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- (72) Inventor; and
- (71) Applicant : KRÜSSELIN, Michael Nikolaus [CZ/CZ];
Padělky 170, 76317 Lukov (CZ).
- (74) Agent: GÖRIG, Jan; University Institute, Tomas Bata
University in Zlin, Nam. T.G.Masaryka 5555, 76001 Zlin
(CZ).

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(54) Title: SUSPENSION DEVICE FOR TRANSPORTING AND LIGHTENING OF PATIENTS

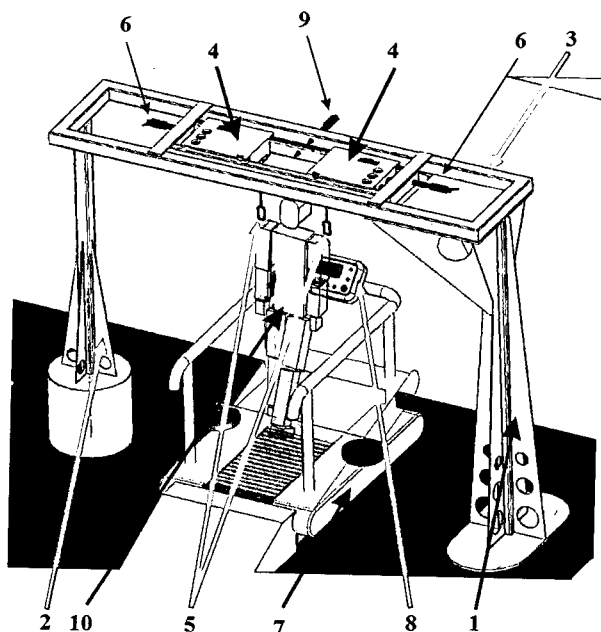


Fig. 1

(57) Abstract: The suspension device for transporting and lightening patients, especially for dynamic relief or static suspension of patients with various types of damage to the locomotor system during therapy on a treadmill or moving walkway is made of at least two winding mechanisms of which each contains a winding drum with pulleys, a suspension rope and a drive with a synchronous servomotor. This servomotor has permanent magnets on the rotor and winding on the stator and can be run alternately in positional and torque mode and is equipped with elements for maintaining constant predefined tension whatever the height of the suspension rope-sling through constant reading of the position of the servomotor axles and subsequent correction of this axle position, responding in tens of milliseconds.



TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, —
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SUSPENSION DEVICE FOR TRANSPORTING AND LIGHTENING OF PATIENTS

Technical field

The invention involves a suspension device for transporting and lifting patients, especially for dynamic relief or static support of patients with various types of damage to the locomotor system during therapeutic movement on a treadmill, walking simulator or other rehabilitation equipment and during transport of patients onto such devices.

Previous state of the technology

Rehabilitation facilities currently lift patients using suspension systems that use weights or manual winding systems to balance the patient's weight.

From Japanese patent 10179559, for example, a suspension device is known for lifting the patient during therapeutic walking on a moving walkway, and it consists of a suspension frame with a pulley system and counterweight. This involves stabilization of the amount of the patient's lifted body weight through constant adjustment of the counterweight. However, here the optimal dynamic relief is not achieved, because this principle displays delayed movement of the counterweight caused by friction and by gravity itself. The dynamic relief reaction is thus delayed and sometimes even conflicts.

Up to now there have been relief/support systems equipped with one or two slings, used for lifting the patient by a purely mechanical principle. Furthermore, in the case of just one sling, the patient has a beam overhead, to which this sling is centrally attached, and two slings on the sides for the shoulders. In that case, it is not possible to suspend and relieve patients in the coronal plane, i.e. patients who are paralysed on one side of the body (e.g. hemiplegia). It is therefore obvious that for this reason the devices cannot be used for this group of patients.

Existing relief/support systems cannot provide dynamic relief for a patient up to 160 kg. Additionally, many have stationary, firmly fixed frames, or frames that slide in only limited fashion and must be moved manually by the operator. This significantly complicates transport of patients with limited movement to rehabilitation facilities and excludes

more universal and effective use of one suspension device for more than one rehabilitation device, such as for a treadmill or moving walkway.

Subject matter of the invention

For removing this deficiency, a significant contribution can be made by suspension devices for transporting and lifting patients according to the invention. The invention is characterized in that the suspension device is created by at least two winding mechanisms, of which each contains a winding drum with pulleys, a suspension rope and a drive with a synchronous servomotor. This servomotor has magnets on the rotor and winding on the stator and can be run alternately in positional and torque mode. It is equipped with elements for maintaining constant predefined tension at any height of the suspension rope sling through continuous reading of the servomotor's axle position and subsequent correction of this axle position with response in tens of milliseconds.

The suspension device's frame may be in the form of a portal rotated around one of its two struts, and the upper ends of these two struts are connected to a horizontal beam. On this horizontal beam, at least two winding mechanisms with suspension ropes and positioning mechanisms are then placed.

The winding mechanisms' positioning mechanisms are preferentially formed by an assembly of at least two lateral displacement mechanisms and at least one correction mechanism, and the winding mechanisms and the mechanisms for their placement are equipped with separately controllable drives. In the preferential arrangement, the entire device is separately controlled in all directions through a touch screen.

The benefit is a special winder drive solution that ensures constant, predefined tension regardless of sling height and a reaction time in the tens of milliseconds to winder over-tension and subsequent correction executed by the correction mechanism. Another benefit of the suspension device for lifting patients according to the invention is characterized in that its frame is designed to rotate, which allows easy transport of the patient to the appropriate rehabilitation equipment and also, when necessary, for the suspension device also to be used for two rehabilitation devices (such as for a treadmill and a moving walkway).

Brief description of the drawing

A more detailed explanation of the invention is provided by the attached drawing, in which Fig. 1 represents a diagram of the device for transporting and lifting patients according to the invention in the exemplary embodiment.

Example embodiment of the invention

The suspension device for transporting and lifting patients in the example embodiment (see Fig. 1) is realized as a device for dynamic relief or static suspension of patients with various types of damage to the locomotor system in vertical position — it can be used, for example, during therapeutic walking on a treadmill⁷ or on a moving walkway. This suspension device consists of a frame 1 a suspension device shaped like a portal that is rotatable around one of its two struts 2, while the upper end of these two struts 2 are connected by a horizontal beam 3. On this horizontal beam 3 are placed two winding mechanisms 4 with suspension ropes 5 for the patient 10 and with the positioning mechanisms 6 and 9 of these winding mechanisms 4. The drive for each of the winding mechanisms 4 contains a servomotor that has magnets on the rotor and winding on the stator and can be run alternately in positional and torque mode and is equipped with elements for maintaining constant predefined tension whatever the height of the suspension rope sling 5 through constant reading of the position of the servomotor axles and subsequent correction of this axle position, responding in tens of milliseconds.

The positioning mechanisms 6 and 9 of the winding mechanisms 4 are made of an assembly of two positioning mechanisms 6 that slide laterally and one correction positioning mechanism 9. The drives of the suspension are independently controllable from a touch screen 8 in all directions.

PATENT CLAIMS

1. Suspension device for transporting and lightening patients, especially for dynamic relief or static suspension of patients with various types of damage to the locomotor system in upright position using a two-point sling characterized in that it is made of at least two winding mechanisms (4), of which each contains a winding drum with pulleys, a suspension rope (5) and a drive with a synchronous servomotor and this servomotor has permanent magnets on the rotor and winding on the stator allowing alternating operation in positioning or torque mode and is equipped with elements for maintaining constant predefined tension whatever the height of the suspension ropes (5) through constant reading of the position of the servomotor axles and subsequent correction of this axle position, responding in tens of milliseconds.
2. Suspension device according to claim 1 characterized in that (1) the suspension device is shaped like a portal rotatable around one of its two struts (2), while the upper ends of these two struts (2) are connected by a horizontal beam (3) and that on this horizontal beam (3) are placed two winding mechanisms (4) with suspension ropes (5) and with positioning mechanisms (6, 9) of these winding mechanisms (4).
3. Suspension device according to claim 2 characterized in that the positioning mechanisms (6, 9) of the winding mechanisms (4) are made of an assembly of at least two mechanisms (6) that slide laterally and at least one correction mechanism (9).
4. Suspension device according to claim 1 characterized in that the winding mechanisms (4) and positioning mechanisms (6, 9) of these winding mechanisms (4) are equipped with separately controllable drives.
5. Suspension device according to claim 4 characterized in that the drives of the winding mechanisms (4) and positioning mechanisms (6, 9) are separately controllable from a touch screen (8) in all directions.

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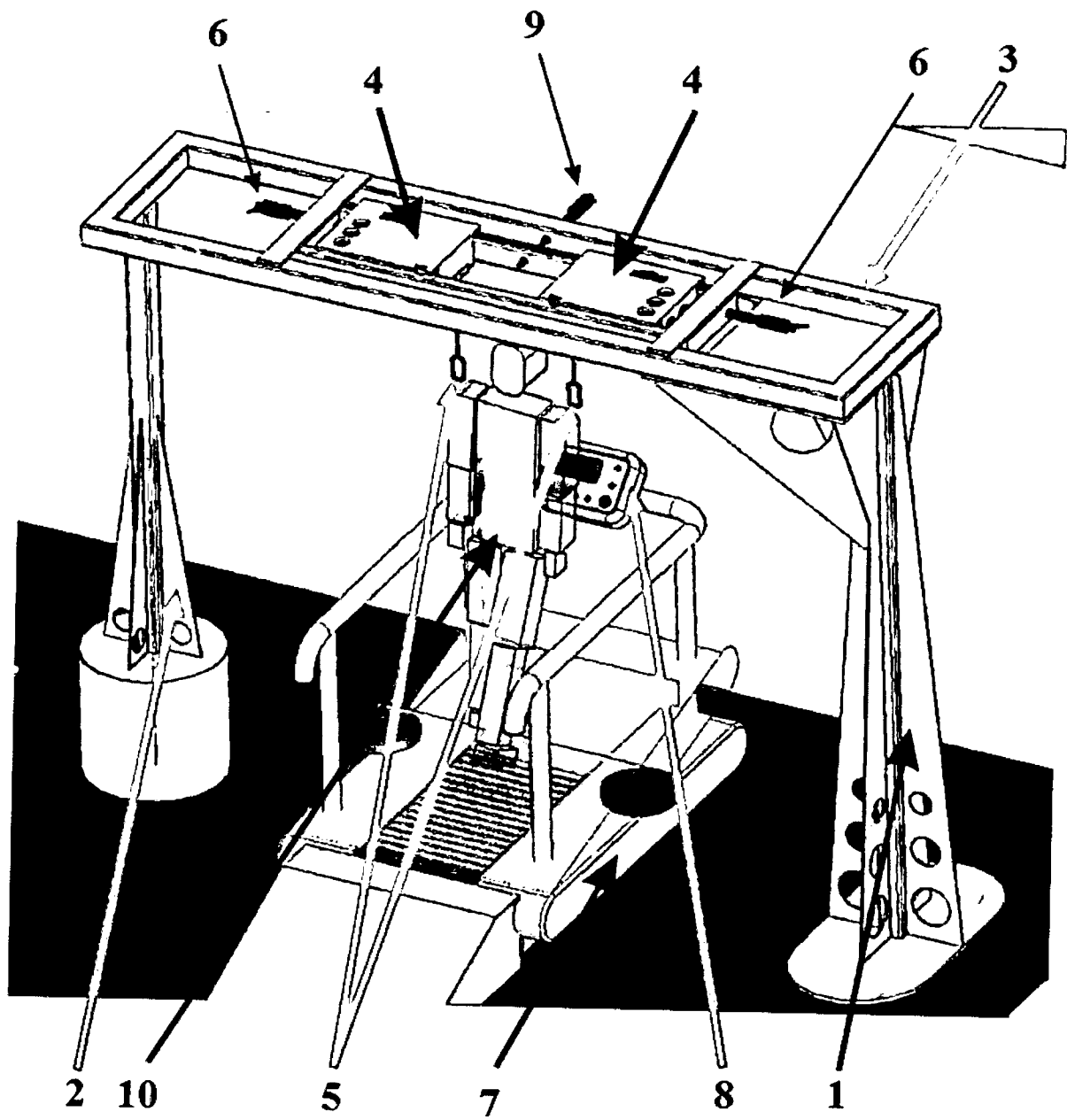


Fig. 1

INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
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ADD.

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)
A61H A61G

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 practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 1 595 522 A1 (OLTHOF ALEXANDER OLDE [DE]) 16 November 2005 (2005-11-16) paragraphs [0012] - [0024]; figures -----	1-5
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A	US 2007/232965 A1 (TALISH ROGER J [US]) 4 October 2007 (2007-10-04) paragraph [0022]; figure 1 -----	1
A	US 2008/287268 A1 (HIDLER JOSEPH [US]) 20 November 2008 (2008-11-20) claims; figures -----	1



Further documents are listed in the continuation of Box C.



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Date of the actual completion of the international search

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European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Knoflachner, Nikolaus

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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