(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number : **0 519 762 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number : **92305728.5**

(22) Date of filing : **22.06.92**

(51) Int. Cl.[5] : **A61H 3/00,** A63B 69/00

(30) Priority : **20.06.91 SU 494357**

(43) Date of publication of application :
23.12.92 Bulletin 92/52

(84) Designated Contracting States :
AT BE CH DE DK ES FR GB GR IT LI LU MC NL PT SE

(71) Applicant : **Gross, Yaak Arturovich**
Kvartira 110, Taamsaretee, 103
Tallinn, Estonia (SU)

(71) Applicant : **Gross, Jukhan Arturovich**
Kvartira 208, ulitsa Ljublinskaya, 59
Moscow (SU)

(72) Inventor : **Gross, Yaak Arturovich**
Kvartira 110, Taamsaretee, 103
Tallinn, Estonia (SU)
Inventor : **Gross, Jukhan Arturovich**
Kvartira 208, ulitsa Ljublinskaya, 59
Moscow (SU)

(74) Representative : **Godwin, Edgar James**
MARKS & CLERK 57-60 Lincoln's Inn Fields
London, WC2A 3LS (GB)

(54) A training device.

(57) The invention relates to medical technology.

The training device comprises a system of safety belts (1), adapted to be fixed to the body of a patient (2) connected by means of an articulated arm mechanism (3) with a safety cable (4) connected with a support (5) overhead. The support (5) comprises two parallel longitudinal guides (6 and 6′) and a transverse guide (7) movably connected with the longitudinal guides (6, 6′) and provided with a movable link (8) adapted to move along the guide (7). The cable (4) is connected with the movable link (8) and comprises an elastic member (9) having adjustable elasticity.

The training device is designed for rehabilitation of the disabled suffering from the dysfunction of the locomotive apparatus, but can also be used for training purposes for sports such as figure skating.

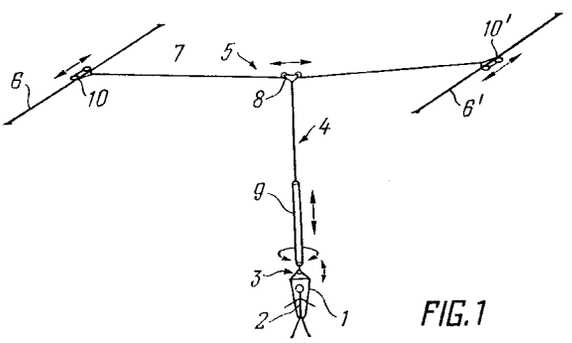

FIG.1

EP 0 519 762 A1

The invention relates to medical technology and can be used to vary the conditions of rehabilitation after injury or disease of the locomotive apparatus as well as for the purposes of the figure skating, ballet, circus an hockey to practise multi-revolution vaults, supports, rotation and other complex figures.

At present in order to restore the locomotive apparatus disabled people ususally use such commonly accepted devices as crutches and wheeled carriages propelled by human power.

These devices require much effort from the user and as a result place load on the shoulder and spinal column, which bring about rapid fatigue. Besides, they restrict movement of the body and arms.

Application of an upward force to the body will help to avoid these shortcomings. This principle is implemented in training devices employed for practising multi-revolution vaults and other complex figures in the figure skating and other sports.

Physiologically rehabilitation after injury and disease of the locomotive apparatus is similar to the process of forming locomotive patterns and improving physique in sports training. This prompts the use of training devices to facilitate movement of the disabled and do physical exercises to promote rehabilitation after injury and disease of the locomotive apparatus. An essential condition in this case is the possibility of controlling the load depending on the degree of dysfunction of the locomotive apparatus.

Known in the art is a training device comprising a safety belt to be fixed to the body, a safety cable fixed to the belt, and a pulley-block fixed overhead, the loose end of the safety cable being slipped through the pulley-block and held by another man who controls the cable tension and, thus, the load on the locomotive apparatus. (A.N.Mishin, Pryzhki v figurnom katanii - Figure Skating Vaults, Moscow, "Fizkultura i sport", 1976, p. 56).

This technical solution practically precludes any movement of the user and load adjustment by another man. Besides, since the safety cable is fixed to the safety belt the equilibrium requirement is not met and there is a possibility of cable twisting.

Also known in the art is another training device comprising a system of safety belts to be fixed to the body, connected by means of an articulated arm mechanism to the safety cable connected with a support overhead. (Ya.A. Gross, Trenazhery v figurnom katanii (Training Devices in Figure Skating) in the collection "Ispolzovanie netraditsionnyh sredstv i metodov v podgotovke yunykh sportsmenov (The Use of Non-traditional Means and Methods for Training Young Sportsmen)", ed. by V.M. Topchian, "Fizkultura i sport", Moscow, p. 15).

In this device the system of safety belts consists of soft loops holding the hip and shoulders in a criss-cross manner, and is connected to the safety cable by means of an articulated arm mechanism at shoulder width.

The support in the known device has the form of a fishing rod to which the safety cable is fixed and which is held by the second man.

This training device allows the user to move as a result of the second man's movement and turn around, any cable twisting being excluded thanks to the articulated arm connection.

The articulated arm mechanism keeping the belt system at shoulder width does not prevent the user from bending and at the same time maintains the upward force effected by the second man.

However, this device as the previous one requires the second participant. Besides, the load adjustment, especially easy conditions, utterly depends on the power potential of the second man. The known device does not allow to adjust load during the long use of the device since the second man adjusting the load has to constantly watch the user to avoid any hindrance. Load adjustment in this case is quite relative and is entirely impossible when light loads on the locomotive apparatus are required and the user is of heavy weight.

The aim of the invention was to create a training device having such a support and a safety cable which would allow to control the load on the locomotive apparatus without outside help and retaining the upward force.

The essence of the invention consists in that the training device comprising a system of safety belts adapted to be fixed to the body of man, connected by means of an articulated arm mechanism to a safety cable connected with a support overhead, is distinguished in that the support includes two parallel longitudinal guides and a transverse guide connected with the longitudinal guides and adapted to move along them, and provided with a movable link movably mounted on the transverse guide and connected with the cable which includes an elastic member.

The transverse guide may be connected with the longitudinal guides by means of movable links, each being mounted movably on either longitudinal guide and connected with one of the ends of the transverse guide.

It is also possible to connecte the ends of the transverse guide rigidly with the longitudinal guides, each longitudinal guide being made in the form of a closed cable stretched on spaced rotary members.

It will be helpful if the elastic member is made adjustable.

The training device according to the present invention allows to adjust, rather accurately, the load on the user's locomotive apparatus by varying the elasticity of the elastic member, and provides freedom of movement without outside assistance over the space limited only by the dimensions of the guides, the upward loading force being retained.

Further the invention is being disclosed by the de-

scription of preffered embodiments and drawings attached wherein:

Fig. 1 shows an embodiment of the invention comprising a transverse guide connected with the longitudinal guides by means of movable links, and

Fig. 2 shows an embodiment comprising a transverse guide connected rigidly with the longitudinal members.

The embodiment according to Fig. 1 comprises a system of safety belts (1) adapted to be fixed to man's body (2), connected by means of an articulated arm mechanism (3) with a safety cable (4) connected in turn with a support (5) overhead.

The support (5) comprises two parallel longitudinal guides (6, 6′) and a transverse guide (7) connected with the longitudinal guides and adapted to move along them. The transverse guide (7) is provided with a movable link (8) adapted to move along the guide and rigidly connected with one end of the cable (4). The latter comprises an elastic member (9) located on that side where the cable (4) is connected with the articulated arm mechanism (3). In this embodiment the longitudinal guides (6, 6′) have a stretched linear form, for instance, they may be rails, cables or similar parts of a different shape, and are provided at the ends with members (not shown in Fig. 1) for fixing the structure over the floor or ice with the required tension. The transverse guide (7) is similar to the guides (6, 6′) and is connected with them by means of movable links (10, 10′ respectively).

The movable links (8, 10, 10′) may be roller-blocks, each comprising two pairs of rollers adapted to roll along the rail guides, or gear-type members or any other parts ensuring free movement along the guides (6, 6′ , 7) and prompt reaction of the user.

The system of safety belts (1) may vary from a belt and two loops to hold the shoulders to a complex system holding the hip and feet to distribute the compensating force over the whole body of man (2).

In the embodiment described the system of safety belts (1) is made of two flexible loops fixed at the ends of a two-arm member being part of the articulated arm mechanism (3), and holding the hip and shoulders in a criss-cross manner. The length of the member is chosen to equal the user's shoulder width and the axis of rotation of the member is fixed on one of the links of the articulated arm mechanism perpendicular to the axis of rotation of the link. The axis of rotation of the articulated unit of the mechanism, for instance a ball or roller bearing, is positioned vertically given the upward direction of the traction force, the second link of the articulated unit being connected with the safety cable (4).

The elastic member (9) of this embodiment is a set of elastic links which may be springs, rubber bands or the like. The links are connected with the safety cable (4) and the articulated arm mechanism (3) by means of fixing units (not shown on the drawings) which allow to adjust the elasticity of the member (9) by adding or removing them depending on the required load on the locomotive apparatus of the user.

Fig. 2 shows an embodiment which is distinguished from the one according to Fig. 1 in that each of the longitudinal guides (11, 11′) is made as a closed cable stretched on rotable members (12, 12′), for instance, rollers or gears. Both ends of the transverse guide (7) in this case are rigidly connected with longitudinal guides (11, 11′).

The training device according to the present invention is used in the following way.

The longitudinal guides (6, 6′)(Fig. 1) are fixed at the same height above the floor or ice. The guide (7) is mounted on them with the help of movable links (10,10′). A number of elastic links are fitted on the safety cable (4) depending on the required elasticity of the member (9). The load is adjusted with the help of a dynamometer or by using gauged elastic links. In the case when the guide (7) (Fig. 2) is rigidly fixed on the longitudinal guides (11, 11′) the latter are stretched on the rotable members (12, 12′). For instance, in order to create easy conditions, that is, remove 30 per cent of one's weight, a 100 kg man 1.6 m tall will have to use six elastic links 0.6 m long provided that stretching of each elastic link produces the tractive force of 5 kgf when stretched to the working condition (1 m) and the guides (6, 6′) are fixed at 3 m from the floor. When the member (9) is stretched longer than the working condition the upward tractive force grows drastically to create a blocking effect saving from injury in case of falling.

The end of the elastic member (9) is fixed to the articulated arm mechanism (3) with the system of safety belts (1).

Moving in any direction, the man with the system of safety belts (1) (Fig. 1, 2) moves the movable members (8, 10, 10′) along the guides (7, 6, 6′), or the rotable members (12, 12′)(Fig. 2) when the guide (7) is fixed rigidly. The effect of the upward force is retained. When the man moves his body, rotates and jumps with rotation he actuates the articulated arm mechanism (3) (Fig. 1,2). In this case he distributes the upward force over the shoulder width with further re-distribution of it to other parts of the body. Pushing from the floor in a forestalling mode is a prerequisite of the effective operation of the device. The elastic member (9) creates a certain rhythm of movement with a possibility of changing its amplitude. This allows to set the rhythm of walking through minor oscillations. As the locomotive apparatus is recuperating the load is gradually raised to the normal value, that is, the user's weight. The training device ensures safety of any kind of movement and good conditions for equilibrium, which is also essential in the process of rehabilitation. The next stage is the impact load, for instance jumps.

In the process of coaching for sports the assisting

effect of the astic member (9) may amount to 15 to 20 per cent of the user's weight which is quite enough to create conditions favourable for complex figures and vaults. Easy conditions can be ensured for the beginners.

The said training device provides for free movement in any place - an apartment, a hospital, gymnasium or on ice - without outside assistance, retaining the upward force. Besides, the device ensures accurate adjustment of loads on the locomotive apparatus, which creates favourable conditions for rehabilitation after injury or disease of the locomotive apparatus as well as for improving physique and forming new movement patterns.

Claims

1. A training device comprising a system of safety belts (1) adapted to be fixed to the body of man, connected by means of an articulated arm mechanism (3) with a safety cable (4), connected with a support (5) overhead, **characterized** in that the support (5) includes two parallel longitudinal guides (6, 6′) and a transverse guide (7) movably connected with the longitudinal guides (6, 6′) and provided with a movable link (8) adapted to move along it and connected with the cable (4), the latter including an elastic member (9).

2. The training device according to Claim 1, **characterized** in that the transverse guide (7) is connected with the longitudinal guides (6, 6′) by means of movable links (10, 10′) movably mounted on the longitudinal guides (6 and 6′) respectively, each link being fixed to one end of the transverse guide (7).

3. The training device according to Claim 1, **characterized** in that the transverse guide (7) is rigidly fixed at both ends to the longitudinal guides (11, 11′), each of them being made of a closed cable stretched on spaced rotable members (12, 12).

4. The training device according to Claim 1, 2 or 3, **characterized** in that the elastic member (9) is made so that its elasticity can be adjusted.

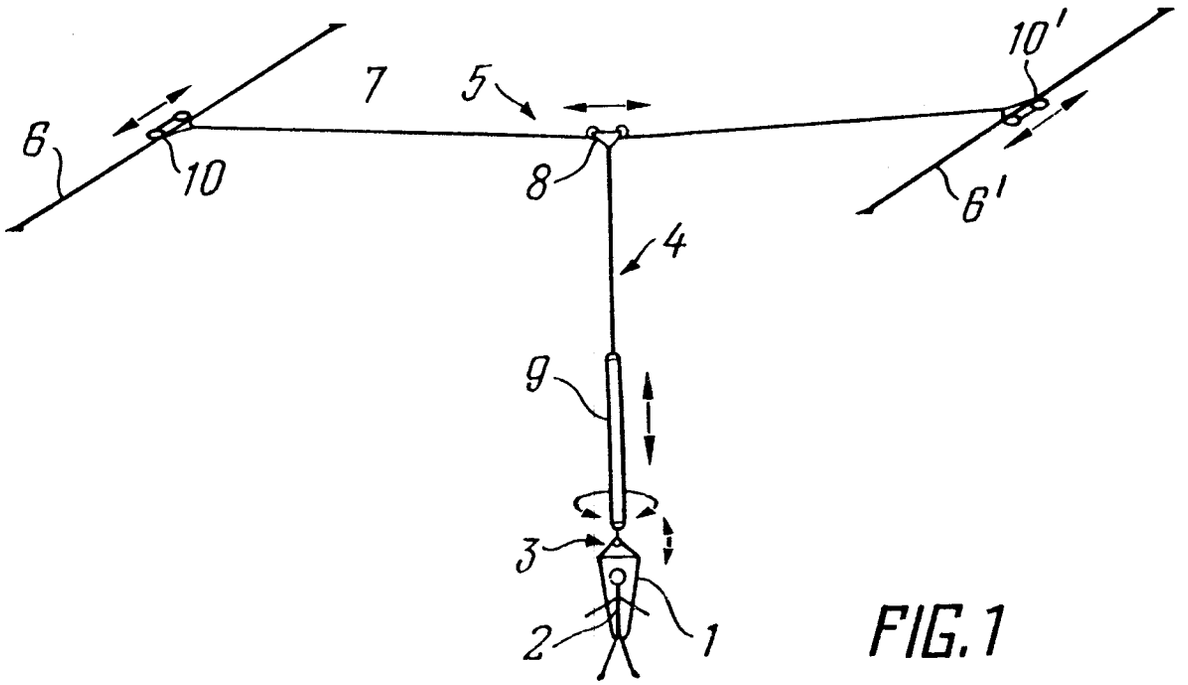

FIG.1

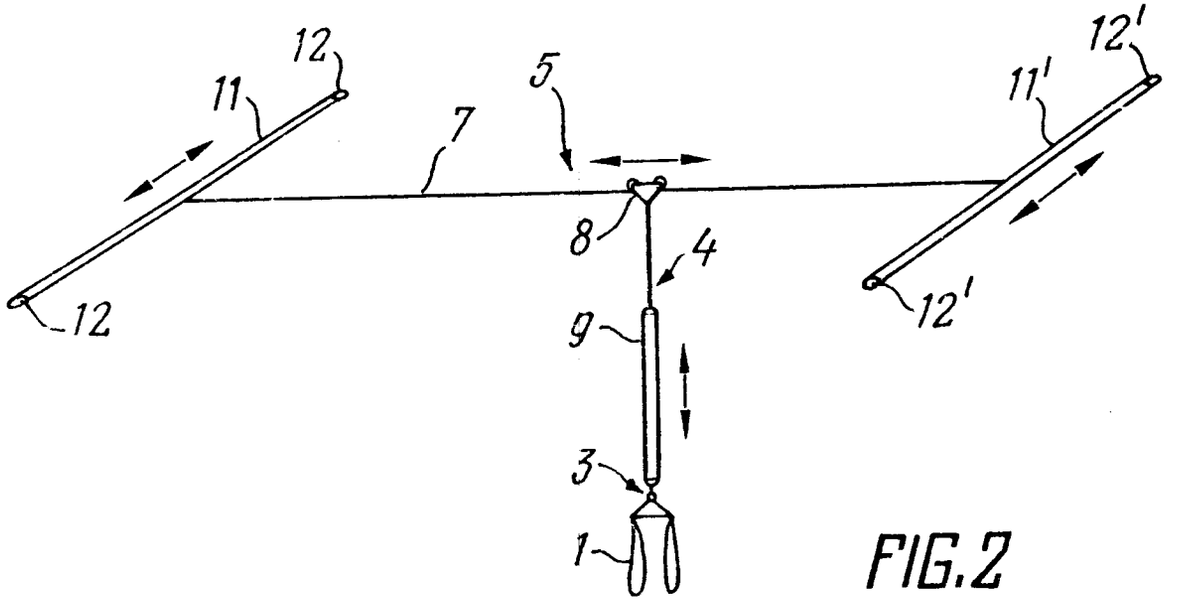

FIG.2

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 92 30 5728

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	US-A-3 761 082 (BARTHEL) * column 7, line 55 - column 8, line 64; figures 2,3,5,8 *	1,2,4	A61H3/00 A63B69/00
X	US-A-3 379 439 (SORENSON ET AL.) * column 2, line 15 - column 3, line 13; figures *	1,2	
A	US-A-4 410 175 (SHAMP) * column 2, line 64 - column 3, line 6; figures *	1	
A	US-A-2 871 915 (HOGAN) * column 2, line 12 - line 28; figures *	3	
A	FR-A-2 506 587 (GARNIER ET AL.) * page 2, line 5 - page 3, line 14; figures 1,2 *	1,2	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

A61H
A63B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	18 SEPTEMBER 1992	MARK JONES

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P0401)