he has to perform during slalom to make two turns in succession.

The patent application No. US 4880226 relates, instead, to a training device, which comprises a frame that defines an opening set inside which is a supporting disk. The latter is suspended from the frame by means of a plurality of elastic springs and comprises a pair of openings aimed at receiving platforms, which are shaped like a sole and are able to rotate about an axis parallel to the direction in which the platforms themselves develop. A parallelogram linkage is provided underneath the disk between the two platforms in order to enable them to move simultaneously. The device is completed by a damping element connected between the disk and the platforms in order to provide a force of contrast that opposes rotation of the platforms. From the functional standpoint, this device affords the user a greater number of degrees of freedom as compared to the device of the previous example, in particular favouring lateral displacements and front and rear inclinations of the trunk.

It is precisely the possibility of inclining the body backwards with respect to the vertical that in effect represents a drawback for the user since it induces him to assume a "sitting" position, which is notoriously the source of falls during slalom. Basically, through this device the skier can in effect exercise some joints of his legs, but he certainly can not train to assume the correct position necessary for performing turns, in so far as the device does not stimulate the inclination of a slope in a well-defined way, so leaving the skier with the job of having to do it by inclining his trunk forwards. The use of the quadrilateral linkage for connecting the two platforms together imposes on the platforms the need to assume the same position in all cases. As in the case of the previous example, this structural constraint does not allow the user to assume the most correct positions to perform change of slope. If, in fact, on the one hand, the modern technique of skiing requires a parallelism between the skis (evaluated with respect to

an axis orthogonal to the plane of sliding of the skis), on the other hand it in any case requires the user to incline the skis differently along their longitudinal axis. In the example cited, this latter possibility is evidently not allowed.

The patent applications Nos. US 5374228 and US 5496239 relate to a second type of training devices for skiers. In particular, said devices basically comprise, a frame, which supports a pair of ski-shaped elements, the rear ends of which rest on a mobile support set slidably on a curved guide defined by a rear part of the frame. The front ends of the ski-shaped elements are, instead, pivoted on a front support that is physically connected to the rear one to complete the frame. At each end of the curved guide ,a grip is provided to be gripped by the user once he places his feet on the ski-shaped elements. The user, exploiting the grips and the mobile support, pushes himself alternately from one end to the other of the curved guide, simulating, also in this case, a turn to the right and a turn to the left.

It has been seen that said latter devices, in most of the variant embodiments thereof, are partially effective only for muscular training, but disadvantageously lead the athlete to assume, during exercise, a position that is quite distant from the ideal one for slalom. In particular, when training with these devices, the skier is frequently tempted to move along the curved guide by exploiting not only his legs but also his arms in view of the inviting position of the grips. This is in marked contrast with what is required for making a descent on a ski run, where the skier grips the sticks, which purely have the purpose of providing a rest, given that displacement should be determined exclusively by movement of the legs and by inclination of the trunk.

The above type of devices moreover tends disadvantageously to "direct" the athlete towards a lateral sliding that is too accentuated during simulation of the turn, basically accustoming him to concentrating on the torsion of his legs to create sliding instead of focusing his attention on shifting his weight from one leg to the other when curving.

On the basis of what has been described up to now, it emerges clearly how the devices traditionally used for off-slope training of skiers do not allow the latter to maintain and/or improve their slalom technique. In particular, it is evident how known devices do not put the user in the conditions of simulating the execution of the turn correctly, i.e., of assuming the correct inclination of his feet and legs. Basically, the traditional devices can be defined as normal gym-training equipment, which enable a skier to keep his lower limbs trained or to strengthen some of their muscles, but are such as not to enable the skier at all to maintain, correct, and/or improve the technique demanded by the discipline of slalom.

Consequently, the main task of what forms the subject of the present invention is to provide a training device for skiing that enables the drawbacks referred to above to be overcome.

In the framework of this task, a purpose of the present invention is to provide a training device for skiing that enables the user to learn, maintain, correct, and/or improve the slalom technique.

A further purpose of the present invention is to provide a training device for skiing that will enable a user to practice assuming correct inclinations of his feet and legs in conformance with the ones required by slalom techniques.

Not the least important purpose of what forms the subject of the present invention is to provide a training device for skiing that is reliable and relatively easy to produce at competitive costs.

The above task, as well as the above and other purposes, which will emerge more clearly in the course of the ensuing description, are achieved through a training device for skiing that is characterized in that it comprises:

- a guide element turning mounted on a supporting structure, which defines a resting surface for the training device, said guide element defining an axis of translation for a slide slidably coupled thereto and being mounted on the supporting structure so as to preserve a first freedom of rotation about a first axis of rotation substantially parallel to the resting surface, said slide being coupled in a slidable way to the guide element for preserving a freedom of translation in the two directions of the axis of translation defined by the guide element;
- first elastic means, operatively set between the supporting structure and the guide element for counteracting said first freedom of rotation;
- second elastic means, operatively set between the guide element and the slide for counteracting the freedom of translation of the slide along the guide element;
- a first platform and a second platform, mounted on the slide (in such a way as) so as to preserve with respect thereto a second freedom of rotation, respectively, about a second axis and a third axis of rotation which are substantially parallel to one another and orthogonal to the axis of translation, said platforms being moreover mounted on the slide in such a way that each of them can preserve, with respect to the same slide, a third freedom of rotation, respectively, about a fourth axis and a fifth axis substantially parallel to one another and orthogonal to the aforesaid second and third axes of rotation; and
- third elastic means, operatively connected between the platforms and the slide so as to contrast the aforesaid second freedom of rotation and third freedom of rotation.

The structure of the training device according to the invention advantageously enables a dual motion of the slide, added to which is a dual movement of rotation of the platforms mounted on the slide itself to provide a rest for the user's feet. The dual motion of the slide is obtained through just one guide element mounted on the supporting structure so as to enable inclination during translation of the slide in order to provide a further movement to force the user to incline his legs and feet accordingly. Said dual motion of the slide in fact enables the user to exercise on changes of slope that are constantly present during a descent in particular during slalom. The two platforms, by advantageously preserving two degrees of freedom of rotation with respect to the slide, enable the user to incline his feet in a different way similar to what he is forced to do during slalom for exerting different pressures on the skis, i.e., for correctly making a turn.

Further characteristics and advantages of the invention will emerge more clearly from the description of preferred, but non-exclusive, embodiments of the training device according to the invention, illustrated by way of non-limiting example in the annexed plate of drawings, in which:

- Figure 1 is a first front view of a first embodiment of a training device according to the present invention;
- Figure 2 is a first lateral view of the training device illustrated in Figure 1;
- Figure 3 is a first plan view of the training device illustrated in Figures 1 and 2;
- Figure 4 is a second front view that illustrates some degrees of freedom of the training device according to the invention illustrated in Figures 1 to 3;
- Figure 5 is a second side view that illustrates other degrees of freedom of the training device according to the invention illustrated in Figures 1 to 3; and
- Figure 6 is a second plan view that illustrates further degrees of freedom of the training device according to the invention illustrated in Figures 1 to 3.
- Figure 7 is a further plan view of a second embodiment of a training device according to the present invention;

With reference to the aforesaid figures, the training device 1 according to the invention is characterized in that it comprises a supporting structure 2, which defines a resting surface 3 for the device 1 itself. A guide element 10 is turning mounted on the supporting structure 2 at a pre-set height H, from the resting surface 3, so as to define a rectilinear axis of translation 11 for sliding of a slide 20 coupled to said guide element 10. More precisely, the slide 20 is coupled so as to preserve a freedom of translation 5 in the two directions defined by the first

axis of translation 11 (see Figure 4). That wants to indicate the possibility for the slide 20 to displace from one end to the other of the guide element 10 i.e., from right to left and vice versa. The guide element 10 is mounted on the supporting structure 2, in the proximity of its middle part, so as to preserve, with respect to the structure itself, a first freedom of rotation 4A about a first axis of rotation 51 substantially parallel to the aforesaid resting surface 3 (see Figure 2). In particular, said freedom of rotation 4A is expressed in the two directions, this meaning that it can occur both in a clockwise direction that in a counterclockwise direction.

The training device 1 comprises first elastic means 81 operatively set between the supporting structure 2 and the guide element 10 to counteract said first freedom of rotation 4A. With reference to Figure 4, the first elastic means 81 cause, according to their rigidity and operative position, rotation 4A of the guide element 10 between two end positions. In particular, they are placed so ad to limit rotation 4A of the guide element 10 to a first oscillation in a clockwise direction 8A and to a second oscillation in a counterclockwise direction 8B with an amplitude equal to the first oscillation 8A.

The training device 1 according to the invention further comprises second elastic means 82, operatively set between the guide element 10 and the slide 20 in order to contrast the freedom of translation 5 of the latter. More precisely, the second elastic means 82 are arranged in such a way as to limit translation of the slide 20 between two opposite end-of-travel positions, at the same time preventing the slide 20 from coming into contact with the terminal parts of the guide element 10.

With reference to Figures 1 and 4, a first platform 31 and a second platform 32 are mounted in an independent way on the slide 20 to provide a support surface for the user's feet. In order to perform this function, each platform 31 and 32 comprises a plane surface 33, which is designed to simulate the plane surface of the skis. In a possible embodiment, this plane surface can be integrated with an attachment for "ski boots", in order to enable the user to practice on the training device 1 with the same boots that he normally wears during on-slope activity.

In particular, the first platform 31 and second platform 32 are mounted so as to preserve, with respect to the slide 20, a second freedom of rotation 4B (see Figure 6), respectively, about a second axis of rotation 52 and a third axis of rotation 53, which are parallel to one another and orthogonal to the axis of translation 11 of the slide 20 (see Figure 1). The first platform 31 and the second platform 32 are likewise mounted on the slide 20 so as to preserve, once again with respect to the latter, a third freedom of rotation 4C, respectively, about a fourth axis of rotation 54 and a fifth axis of rotation 55, which are substantially parallel to one another and

orthogonal to said second axis of rotation 52 and to said third axis of rotation 53 (see Figures 3 and 4). Preferably, but not exclusively, said fourth axis 54 and fifth axis 55 are substantially orthogonal also to said axis of translation 11.

The training device 1 further comprises third elastic means 83A, 83B, which are set between the two platforms 31 and 32 and the slide 20 in order to contrast the second freedom of rotation 4B and third freedom of rotation 4C allowed to the platforms themselves. More precisely, the third elastic means 83A, 83B have the function of bringing the two platforms 31 and 32 back into a position of equilibrium with respect to the slide 20. Said position of equilibrium is to be considered as a position preferably assumed by the two platforms 31 and 32 when the training device is not being used.

With reference to Figures from 4 to 6, operation of the training device 1 can be readily understood. Once the user has placed his feet on the two platforms 31 and 32, he exerts (by inclining his feet and pushing his legs) a pressure on the platforms themselves in order to move the slide 20 towards one end of the guide element 10. On account of the first freedom of rotation 4A, the guide element 10 turns about the first axis of rotation 51, consequently inclining the axis of translation 11 in the direction of the resting surface 3. The user follows the slide 20 in its movement, further inclining his legs and feet until a first end-of-travel position is reached. At this point, the user moves his legs back to displace the slide 20 towards the opposite end of the guide element 10, thus basically adapting his legs, feet, muscles, and joints to a change of slope corresponding to the one that he has to tackle during a slalom descent. It has been seen that the continuous repetition of this movement enables the user to "memorize" the positions to be assumed during slalom, so improving his subsequent on-slope performance to a really appreciable extent.

According to a preferred embodiment of the invention, the training device 1 advantageously comprises connection means 38 for connecting the two platforms 31 and 32 together in such a way that rotation of the first platform 31 about the second axis of rotation 52 will bring about a corresponding rotation of the second platform 32 about the third axis of rotation 53 parallel, as has been said, to the second axis 52. In other words, the connection means 38 have the purpose of keeping the two platforms 31e 32 parallel to one another during their rotation about the aforesaid second axis of rotation 52 and third axis of rotation 53 in order to train the user to keep his feet, and consequently his skis, parallel during the descent, as is required in particular in modern slalom techniques.

With reference to Figures 2 and 6, in order to increase further the effectiveness and

functionality of the training device 1, the guide element 10 is preferably mounted on the supporting structure 2 so as to preserve also a fourth freedom of rotation 4D, with respect to the structure itself, about a sixth axis of rotation 56 substantially orthogonal to the aforesaid resting surface 3. In other words, in this operative configuration, the guide element 10 can rotate with respect to the supporting structure 2 both with respect to the first axis of rotation 51 and with respect to the sixth axis of rotation 56, which is substantially orthogonal to said first axis of rotation 51. In addition, in said configuration, the device 1 comprises also fourth elastic means 84 (see Figure 2) operatively set between the supporting structure 2 and the guide element 10 so as to contrast the fourth freedom of rotation 4D allowed to said guide element 10.

This further possibility of rotation allowed to the guide element 10, combined with the action performed by the fourth elastic means 84, enables the guide element 10 to move, with respect to the resting surface 3, describing oscillations substantially on two planes by virtue of the combination of the first freedom of rotation 4A with the fourth freedom of rotation 4D. From the kinematic standpoint, when the user moves the slide 20 towards one of the ends of the guide element 10 (for example, in the direction indicated by the arrow 5A of Figure 6), he also causes inclination of said guide element 10 towards the resting surface 3 (rotation about the first axis 51). At the same time, however, the guide element 10 and the slide 20 are induced to incline "forwards" as a result of the fourth freedom of rotation 4D about the sixth axis 56. In other words, this further freedom of rotation 4D allowed to the guide element 10, i.e., to the slide 20, enables the user to reproduce in a faithful way the movements that he has to perform during slalom in the proximity of a stake that delimits the slalom ski run.

In order to increase the functional versatility of the training device 1, the latter advantageously comprises adjustable inclination means 9, which enable variation, when the device is not being used, of the inclination of the two platforms 31 and 32 with respect to the resting surface 3 and in particular the inclination of the plane surface 33 of said platforms. In other words, said adjustable means 9 enable an initial set-up of the training device 1 in order to enable the user to establish *a priori* the inclination of the plane surface 33 of the platforms 31 and 32 selecting a more or less accentuated inclination according, for example, to the characteristics of the slope on which the user will actually have to make the slalom descent. As specified more clearly hereinafter and according to a preferred embodiment, the adjustable-inclination means 9 perform their function, enabling a rotation of the guide element 10 about an axis substantially parallel to the axis of translation 11.

In an alternative embodiment, the adjustable inclination means 9 could, for example, enable a variation of the inclination of the resting surface 3 and/or of the inclination of the two platforms 31 and 32 with respect to the slide 20.

Figures 1 and 2 are, respectively, a front view and a side view of a training device 1 according to the present invention and show a possible embodiment of the guide element 10. In particular, this comprises a connection bracket 48, which enables connection thereof to the supporting structure 2 and supports one or more rectilinear guides 41, 42 that basically define the direction of the axis of translation 11. According to the embodiment illustrated in Figure 3, the guide element 10 comprises in a specific way a first guide 41 and a second guide 42 arranged parallel to one another and axially blocked in a position corresponding to their ends through a first flange 44A and a second flange 44B, each of which is in turn connected to a terminal portion 49 (Figures 1 and 4) of the connection bracket 48.

With reference in particular to Figures 2 and 5, the aforesaid adjustable inclination means 9 are operatively set between the terminal portions 49 of the connection bracket 48 and the flanges 44A and 44B of the guide element 10 in order to enable inclination of the guide element 10 with respect to the bracket itself, i.e., with respect to the supporting structure 2 connected thereto. More in particular, the adjustable inclination means 9 perform their function by enabling a rotation of the guide element 10 about an axis substantially parallel to the axis of translation 11, as indicated clearly by the arrow (with reference 18) in Figure 5. In this figure, the guide element 10 is represented in two possible operative configurations both considered with the device stationary. The first configuration (represented with a solid line) is distinguished by a substantially horizontal arrangement of the guide element 10, whilst the second (represented with a dashed line) shows the same element 10 inclined with respect to the horizontal position. From the practical standpoint, the adjustable means 9 hence enable choice of the inclination of the guide element 10, and consequently of the slide 20 and of the platforms 31 and 32, in a range of possible angles defined between an initial position and a position of maximum inclination. Said choice is to be considered precisely as an operation of setting up the training device 1, which is carried out prior to use thereof.

With reference in particular to Figures 1 and 4, the connection device 1 according to the invention can advantageously comprise also resting means 19 set between the supporting structure 2 and the guide element 10 to render more stable the movement to which the same guide element 10 is subject as a result of rotation about the first axis of rotation 51 and about the sixth axis of rotation 56. As illustrated in said Figures 1 and 4, said resting means 19

preferably comprise a pair of guides 19A connected to the supporting structure 2 on opposite sides with respect to the first axis of rotation 51 or the sixth axis of rotation 56. Each of these guides 19A defines a track for a rolling element 19B, such as, for example, a wheel, associated to a bottom part of the connection bracket 48 opposite to a top part, associated to which are the rectilinear guides 41 and 42. Each rolling element 19B, by rolling on a corresponding guide 19A, increases the stability of movement, at the same time providing a further point for discharging the stresses to which the guide element 10 is subjected.

Figures 1 and 4 likewise show a possible embodiment of the first elastic means 81, which preferably comprise a pair of elastic dampers, which emerge from the supporting structure 2 on opposite sides with respect to the first axis of rotation 51 of the guide element 10. As highlighted in particular in Figure 4, said damping elements enable the guide element to rotate in a symmetrical way about the first axis of rotation 51 basically describing opposite oscillations, but ones of the same amplitude. In particular, the amplitude of the oscillations is an inverse function of the rigidity of the dampers, and increases as said rigidity decreases.

Obviously, to be considered as falling within in the scope of the inventive idea is the possibility of using other elastic elements functionally equivalent to the dampers described, as likewise the possibility of said dampers to be such as to enable once again oscillations in the two directions, however, ones of different amplitude.

The guide element 10 is mounted on the supporting structure 2 via interposition of a connection arm 6 particularly visible in Figure 2. The supporting arm 6 comprises a first end 6A and a second end 6B, which are operatively connected to the supporting structure 2 and to the guide element 10 through the hinge pairs. In greater detail, the first end 6A is hinged to a terminal portion 7A of a leg 7 of the supporting structure 2 so as to define the sixth axis of rotation 56. The second end 6B is, instead, kinematically coupled to the connection bracket 48 through a hinge articulation in order to define the first axis of rotation 51. This latter coupling is performed in a position corresponding to the middle of the connection bracket 48 so as to enable a symmetrical positioning of the guide element 10 about the first axis of rotation 51.

According to a preferred embodiment of the invention, the slide 20 comprises a plurality of sliding bushings 21, each kinematically coupled to one of the rectilinear guides 41, 42 of the guide element 10. The slide 20 moreover comprises a plane plate 27, which is operatively connected to the bushings 21 to define a surface 13 of attachment for the two platforms 31 and 32 (see Figure 2). In greater detail, in the embodiment illustrated in the figures, the slide 20 comprises a first pair of bushings 21A, kinematically coupled to the first rectilinear guide 41

and mutually connected together through a first plate 71. A second plate (not visible) connects, instead, one to another a second pair of bushings 21B, which are kinematically coupled to the second rectilinear guide 42. Said plates have the function of supporting the plate 27, which defines the resting surface 13 for the platforms and constitute advantageously a technological solution that renders the structure of the slide 20 particularly "light". Said structure could in any case assume other functionally equivalent configurations, all of which are hence to be considered as falling within the scope of the same inventive idea.

Figure 3 likewise shows a possible configuration of the second elastic means 82A,82B prearranged for limiting movement of the slide 20 between two end-of-travel positions. In particular, said means preferably comprise a pair of elastic ropes 82A connected to said slide 20 on opposite sides. In particular each of said elastic ropes 82A connects said slide 20 to one of the two flanges 44A,44B designed to block the two rectilinear guides 41 and 42 axially. By this layout, the elastic ropes 82A perform an action of contrast against the translation movement of the slide 20. According to a preferred embodiment, the second elastic means also comprise a pair of helical springs 82B, each of which associated to one of the two flanges 44A and 44B. Each helical spring 82B is arranged so as to surround (along its length) one of the two rectilinear guides 41 and 42. In this way, the helical springs 82B can perform an action of damping on the movement of the slide 20, preventing the latter from striking alternately the two flanges 44A, 44B.

With reference now to Figure 4, the first platform 31 and the second platform 32 both comprise a first portion 45 coupled to the plane plate 27 through a first hinge connection. Said coupling physically defines the second axis of rotation 52 for the first platform 31, whilst in the case of the second platform 32 it defines the third axis of rotation 53 thereof. Each of the two platforms 31 and 32 likewise comprises a second portion 46 mobile with respect to the first portion 45 through a second hinge connection, which defines the fourth axis of rotation 54 in the case of the first platform 31 and the fifth axis of rotation 55 in the case of second platform 32.

According to this particular constructional configuration, the third elastic means comprise a first pair of elastic elements 83A, each of which is set between a first portion 45 of one of the platforms 31 and 32 and the plane plate 27 (see Figure 1). Said elastic elements 83A could be each constituted by a tension spring anchored at one end thereof to a platform 31 or 32 and at the opposite end to the plate 27. In this way, each elastic element 83A exerts on the first portion 45 of one of the platforms 31 or 32 a contrast force that tends to bring the platform

back into a position of equilibrium with respect to the plate 27, as could be, for example, the one illustrated in Figure 1.

As already mentioned above, advantageously set between the two platforms 31 and 32 are connection means 38, which have the function of mutually constraining the platforms 31 and 32 in such a way that their rotation about the second axis of rotation 52 and the third axis of rotation 53, respectively, is synchronous. In the configuration illustrated, said connection means 38 are constituted by a pair of parallel rods, which connect the first portion 45 of the first platform 31 to the corresponding first portion 45 of the second platform 32. In accordance with the purposes referred to above, the use of the two rods keeps the rotation of the two platforms effectively synchronous, thus training the user to maintain his feet, and consequently his skis, parallel.

Once again with reference to the configuration illustrated in the figures, the third elastic means likewise comprise a second pair of elastic elements 83B, such as, for example, a pair of torsion springs, each of which is set between a first portion 45 and a second portion 46 of one of the platforms 31 and 32 (see Figure 2). Each of the latter elastic elements 83B has the function of counteracting the third freedom of rotation 4C of one of the two platforms 31 or 32, exerting a force of contrast on its second portion 46, which tends to bring it back into a position of equilibrium with respect to the first portion 45 (see once again, by way of example, the position illustrated in Figure 1). Hence, as is clearly evident, each of these second elastic elements 83B acts in an independent way on one of the two platforms 31 and 32, enabling the user to apply different loads thereon similar to what he is forced to do on the skis.

Once again according to a preferred embodiment, the training device 1 according to the invention comprises a mobile rod 99 simulating a stake moved through a drawing mechanism 95, operatively associated to the mobile slide 20. In particular, the drawing mechanism 95 acts so as to enable the stake 99 to assume a first position, when the slide 20 reaches, in its translation, an end-of-travel position, and a second position, when the guide element 10 assumes a position such that the axis of translation 11 is substantially parallel to the resting surface 3. In particular, the two positions assumed by the stake 99 are defined by the ends of a guide 92, mounted on the supporting structure 2 so as to face the resting surface 3 in order to define a direction of sliding 12 (see Figure 6) substantially orthogonal to the axis of translation 11 when the latter is considered in a position parallel to said resting surface 3.

The presence of this mobile stake 99 bestows, in fact, a further functionality upon the training device 1 in so far as it allows the latter to reproduce in a way that is even more adherent to

reality what occurs during slalom. In fact, the drawing mechanism 95 acts so as to bring the stake 99 up to the user in the same way in which the latter would approach a stake set on a slalom ski run. Consequently, when the slide 20 reaches an end-of-travel position, the stake 99 is located at the minimum distance from the user's legs (first reference position) and provides a useful reference to the latter for controlling, correcting, learning and keeping the correct position of his feet and legs. Instead, when the slide 20 is located in a central position (i.e., when the element 10 is substantially parallel to the resting surface 3), then the stake 99 is located at the maximum distance from the guide element 10, i.e., from the user's legs (second reference position).

In greater detail, the drawing mechanism 95 comprises an elastic member 102 which is connected at one of its end to the stake 99 and at another end to a fixed point of the structure support (2). This fixed point can be formed, for example, by a protrusion of the guide 92 (see figure 3) or alternatively by another part of the supporting structure 2 (for example the grips following described). The elastic member 102 performs a continuous action on the stake 99 to bring back the same from the first towards the second reference position.

In a first possible embodiment, the drawing mechanism 95 comprises a round bar 93, for example, made of metal material, which is bent so as to describe substantially a semicircle. Said round bar 93 comprises a first end 93A and a second end 93B, which are connected to the slide 20 on opposite sides considered along the direction of the axis of translation 11 (see plan view of Figure 3). The stake 99 comprises a grooved pulley 97, prearranged for being coupled in a slidable way to the round bar 93 and such as to be operatively located within the semicircle defined by the round bar 93. Operation of the drawing mechanism 95 can be understood from the plan view of Figure 6, marked in which are (with a dashed line) two opposite positions, with respect to the drawing axis 12, assumed by the round bar 93 following upon two corresponding opposite positions assumed by the slide 20. In practice, since the round bar 93 is fixed with respect to the slide 20, it follows the movement thereof by drawing, as a result of its semicircular shape, the stake 99 in the drawing direction 12 between the first and second positions defined by the ends of the guide 92.

In an alternative embodiment (shown in figure 7), the drawing mechanism 95 comprises a flexible cord 106 which replace functionally the round bar 93 of the previous embodiment. For this reason opposite ends 106A,106B of the flexible cord 106 are connected to the slide 20 on opposite sides considered along the direction of the axis of translation 11. A cross plate 108 is connected to the guide 92 so as to be substantially perpendicular to the direction of sliding 12

of the stake 99. A pair of rollers 109 are mounted on opposite sides of the cross plate 108 so as to provide bending point for the flexible cord 106. In particular the rollers 109 have the function to maintain stretched the cord 106 when the slide 20 moves towards one of its end position (corresponding to the first reference position of the stake 99). By its configuration, the flexible cord 106 draws the stake 99 from the second to the first reference position moving directly the grooved pulley 97 when the slide 20 moves between its end positions.

With reference in particular to Figures 1 and 4, the training device 1 according to the invention advantageously comprises a first grip 64A and a second grip 64B designed to be gripped by the user during use of the device itself. In particular, said grips 64A, 64B have the function of simulating what is normally allowed by the sticks used by a skier for maintaining equilibrium during descent on the ski run. The grips 64A, 64B are each defined at a top end of a first rod 65 and of a second rod 65B connected to the supporting structure 2 in such a way as to develop according to a direction substantially orthogonal to the resting surface 3. More precisely, the rods 65A, 65B are connected to the supporting structure 2 in an adjustable way in order to vary the height H1 of the grips according to the requirements. In the solution illustrated, for example, the bottom end of each rod 65A, 65B is telescopically inserted in a seat defined by a hollow support associated to the supporting structure 2.

With reference to Figure 2, each rod 65A, 65B is bent at the top in such a way that the grips 64A, 64B are inclined with respect to the vertical. This characteristic is advantageous in training the user to maintain a position of his body projecting forwards, which is indispensable during descent in order to prevent falls due to his centre of gravity remaining too far back. Obviously, falling within the scope of the inventive idea is the possibility of making the rods 45 vertical throughout their length, as likewise the possibility for the latter not to be adjustable in height.

The training device described clearly presents a prevalently mechanical structure, which could, however, be integrated by an electronic component in a further embodiment. In fact, the training device could comprise a plurality of sensors designed to generate a series of signals that are to be sent to a control unit. These signals could regard, for example, positions, speeds or forces assumed or performed by the mobile parts of the training device 1 and, once processed by the control unit, could advantageously provide useful information on the angles of inclination or the efforts exerted by the user during the exercise. Simultaneously, the control unit could also be used in a more complex control, for example aimed at use of a virtual display that stimulates a slalom ski run. The control unit could likewise enable an automatic movement

of the reference stake 99 to provide an alternative embodiment to the drawing system described above.

The technical solutions adopted for the training device according to the invention enable the pre-set tasks and purposes to be fully achieved. In particular, the device proves particularly effective by virtue of its structure, which enables a user to learn, improve, and practice the technique necessary for skiing and in particular the one linked to the discipline of slalom. The training device 1 enables the user to train and particularly to train his legs to the change of slope by correcting possible setting errors. The training device thus conceived proves moreover particularly reliable by virtue of its structure made up of a relatively contained number of elements that can be readily assembled together at contained costs.

In practice, the materials used, as well as the corresponding dimensions and shapes, may be any whatsoever according to the requirements and the state of the art.

CLAIMS

1. A training device (1) for skiing, characterized in that it comprises:
   - a guide element (10) turning mounted on a supporting structure (2), which defines a resting surface (3) for said device (1), said guide element (10) defining an axis of translation (11) for a slide (20) coupled thereto in a slidable way, said guide element (10) being mounted on said supporting structure (2) so as to preserve a first freedom of rotation (4A), with respect to said supporting structure (2), about a first axis of rotation (51) substantially parallel to said resting surface (3), said slide (20) being coupled in a slidable way to said guide element (10) for preserving a freedom of translation (5) in the two directions defined by said axis of translation (11);
   - first elastic means (81), operatively set between said supporting structure (2) and said guide element (10) for counteracting said first freedom of rotation (4A);
   - second elastic means (82), operatively set between said guide element (10) and said slide (20) for counteracting said freedom of translation (5) of said slide (20);
   - a first platform (31) and a second platform (32), mounted on said slide (20)so as to preserve, with respect to said slide (20), a second freedom of rotation (4B), respectively, about a second axis of rotation (52) and a third axis of rotation (53) substantially parallel to one another and orthogonal to said axis of translation (11), said platforms (31) and (32) being mounted on said slide (20) in such a way that each of them preserves, with respect to said slide (20), a third freedom of rotation (4C) respectively about a fourth axis of rotation (54) and a fifth axis of rotation (55) substantially parallel to one another and orthogonal to said third axis of rotation (53) and to said fourth axis of rotation (54); and
   - third elastic means (83A, 83B) operatively, set between said platforms (31, 32) and said slide (20) so as to counteract said second freedom of rotation (4B) and said third freedom of rotation (4C) of said platforms (31, 32).
2. The training device (1) according to Claim 1, characterized in that said first elastic means (81) are prearranged between said guide element (10) and said supporting structure (2) so as to limit said freedom of rotation (4A) of said guide element (10) to a first oscillation in a clockwise direction (8A) and to a second oscillation in a counterclockwise direction (8B).
3. The training device (1) according to Claim 2, characterized in that said second elastic

means (82A,82B) are prearranged between said slide (20) and said guide element (10) so as to limit the translation of said slide (20) between two opposite end-of-travel positions.

4. The training device (1) according to one or more of Claims 1 to 3, characterized in that said third elastic means (83A, 83B) are prearranged between said platforms (31, 32) and said slide (20) in such a way as to bring each of the two platforms (31, 32) back into a pre-set position of equilibrium with respect to said slide (20).

5. The training device (1) according to one or more of Claims 1 to 4, characterized in that it comprises connection means (38) for connecting said platforms (31, 32) together in such a way that a rotation of the first platform (31) about said second axis of rotation (52) will bring about a corresponding rotation of said second platform (32) about said third axis of rotation (53)

6. The training device (1) according to one or more of Claims 1 to 5, characterized in that said guide element (10) is mounted on said supporting structure (2) so as to preserve a fourth freedom of rotation (4D), with respect to said supporting structure (2), about a sixth axis of rotation (56) substantially orthogonal to said resting surface (3), said training device (1) comprising fourth elastic means (84) operatively set between said guide element (10) and said supporting structure (2) so as to counteract said fourth freedom of rotation (4D) about said sixth axis of rotation (56).

7. The training device (1) according to one or more of Claims 1 to 6, characterized in that said guide element (10) is mounted on said supporting structure (2) through the interposition of adjustable inclination means (9), which enable variation of the inclination, with respect to said resting surface (3), of said first platform (31) and said second platform (32) when said device (1) in not being used.

8. The training device (1) according to one or more of Claims 1 to 7, characterized in that it comprises a connection bracket (48), operatively connected to said supporting structure (2), said connection bracket (48) supporting one or more rectilinear guides (41, 42) parallel to one another which define said direction of translation (11).

9. The training device (1) according to Claim 8, characterized in that said guide element (10) comprises a first rectilinear guide (41) and a second rectilinear guide (42) parallel to one another and axially blocked in a position corresponding to their ends through a first flange (44A) and a second flange (44B), each of which is in turn connected to a terminal portion (49) of said connection bracket (48).

10. The training device (1) according to Claim 9, characterized in that said adjustable inclination means (9) are operatively set between said terminal portions (49) of said connection bracket (48) and said flanges (44A, 44B) to enable a rotation of said rectilinear guides (41, 42) about an axis substantially parallel to said axis of translation (11).

11. The training device (1) according to one or more of Claims 8 to 10, characterized in that it comprises resting means (19) set between said supporting structure (2) and said guide element (10) for rendering the movement of said guide element (10) more stable.

12. The training device (1) according to Claim 11, characterized in that said resting means (19) comprise a pair of guides (19A), connected to said supporting structure (2) and such as to define a track for a rolling element (19B) connected to said connection bracket (48).

13. The training device (1) according to one or more of Claims 1 to 12, characterized in that it comprises a connection arm (6) set between said supporting structure (2) and said guide element (10).

14. The training device (1) according to Claim 13, characterized in that said connection arm (6) comprises a first end (6A) and a second end (6B), operatively connected to said supporting structure (2) and to said guide element (10) through hinge pairs, said first end (6A) being hinged to a terminal portion (7A) of a leg (7) of said supporting structure (2) to define said sixth axis of rotation (56), said second end (6B) being connected to said connection bracket (48) to define said first axis of rotation (51).

15. The training device (1) according to one or more of Claims 8 to 14, characterized in that said slide (20) comprises a plurality of sliding bushings (21A, 21B) each kinematically coupled to one of said rectilinear guides (41, 42), said slide (20) comprising a plane plate (27) operatively connected to said plurality of sliding bushings (21A, 21B), said plane plate (27) defining an attachment surface (13) for said first platform (31) and for said second platform (32).

16. The training device according to Claim 15, characterized in that said slide (20) comprises a first pair of sliding bushings (21A) kinematically coupled to said first rectilinear guide (41) and connected together by a first plate (71), said slide (20) comprising a second pair of bushings (21B) kinematically coupled to said second rectilinear guide (42) and connected together by a second plate, said first plate (71) and said second plate supporting said plane plate (27).

17. The training device (1) according to one or more of Claims 8 to 16, characterized in that said second elastic means (82A,82B) comprise a pair of elastic ropes (82A) connected to said slide 20 on opposite sides, each of said elastic ropes connecting said slide (20) to one of the said flanges (44A,44B),said second elastic means comprising a pair of helical springs (82B), each associated to one of said flanges (44A, 44B) in such a way as to surround one of said rectilinear guides (41, 42).

18. The training device (1) according to Claim 15 or Claim 16, characterized in that said first platform (31) and said second platform (32) each comprise a first portion (45) coupled to said plane plate (27) through a first hinge connection, each of said platforms (31, 32) comprising a second portion (46) coupled to said first portion (45) through a second hinge connection, said first hinge connection of said first platform (31)/second platform (32) defining said second axis of rotation (52)/third axis of rotation (53), said second hinge connection of said first platform (31)/second platform (32) defining said fourth axis of rotation (54)/fifth axis of rotation (55).

19. The training device (1) according to Claim 18, characterized in that said connection means (38) connect to one another said first portion (46) of said first platform (31) and of said second platform (46), said third elastic means (83A, 83B) comprising at least one first pair of elements (83A), each set between a first portion (41) of one of said platforms (31, 32) and said plane plate (27), said third elastic means (83A, 83B) comprising at least one second pair of elements (83B), each set between a first portion (45) and a corresponding second portion (42) of one of said platforms (31, 32).

20. The training device (1), according to one or more of Claims 1 to 19, characterized in that it comprises a stake (99) moved through a drawing mechanism (95) operatively associated to the mobile slide (20), said mobile stake (99) assuming a first reference position when said slide (20) reaches an end-of-travel position, said mobile stake (99) assuming a second reference position when said guide element (10) assumes a position such that said first axis of translation (11) sets itself substantially parallel to said resting surface (3).

21. The training device (1) according to Claim 20, characterized in that it comprises a guide (92) mounted on said supporting structure (2) so as to face said resting surface (3) to define a direction of sliding (12) substantially orthogonal to said axis of translation (11) when said axis of translation (11) is considered in a position substantially parallel to said resting surface (3), said guide (92) being delimited by two

opposite ends that define said first reference position and second reference position assumed by said stake (99).

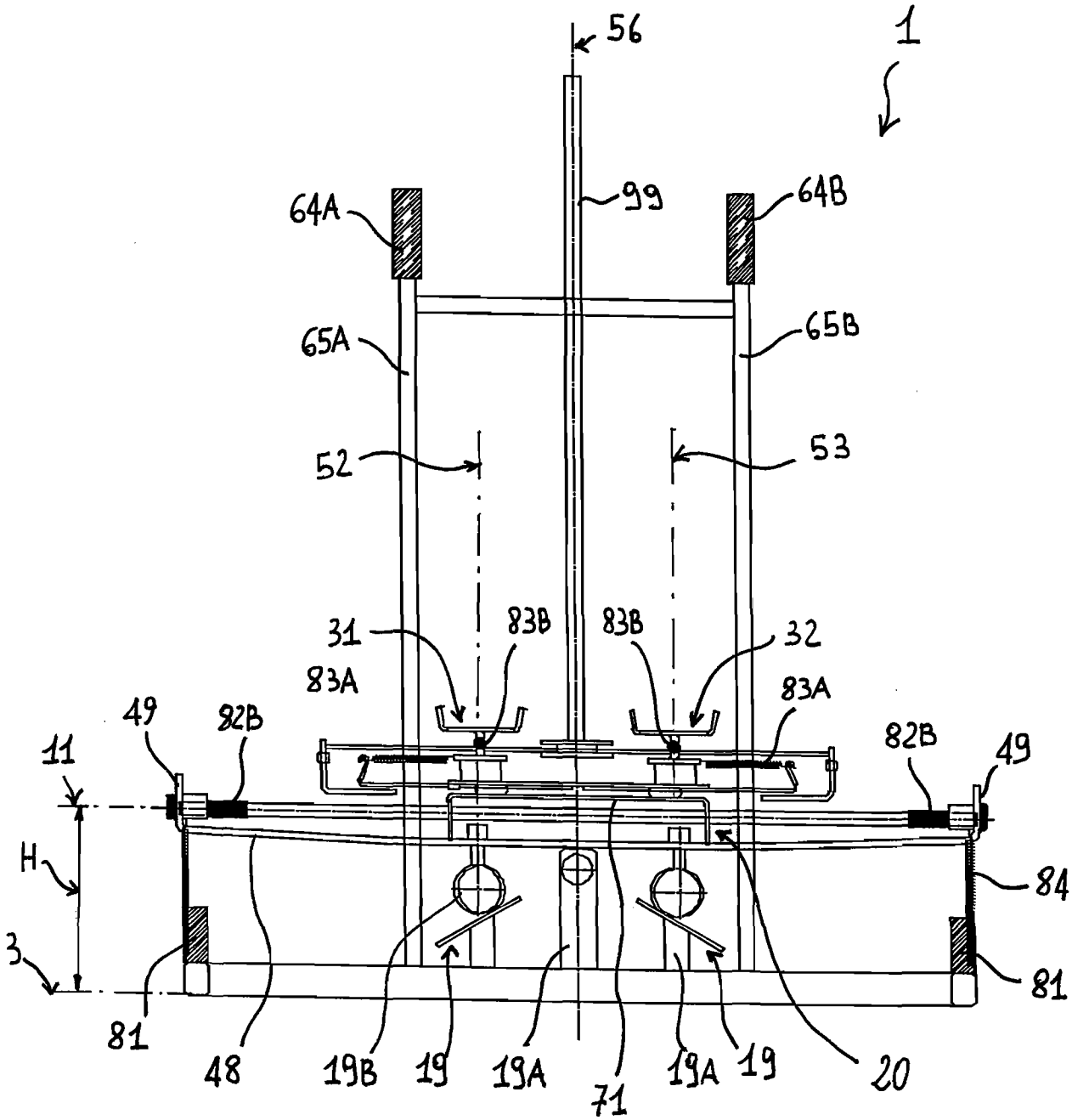
22. The training device (1) according to Claim 21, characterized in that said first reference position corresponds to a position such that said stake (99) is located to a minimum distance from said guide element (10), said second reference position corresponding to a position such that said stake (99) is located at a maximum distance from said guide element (10).

23. The training device (1) according to Claim 21 or Claim 22, characterized in that said drawing mechanism (95) comprises a round bar (93) bent so as to describe substantially a semicircle, said round bar (93) comprising a first end (93A) and a second end (93B) connected to the slide (20) on opposite sides considered along said first axis of translation (11), said stake (99) comprising a grooved pulley (97) prearranged for coupling slidably with said round bar (93), said grooved pulley (97) being operatively located within the semicircle defined by said round bar (93), which draws said stake (99) along said guide (92) following upon displacement of said slide (20) along said axis of translation (11).

24. The training device (1) according to one or more of the preceding claims, characterized in that it comprises a first grip (64A) and a second grip (64B) aimed at being gripped by the user during use of said device (1).

25. The training device (1) according to Claim 24, characterized in that each of said grips (64A, 64B) is defined, respectively, at a top end of a first rod (65A) and a second rod (65B) connected to said supporting structure (2).

26. The training device (1) according to Claim 24 or Claim 25, characterized in that said rods (65A, 65B) are connected to said supporting structure (2) so as to develop in a direction substantially perpendicular to said resting surface (3), said rods (65A, 65B) being connected to said supporting structure (2) in an adjustable way in order to vary the height of said grips (64, 64B) with respect to said resting surface (3).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3
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20

Fig. 1

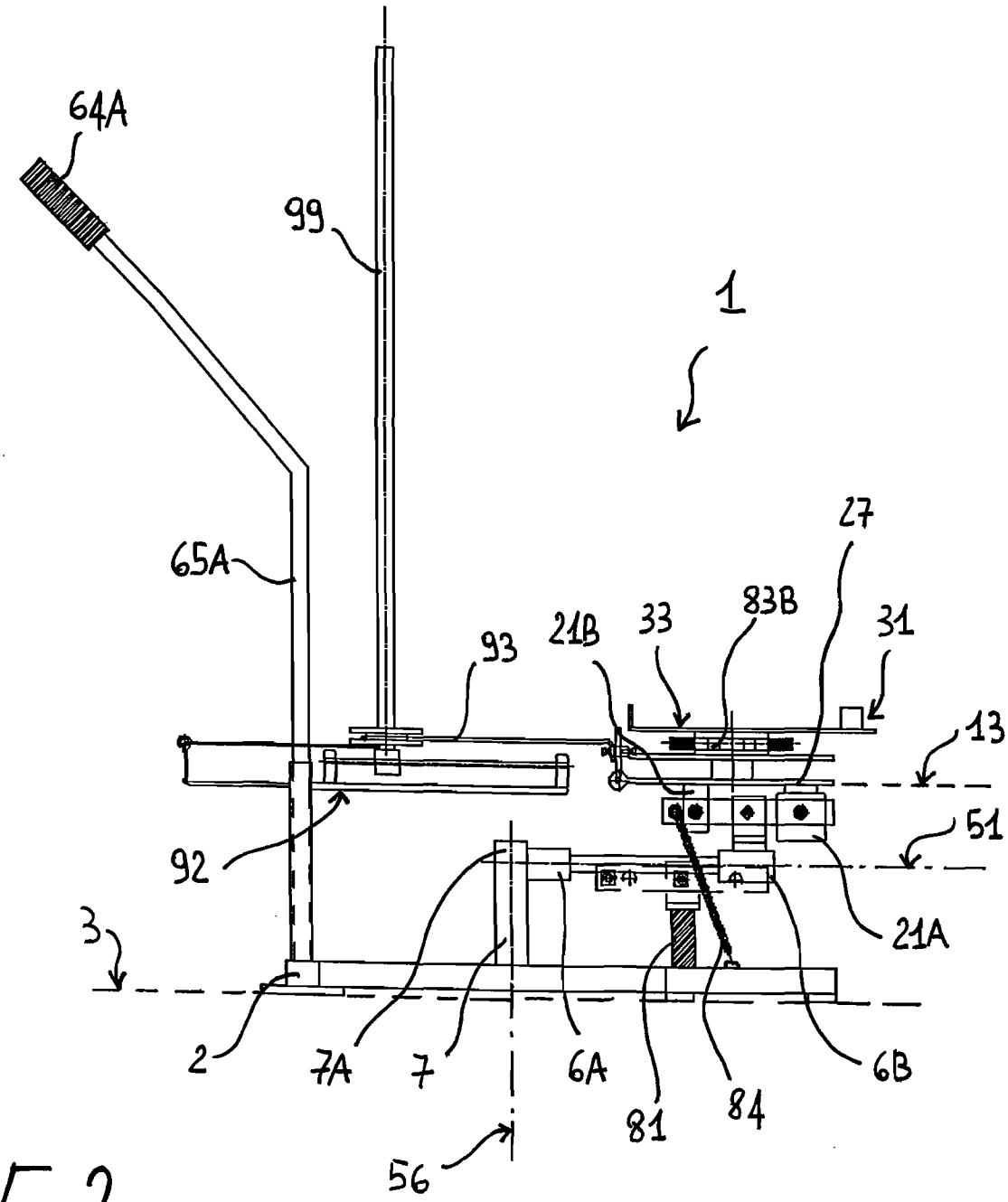
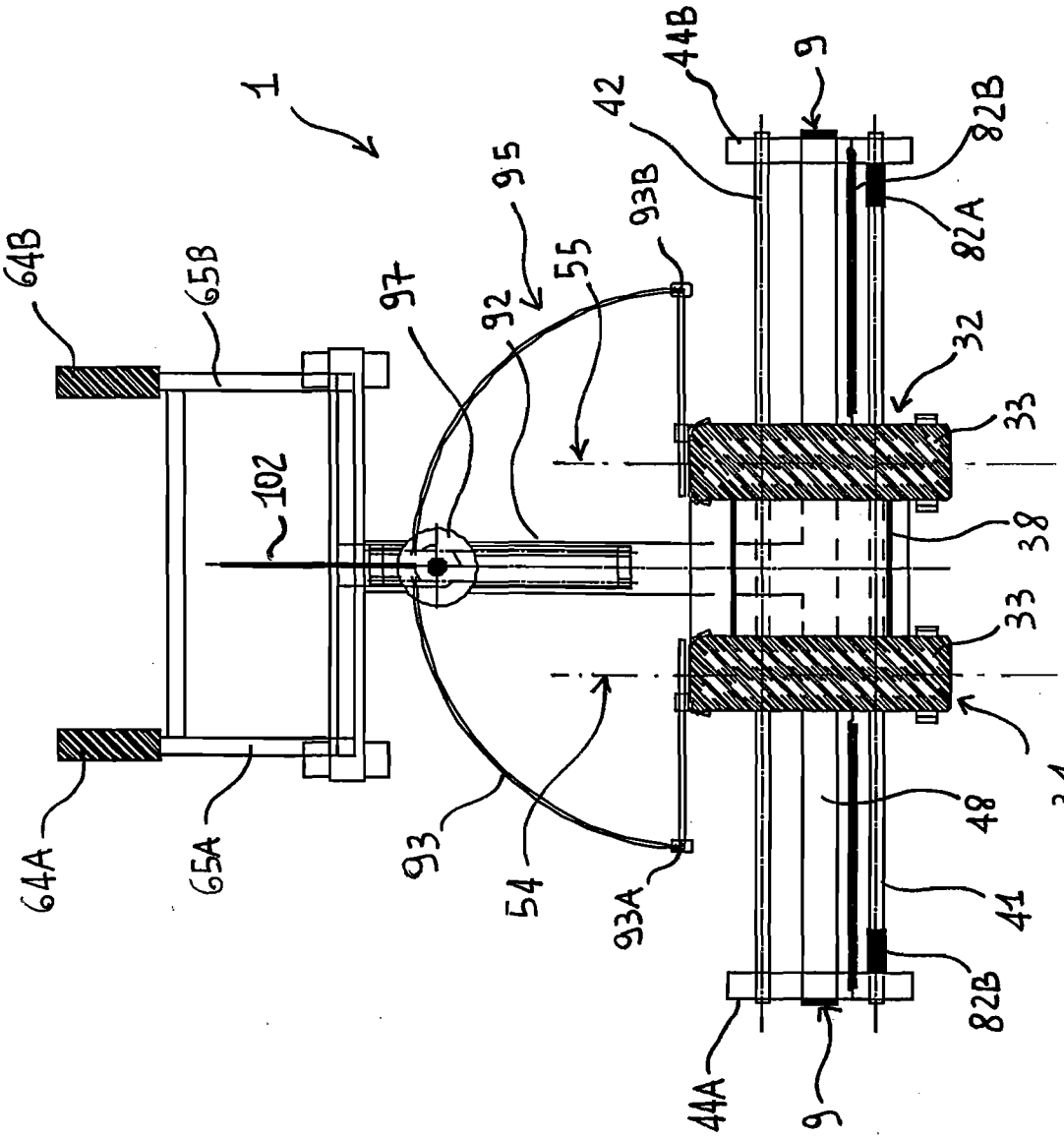


Fig. 2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44A
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93
65A
64A
102

Fig. 3

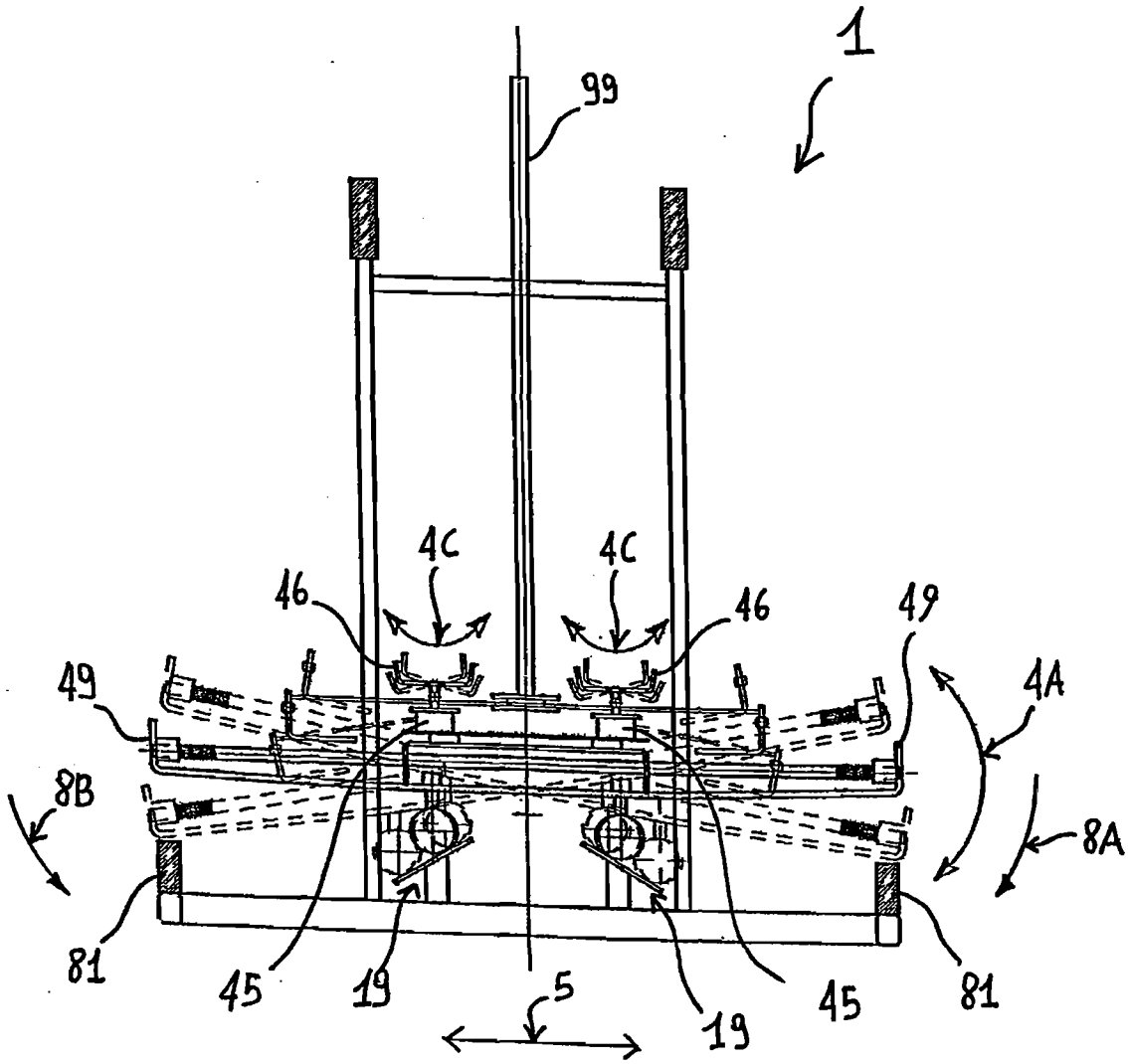


Fig. 4

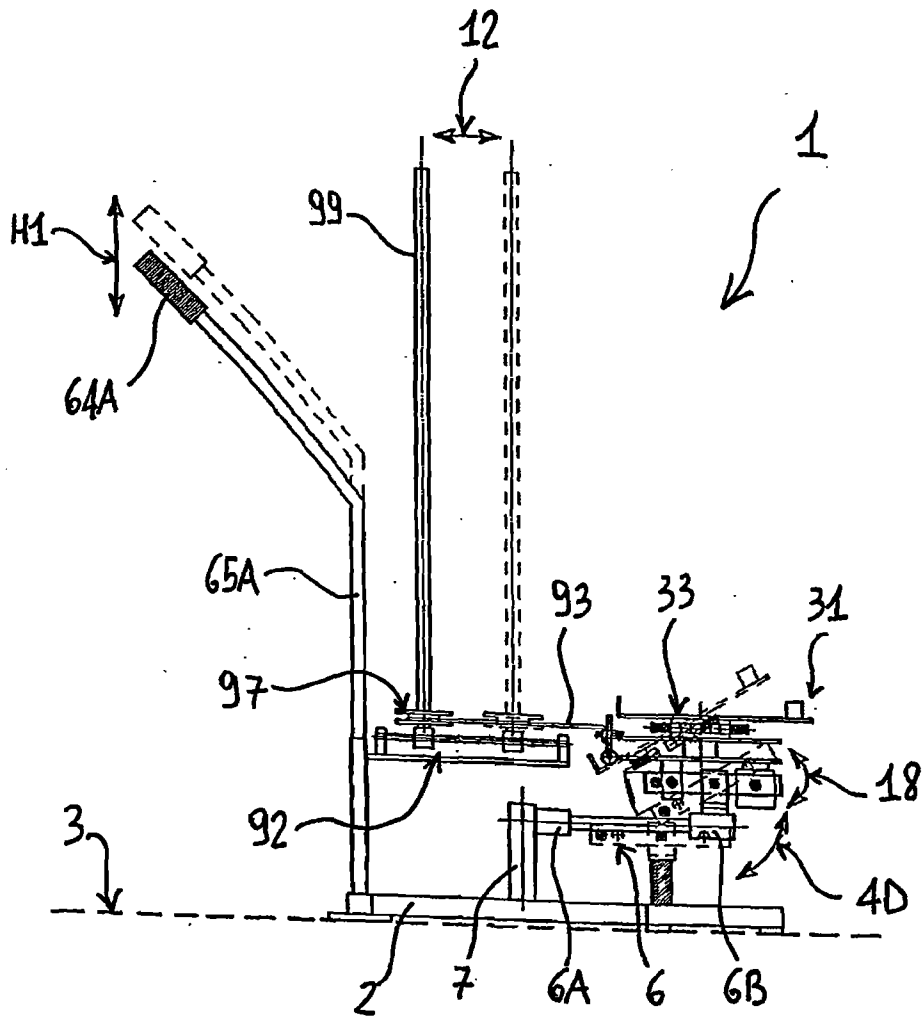


Fig. 5

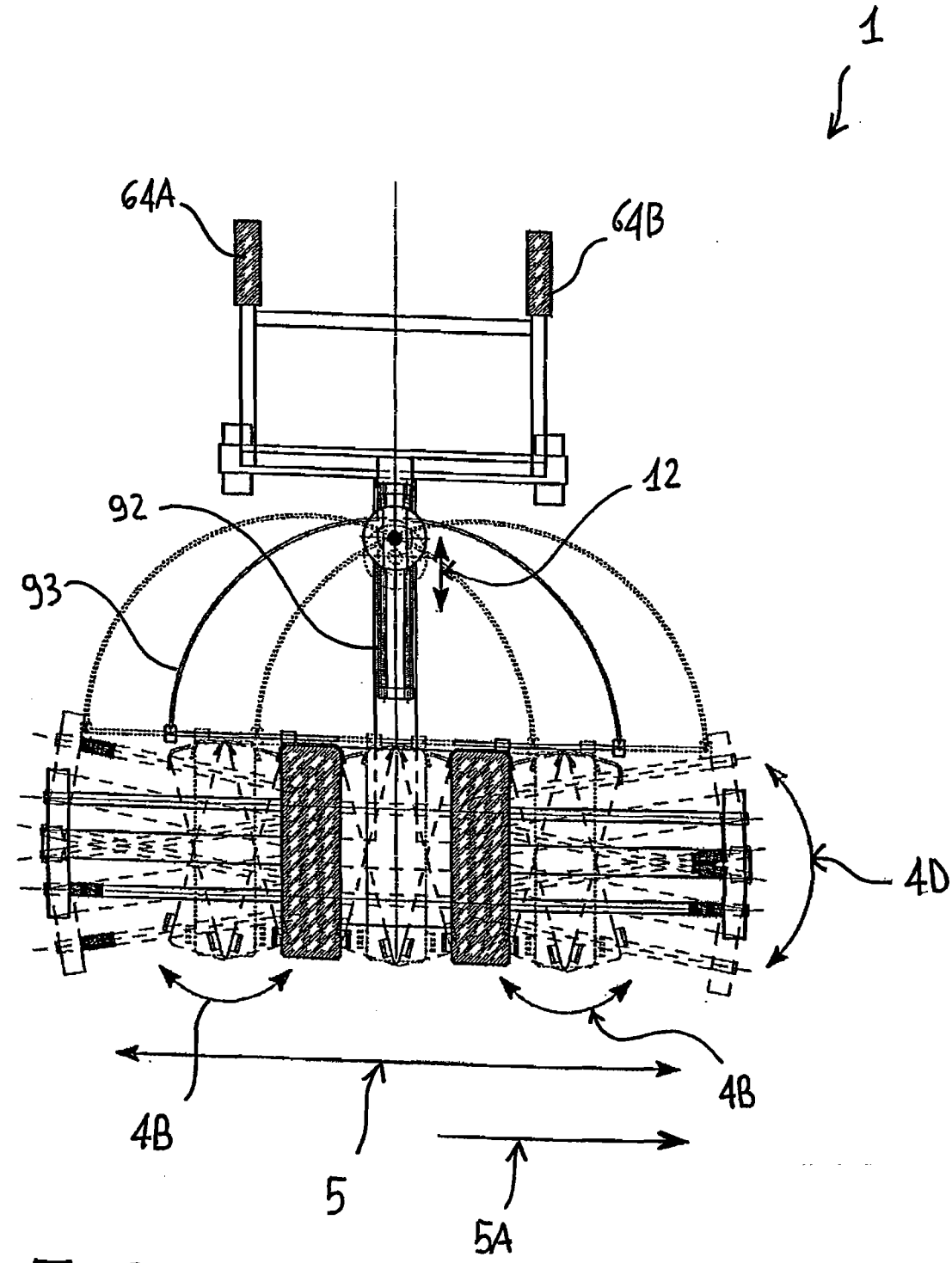
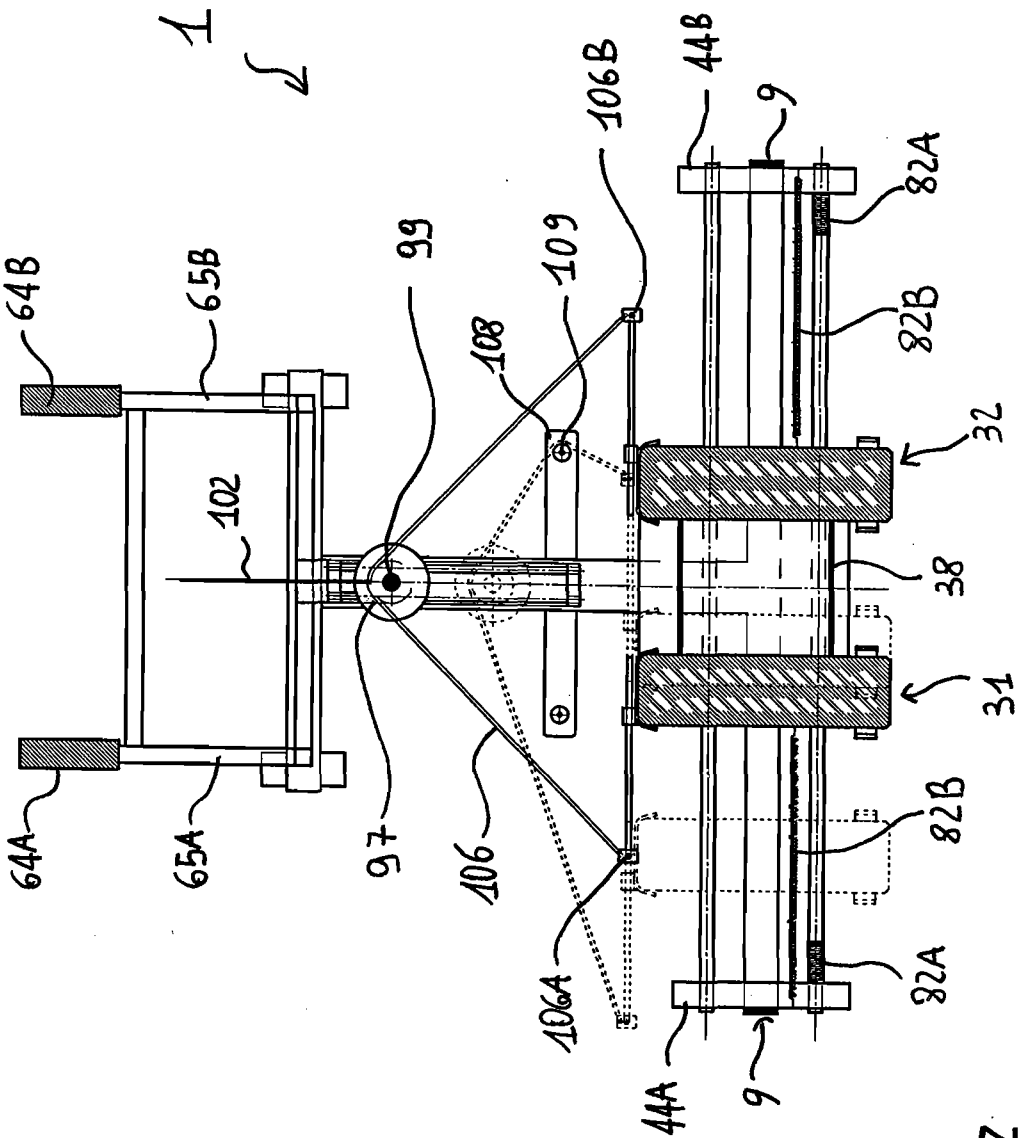


Fig. 6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44A
9

Fig. 7

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2006/069867

A. CLASSIFICATION OF SUBJECT MATTER
INV. A63B69/18 A63B23/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A63B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 912 260 A (RICE WALTON M) 14 October 1975 (1975-10-14)	1-4, 6-19, 24-26
Y	column 4, line 1 - column 8, line 23 column 13, line 59 - column 16, line 12; figures	5,10,20
Y	US 2004/014569 A1 (LOANE R JOEL [US]) 22 January 2004 (2004-01-22) page 11, paragraph 148 - paragraph 149; figure 6	5
Y	US 5 496 239 A (KALLMAN ROBERT [US] ET AL) 5 March 1996 (1996-03-05) cited in the application column 6, line 56 - line 63; figures	10

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 July 2007	02/08/2007

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Squeri, Michele

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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2006/069867

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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