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Patents Act 1990

Section 29(1)
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NOTICE OF ENTITLEMENT

I/We, AKTSIONERNOE OBSHESTVO ZAKRYTOGO TIPA "ADJURVEDA"

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RUSSIAN FEDERATION

.. being the applicant in respect of the attached application,
.. state the following:-

The person nominated for the grant of the patent has
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The person nominated for the grant of the patent is the
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under Article 8 of the PCT.

.. The basic application listed in the declaration made
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in a Convention country in respect of the invention.

.. DATED this SIXTH day of APRIL 1994.

THOMSON PIZZNEY

.....
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Registered Patent Attorney



AU9334112

(12) PATENT ABRIDGMENT (11) Document No. AU-B-34112/93
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 658980

- (54) Title
DEVICE FOR TREATING PATIENTS WITH DISTURBANCES OF POSE AND MOTOR ACTIVITY
- International Patent Classification(s)
(51)⁵ A61H 003/00 A61H 001/00
- (21) Application No. : 34112/93 (22) Application Date : 18.12.92
- (87) PCT Publication Number : WO93/15706
- (30) Priority Data
- | | | |
|-------------|-----------|-----------------------|
| (31) Number | (32) Date | (33) Country |
| 5025647 | 31.01.92 | RU RUSSIAN FEDERATION |
- (43) Publication Date : 03.09.93
- (44) Publication Date of Accepted Application : 04.05.95
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- (56) Prior Art Documents
FR 2120500
EP 66028
FR 2298314
- (57) Claim

1. A device for treatment of patients with disturbed posture and motor activity, comprising pelvic and pedal supports (1) placed on patient's trunk and limbs and interconnected by fixing elements, CHARACTERIZED in that the fixing elements are shaped as elastic tie-members (2) adapted for being placed on the surface of the patient's body so as to follow anatomical arrangement of the skeletal muscles, each tie-member (2) being connected to two of the supports (1).

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PCT

ВСЕМИРНАЯ ОРГАНИЗАЦИЯ
ИНТЕЛЛЕКТУАЛЬНОЙ СОБСТВЕННОСТИ
Международная конвенцияМЕЖДУ ANNOUNCEMENT OF THE LATER PUBLICATION
OF INTERNATIONAL SEARCH REPORTSОТВЕТСТВИИ
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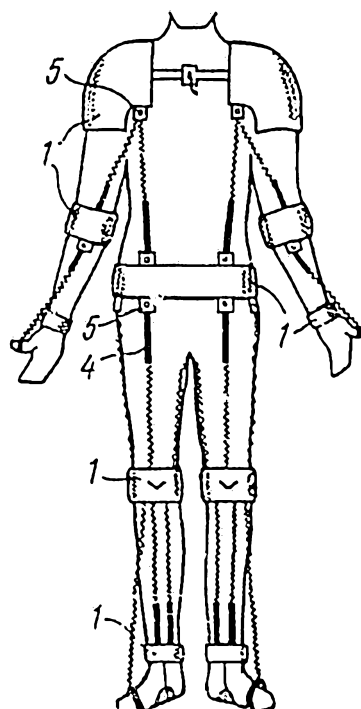
(51) Международная классификация изобретения ⁵ : A61F 5/01	A3	(11) Номер международной публикации: WO 93/15706 (43) Дата международной публикации: 19 августа 1993 (19.08.93)
(21) Номер международной заявки: PCT/RU92/00247 (22) Дата международной подачи: 18 декабря 1992 (18.12.92) (30) Данные о приоритете: 5025647 31 января 1992 (31.01.92) RU (71) Заявитель (для всех указанных государств, кроме US): АКЦИОНЕРНОЕ ОБЩЕСТВО ЗАКРЫТОГО ТИПА «АЮРВЕДА» [RU/RU]; Москва 117593, Литовский бульвар, д. 5/10, кв. 275 (RU) [AK-TSIONERNOE OBSHCHESTVO ZAKRYTOGO TИPA «AJYRVEDA», Moscow (RU)]. (72) Изобретатели; и (75) Изобретатели / Заявители (только для US): АФАНАСЕНКО Николай Иванович [RU/RU]; Москва 111587, Свободный пр., д. 7, корп. 1, кв. 77 (RU) [AFANASENKO, Nikolai Ivanovich, Moscow (RU)]. БАРЕП Арнольд Семёнович [RU/RU]; Москва 129301, пр. Мира, д. 184, корп. 2, кв. 299 (RU) [BARER, Arnold Semenovitch, Moscow (RU)]. ГРИГОРЬЕВ Анатолий Иванович [RU/RU]; Москва 125047, ул. А.Невского, д. 1, корп. В, кв. 47 (RU) [GRIGORIEV, Anatoly Ivanovich, Moscow (RU)]. КОЗЛОВСКАЯ Инеса Бенедиктовна [RU/RU]; Москва 103006, ул. Каляевская, д. 5, кв. 287 (RU) [KOZLOVSKAYA, Inesa Benediktovna, Moscow (RU)].	САВИНОВ Альберт Павлович [RU/RU]; пос. Томилино 140070, Московская обл., ул. Пионерская, д. 19, кв. 8 (RU) [SAVINOV, Albert Pavlovich, pos. Tomilino (RU)]. СЕВЕРИН Гай Ильич [RU/RU]; Москва 117296, Университетский пр., д. 5, кв. 460 (RU) [SEVERIN, Gai Illich, Moscow (RU)]. СЕМЕНОВА Ксения Александровна [RU/RU]; Москва 117330, ул. Дружбы, д. 2/19, кв. 54 (RU) [SEMENOVA, Xenia Alexandrovna, Moscow (RU)]. СИНИГИН Виктор Михайлович [RU/RU]; пос. Томилино 140070, ул. Пионерская, д. 24, кв. 63 (RU) [SINIGIN, Viktor Mikhailovich, pos. Tomilino (RU)]. СОКОЛОВСКИЙ Игорь Антонович [RU/RU]; пос. Томилино 140070, ул. Гоголя, д. 48, кв. 66 (RU) [SOKOLOVSKY, Igor Antonovich, pos. Tomilino (RU)]. ТИХОМИРОВ Евгений Петрович [RU/RU]; Москва 115470, Нагатинская наб., д. 40/1, кв. 634 (RU) [TIKHOMIROV, Evgeny Petrovich, Moscow (RU)]. (81) Указанные государства: AU, BB, BG, BR, CA, CS, FI, HU, JP, KP, KR, LK, MG, MN, MW, NO, PL, RO, SD, US, европейский патент (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), патент ОАПИ (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, SN, TD, TG). Опубликована С отчетом о международном поиске. (88) Дата публикации отчета о международном поиске: 21 июля 1994 (21.07.94)	

(64) Title: DEVICE FOR TREATING PATIENTS WITH DISTURBANCES OF POSE AND MOTOR ACTIVITY

(64) Название изобретения: УСТРОЙСТВО ДЛЯ ЛЕЧЕНИЯ БОЛЬНЫХ С НАРУШЕНИЕМ ПОЗЫ И ДВИГАТЕЛЬНОЙ АКТИВНОСТИ

(57) Abstract

A device for treating patients with disturbances of pose and motor activity comprises shoulder, pelvic, genicular, foot, anconal, carpal and finger supports (1) interconnected by fastening elements. The fastening elements consist of elastic links (2) and are located on the surface of the patient's body in antagonistic pairs depending on the anatomic location of the skeleton musculature. Each link (2) is connected with two supports (1) and comprises a regulator (3) of its tension mounted between the link (2) and one of these supports (1) by means of a lock (5).



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Устройство для лечения больных с нарушением позы и двигательной активности содержит наплечные, тазовые, коленные, стопные, локтевые, кистевые и пальцевые опоры (1), связанные между собой фиксирующими элементами. Фиксирующие элементы выполнены в виде эластичных тяг (2) и размещены на поверхности тела больного антагонистическими парами по принципу анатомического расположения скелетной мускулатуры. Каждая тяга (2) соединена с двумя опорами (1) и содержит регулятор (3) ее натяжения, установленный между тягой (2) и одной из опор (1) через замок (5).

ИСКЛЮЧИТЕЛЬНО ДЛЯ ЦЕЛЕЙ ИНФОРМАЦИИ

Коды, используемые для обозначения стран-членов РСТ на титульных листах брошюр, в которых публикуются международные заявки в соответствии с РСТ.

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DEVICE FOR TREATMENT OF PATIENTS WITH DISTURBED POSTURE
AND MOTOR ACTIVITY

Technical Field

5 The present invention relates generally to devices for nonsurgical (conservative) treatment of the locomotor apparatus (locomotorium) in various neuropathies, and more specifically to a device for treatment of patients with disturbed posture and motor activity.

10 The invention can find most utility when used for treatment of infantile cerebral paralysis.

The invention is likewise applicable in cerebrovascular accidents involving motor disturbances and traumatic lesions of the spinal cord.

15 Furthermore, the invention can be applied for correction of patient's posture (attitude), as well as for sports exercises.

Background Art

20 At present the number of neuropathic patients suffering from affection of the locomotor functions becomes immense, while infantile cerebral paralysis, in particular, tends to rise, for a number of reasons, in many countries throughout the world.

25 Treatment of motor functions in infantile cerebral paralysis patients becomes urgent due to both, the number of patients and imperfection of the treatment method available.

The present state of the medical art knows a number of methods and devices for treatment of patients with disturbed posture and motor activity.

30 One state-of-the-art method for treatment of patients with disturbed posture and motor activity (cf. "Surgical correction of posture and walking in infantile cerebral paralysis" by A.M. Zhuravlev et al., 1986, Aiastan Publishers, Yerevan, pp. 90-91 (in Russian) is known to
35 comprise stage-by-stage plastering, followed by rigidly fixing the position of the limb and trunk with an altered



posture. A disadvantage inherent in said method resides in a restricted motor activity (immobility) of a patient, which might result in amyotrophy, spastic phenomena, and increased hypertensive syndrome due to enhanced pathological muscular synergias.

5 Furthermore, another advantage of said object is a prolonged treatment period, that is, from 4 to 6 months.

One state-of-the-art device for treatment of patients with disturbed posture and motor activity is known
10 (FR; A, 2,120,500) to appear as overalls into which flexible inflatable tubes are inserted to impart rigidity thereto.

A disadvantage inherent in said device is the fact that it is aimed at maintaining the patient's body in a
15 definite position, whereby the field of application of said device is extremely restricted. In addition, said device fails to solve the problem of muscular exercises of a patient, which might lead to profound dysfunction of the muscular system.

20 Another device for treatment of patients with disturbed posture and motor activity is known (FR, A, 2,252,836) to comprise two blades interposed between the patient's thighs, each of said blades being fixed to a respective thigh, and a mechanical system connected
25 to the blades.

The device under discussion suffers from the disadvantage that it can correct only a wrong position of the thighs, knee joints, and feet. In addition, said device is bulky and therefore its application with therapeutic
30 purposes is very questionable.

One more device for treatment of patients with disturbed posture and motor activity is known (SU, A, 1,528,483) to comprise a thoracic, pelvic, and pedal support, and fixing elements to interconnect the afore-
35 said supports to one another.



The fixing elements are shaped as telescopic stands interconnecting the pedal supports with the pelvic one and with a bar one of whose ends is rigidly coupled to the pelvic support. The bar carries a roller reciprocatingly
5 mounted thereon and rigidly linked to the thoracic support. Two arms are rigidly connected to the pelvic support, the free ends of said arms being connected to springs movably mounted on the telescopic stands.

With the patient's body in the erect position the
10 roller provides a light reclining effect produced on the entire vertebral column, while the thoracic support provides rest for the upper trunk portion. With an inclined position of the trunk the roller rides over the bar depending on the angle of inclination, so as to assume an optimum posi-
15 tion, and the springs impart an effort to the bar. Thus, the weight of the inclined trunk portion is compensated for and the muscular system and vertebral column are released from load.

A disadvantage of the abovesaid device consists in that
20 it is intended for treatment of the vertebral column only by releasing it from load. In addition, use of said device might result in restricted mobility of a patient followed by amyotrophy and affected activity of the antigravity muscles. Above all the treatment process with the use of
25 said device is too prolonged.

Disclosure of the Invention

It is an essential object of the present invention to provide a physiologically normal stereotype of posture and movements.

30 The present invention has for its principal object to provide a device for treatment of patients with disturbed posture and motor activity, wherein the fixing elements interconnecting the supports have such a construction that enables the patient's trunk and limbs to be fixed
35 in a position approximating normal physiological parameters, while maintaining a possibility of performing



energy-loaded movements by the patient, with the amplitude of said movements characteristic of a given patient.

The foregoing object is accomplished due to the fact that in a device for treatment of patients with
5 disturbed posture and motor activity, comprising pelvic and pedal supports placed on patient's trunk and limbs and interconnected by fixing elements, according to the invention, the fixing elements are shaped as elastic
10 tie-members arranged on the patient's body surface so as to follow anatomical arrangement of the skeletal muscles, each of the tie-members being connected to two supports.

The proposed device is instrumental in fixation of joints in a required position and to establish a moment of force effecting flexion, extension, rotation, adduction,
15 and abduction of the patient's limbs and trunk.

According to a preferred embodiment of the invention, the device comprises additional shoulder, knee, elbow, finger, and toe supports.

Such an embodiment of the invention makes it possible
20 to fix practically all the joints of patient's trunk and limbs in a preset position and enables the patient to perform energy-loaded movements with amplitudes attainable by a given patient.

It is quite reasonable that the device comprises ten-
25 sion adjusters of the elastic tie-members, each of such adjusters being interposed between the respective tie-member and one of the supports.

Provision of the tension adjusters in the device enables one to vary and individually select the force
30 of action exerted by the tie-members on the musculoskeletal system, thus adding to the efficacy of treatment.

Use of the proposed device makes it possible to utilize functional (active) correction of the pathologic positions of the trunk and limbs instead of static (passive) correc-
35 tions thereof, rearrange the previous pathologic stereotype



of the posture and movements in the central and peripheral nervous systems, potentiate destruction of the old pathologic complex of reflexes that has been established in the course of the disease, and create the new control and con-
5 duction system through the intermediary of the defense structures of the brain. In addition, the effect produced by the device on patient's organism consists in that the correction of the locomotorium and energy loading of move-
10 result in activation of the brain central structures in elaborating a new arrangement of the control system of both, the locomotorium and the motor system of the speech-formation system. Practical application of the proposed device allows for creation of the stereotype of posture
15 and movements closely resembling the physiological one.

Brief Description of the Drawings

Further objects and advantages of the present invention will be understood from the following detailed description of a specific exemplary embodiment thereof
20 and the accompanying drawings, wherein:

FIG. 1 is a front view of a device, according to the invention;

FIG. 2 is a side view of FIG. 1; and

FIG. 3 is a rear view of FIG. 1.

25 Best Mode of Carrying Out the Invention

The device of the invention comprises supports 1 adapted for being mounted in the region of the patient's shoulders, elbows, hands, pelvic girdle, knees, feet, fingers, and toes. The supports 1 are interconnected
30 through fixing elements which appear as elastic tie-members 2 adapted to interconnect both the adjacent and nonadjacent supports 1. The tie-members 2 are so connected to the supports 1 that they are arranged on the surface of the patient's body in antagonistic pairs to

follow the anatomical arrangement of the skeletal muscles. Each of the tie-members 2 has an adjuster 3 of its tension, which connects said tie-member 2 to one of the supports 1.

Each tension adjuster 3 is in fact a band 4 having
5 one of its ends connected to the tie-member 2 and the opposite end is held to a lock 5 which in turn is fastened on one of the supports 1.

The adjuster 3 may obviously be of any other construction suitable for performing a similar function.

10 The supports 1 can be made of any material featuring a minimum degree of extensibility, such as fabric, leather, plastics, and so on.

Specifically, the tie-members 2 can be made of rubber, plastics, or appear as metallic springs.

15 The device of the invention functions as follows.

The proposed device is selected individually for every patient taking account of his/her state and size of the body. Then the device is put onto the patient and those tie-members 2 are tensioned which correct the position
20 of the body parts to be treated. The tie-members 2 are adjusted for tension with the aid of the adjuster, whereupon the position thus attained is fixed by the locks 5. The tie-members 2 are adjusted until a new position of the trunk and limbs is reestablished, which approximates
25 the normal physiological one and enables the patient to perform movements with an amplitude close to a maximum one for a given patient. The tension of the tie-members 2 is increased at least until a load appears in the group of muscle corresponding to a given movement. This done,
30 the device is ready for use.

Thus, a dynamic supporting structure (functional corset) is established with the aid of the present device and the patient is prepared for performing movements.

The device is utilized by the patient with due account
35 of his/her status and individual peculiarities daily for a period of up to 12 hours a day, a treatment cycle lasting for 15 - 30 days.



The tie-members 2 arranged on the surface of the patient's body in antagonistic pairs to follow the anatomical arrangement of the skeletal muscles with respect to the joints provide for all kinds of patient's movements in the course of practical application of the device. In the course of treatment the degree of tension of the tie-members 2 is gradually increased. As the patient becomes adapted to the correcting action of the device, the correction force is increased without affecting the sense of comfort with respect to the load applied.

A new stereotype of control of patient's movements is established in the course of treatment. In addition, the patient's physiological status becomes predominant, which results in a reduced amount of pathological muscular synergies and increased extent of motor activity and allows of correcting the patient's posture in the cases unamenable to treatment with other correction methods.

The present device can be additionally furnished with overalls put onto patient above the device. The overalls are provided with openings to provide access to the adjusters 3.

Example 1

Male patient B.K., 17. Diagnosis: infantile cerebral paralysis. The diagnosis has been established since the six-month age. By the time of treatment with the proposed device the patient had developed paralysis in the form of spastic diplegia. There occurred triple flexion in the lower limbs complicated by contractures in the ankle joints, internal rotation of the thighs, uncompensated body inclination forwards, difficulties in locomotion, pathologic gait, talipes equinovalgus in both feet ("rocking foot"), internal rotation of both arms, and difficult movements of the hands and fingers. The patient's intellect remained unaffected, as well as phrasal



speech. There was noticed high level of psychologic motivation for therapeutic rehabilitation. Previously the patient had been treated medicinally and with the aid physiotherapy, as well as by correction with plaster bandages

5 and solid plaster bars. However, the treatment produced but a transient effect.

The patient passed a treatment course with the proposed device for one month, by daily sessions of 2 - 3 hours.

The load applied was perceived by the patient within the initial seven days of treatment after which the sensation of load disappeared and adaptation ensued. However, within the initial five days the pathological posture of the patient's trunk and limbs reappeared in two hours after load releasing. On the 10th day of treatment a stable result of treatment occurred manifested in complete disappearance of the pathologic posture, elimination of flexural disturbances of the lower limbs, improvement in the gait pattern, facilitating forward displacement of the thighs and higher walking pace. After the 10th day of treatment the patient could walk in the erect position. In addition, by the 10th day of treatment there were observed a considerable decreasing of the pronation disturbances in the hands and fingers. The patient was dismissed in 30 days after admission with a considerable improvement of motor and static functions.

Given below is a table representing the clinical evidence of practical application of the proposed device in treatment of a group of patients for the late residual stage of infantile cerebral paralysis. The age range of the patients was within 15 and 20, a total number of therapeutic sessions 16 - 22 for one month.



Table

Nos	Form of disease	Number of patients	Progress in process of rehabilitating treatment	Assessment of therapeutic effect in five-point system
1	Spastic diplegia	4	1. Normalization (though not always complete) of principal pathological muscular synergies responsible for triple flexure of the lower limbs and flexural synergy in the upper limb. Increased pace length, correct formation of the front and rear thrusts of pace. 2. Diminished torsion of the trunk and in the shoulder girdle. Lower intensity of frontal rocking. 3. Disappearance of pathological synergy in the shoulder girdle. Increased manipulative abilities of the hand and fingers. 4. Gradual improvement in the articulatory aspect of patient's speech.	4-3
2	Hyperkinetic form	2	1. Walking without support. Torsion hyperkinetic phenomena of the neck and trunk muscles still persisted. 2. Intensity of hyperkinesis reduced after 10-15 treatment sessions. Walking over long distances became possible though without conjugate movements of the upper limbs. 3. Improved speech which became discriminable by the patient's associates. The patient got able to perform self-care due to restored movements of the arms.	4-3
3	Cerebellar	2	1. Unassisted walking over a distance of 200-300 m, the original status being complete inability to walk. 2. Diminished cerebellar symptoms (hypermetria, dysmetria, ataxia of the trunk and limbs). 3. Attenuated speech scanning. Speech became discriminable.	5
4	Hemiparetic form	2	1. Improvement in motor functions. 2. Decreased fatigue in walking; walking over long distances. 3. Improved manipulative activities of the paretic arm.	3



As can be seen from the Table, the best results of treatment with the present device were obtained with the cerebellar form of the disease, while the least effect was noted in the hemiparetic form of infantile cerebral paralysis.

Example 2

Male patient Kh., 40. Diagnosis: affection of the lumbar cord with partial disturbance of conduction (decompression sickness).

10 The patient passed a treatment course with the proposed device. The treatment led to improved walking parameters, i.e., synchronism in muscular activity, increased walking pace, and reduced fatigue.

Industrial Applicability

15 The proposed device can be used for treatment of patients affected by infantile cerebral paralysis, as well as in cerebrovascular accidents involving motor disturbances and traumatic lesions of the spinal cord.



CLAIMS

1. A device for treatment of patients with disturbed posture and motor activity, comprising pelvic and pedal supports (1) placed on patient's trunk and limbs and
5 interconnected by fixing elements, CHARACTERIZED in that the fixing elements are shaped as elastic tie-members (2) adapted for being placed on the surface of the patient's body so as to follow anatomical arrangement of the skeletal muscles, each tie-member (2) being connected to two of the
10 supports (1).

2. A device according to Claim 1, CHARACTERIZED in that it comprises additional shoulder, knee, elbow, finger, and toe supports (1).

3. A device according to Claims 1 and 2, CHARACTERIZED
15 in that it comprises adjusters (3) of tension of the elastic tie-members (2), each of the adjusters (3) being interposed between the respective tie-member (2) and one of the supports (1).

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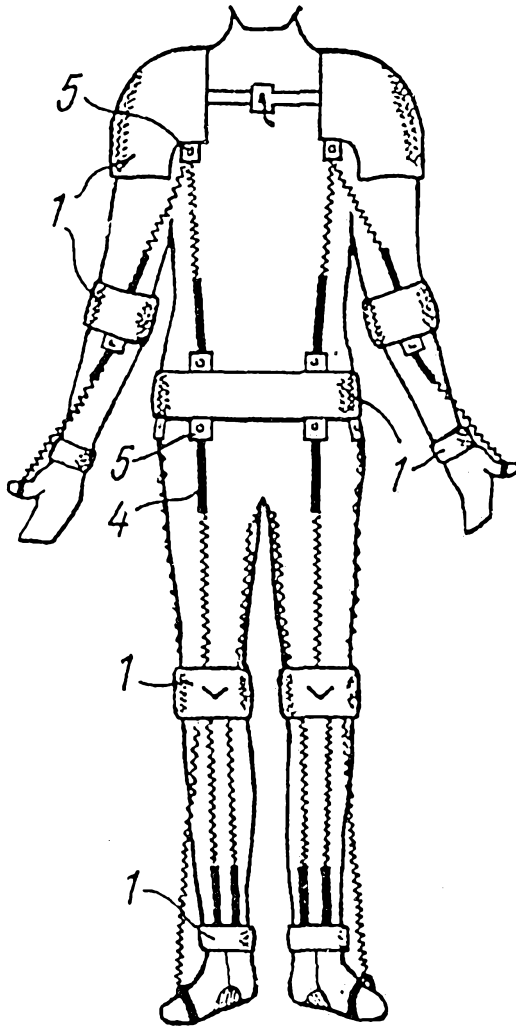


FIG. 1

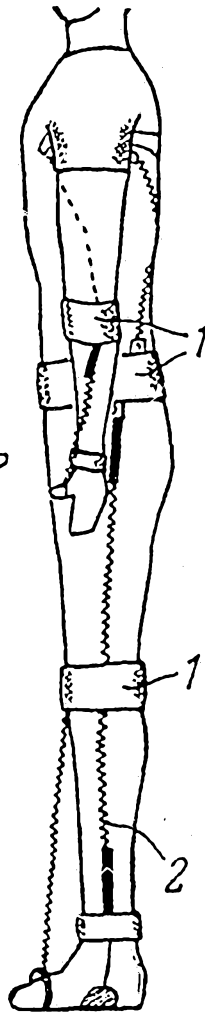


FIG. 2

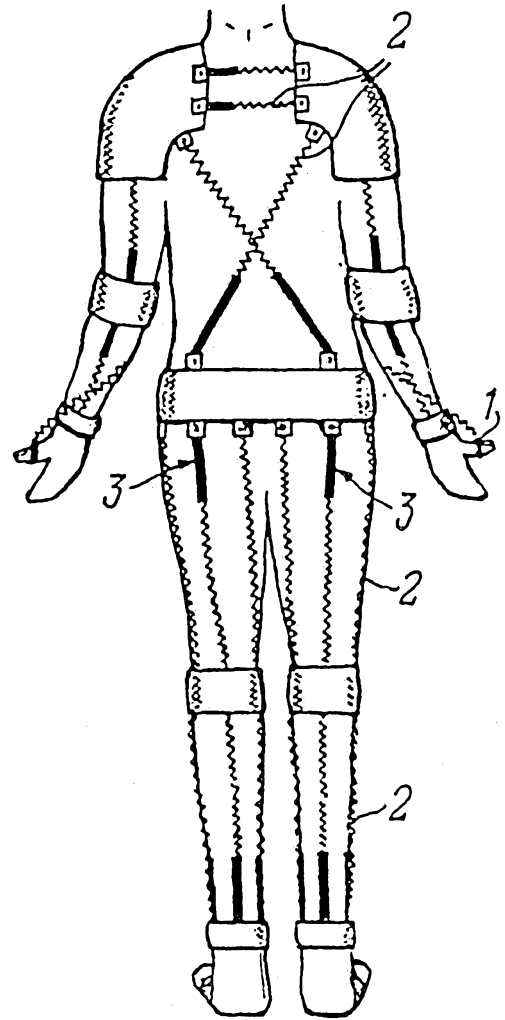


FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/RU 92/00247

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.⁵ A61F 5/01

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)

Int. Cl.⁵ A61F 5/00, A61F 5/01, A61F 5/37; A61H 3/00

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR, A1, 2120500 (AERAZUR CONSTRUCTIONS AERONAUTIQUES), 18 August 1972 (18.08.72)	1
A	FR, A1, 2298314 (INSTITUT NATIONAL DE LA SANTE ET DE LA RECHERCHE MEDICALE), 20 August 1976 (20.08.76)	1
A	FR, A2, 2390152 (INSTITUT NATIONAL DE LA SANTE ET DE LA RECHERCHE MEDICALE - INSERM), 8 December 1978 (08.12.78)	1
A	EP, A1, 0066028 (SALORT, GUY) 8 December 1982 (08.12.82)	1
	./.	

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

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"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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"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

15 July 1993 (15.07.93)

Date of mailing of the international search report

19 July 1993 (19.07.93)

Name and mailing address of the ISA/
RU

Authorized officer

Facsimile No.

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/RU 92/00247

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	SU, A1, 1528483 (O.A. OSTAPENKO), 15 December 1989 (15.12.89)	1
A	-- SU, A1, 1556675 (KIEVSKY NAUCHNO-ISSLEDOVATELSKY INSTITUT ORTOPEDII ET AL), 15 April 1990 (15.04.90)	1

ОТЧЕТ О МЕЖДУНАРОДНОМ ПОИСКЕ

Международная заявка №.
PCT/RU 93/00247

A. КЛАССИФИКАЦИЯ ПРЕДМЕТА ИЗОБРЕТЕНИЯ

A61F 5/01

Согласно Международной патентной классификации (МКК-5)

B. ОБЛАСТИ ПОИСКА

Проверенный минимум документации и система классификации и индексов: МКК-5 A61F 5/00, A61F 5/01, A61F 5/07, A61F 5/00

Другая проверенная документация в той мере, в какой она включена в поисковые подборки:

Электронная база данных, используемая при поиске (название базы и, если возможно, поисковые термины):

C. ДОКУМЕНТЫ, СЧИТАЮЩИЕСЯ РЕЛЕВАНТНЫМИ

Категория	Ссылки на документы с указанием, где это возможно, релевантных частей	Относится к пункту No.
A	FR. A1. 2120500 (AERAZUR CONSTRUCTIONS AERONAUTIQUES), 18 августа 1972 (18.08.72)	1
A	FR. A1. 2298314 (INSTITUT NATIONAL DE LA SANTE ET DE LA RECHERCHE MEDICALE),	1

☒ последующие документы указаны в продолжении графы C ☐ данные о патентах-аналогах указаны в приложении

* Особые категории ссылочных документов:

"A" документ, определяющий общий уровень техники и не считающийся особо релевантным	"T" более поздний документ, опубликованный после даты международной подачи или даты приоритета и не порочащий заявку, но приведенный для понимания принципа или теории, на которой основывается изобретение.
"E" более ранний документ, но опубликованный на дату международной подачи или после нее.	"X" документ, имеющий наиболее близкое отношение к предмету поиска; заявленное изобретение не обладает новизной и изобретательским уровнем в сравнении с документом, взятым в отдельности
"L" документ, подвергавший сомнению признание (а) на приоритет или который приводится с целью установления даты публикации другого ссылочного документа, а также в других целях (как указано).	"Y" документ, имеющий наиболее близкое отношение к предмету поиска и порочащий изобретательский уровень заявленного изобретения в очевидном для лица, обладающего познаниями в данной области техники, сочетании с одним или несколькими документами той же категории
"O" документ, относящийся к устройству, раскрытию, использованию, экспонированию и т.д.	
"P" документ, опубликованный до даты международной подачи, но после даты испрашиваемого приоритета.	
"X" документ, являющийся патентом-аналогом	

Дата действительного завершения международного поиска 15 июля 1993 (15.07.93)	Дата отправки настоящего отчета о международном поиске 19 июля 1993 (19.07.93)
Наименование и адрес Международного поискового органа: Научно-исследовательский институт государственной патентной экспертизы, Россия, 115000, Москва, Бережковская наб. 30-1, факс: 095 240-33-37, телетайп 114818 ПОДАЧА	Уполномоченное лицо: И. Фролова тел. 095 240-33-22

Форма PCT/ISA/210 (второй лист) июль 1992

ОТЧЕТ О МЕЖДУНАРОДНОМ ПОИСКЕ

Международная заявка No.

PCT/RU 92/00247

С. (Продолжение) ДОКУМЕНТЫ, СЧИТАЮЩИЕСЯ РЕЛЕВАНТНЫМИ		
Категория *)	Ссылки на документы с указанием, где это возможно, релевантных частей	Относится к пункту No.
	20 августа 1976 (20.08.76)	
A	FR, A2, 2390152 (INSTITUT NATIONAL DE LA SANTE ET DE LA RECHERCHE MEDICALE - INSERM), 08 декабря 1978 (08.12.78)	1
A	EP, A1, 0066028 (SALORT, GUY), 08 декабря 1982 (08.12.82)	1
A	SU, A1, 1528483 (О.А.ОСТАПЕНКО), 15 декабря 1989 (15.12.89)	1
A	SU, A1, 1556675 (КИЕВСКИЙ НАУЧНО-ИССЛЕ- ДОВАТЕЛЬСКИЙ ИНСТИТУТ ОРТОПЕДИИ и другие), 15 апреля 1990 (15.04.90)	1