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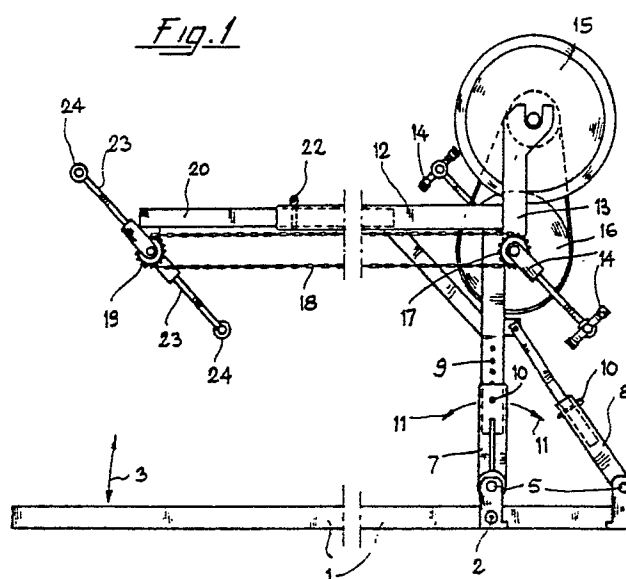
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54 **Gymnastic-curative apparatus.**

57 A stiff, adjustable frame, with fixed or variable position, supports two drive devices, with pedal cranks (14) and cranks (23), connected to each other and acting in coupling with equal or differentiated speed ratios.

The position of the devices is adjustable to the physical structure of the users and is particularly suitable for the therapies of motory rehabilitation of the limbs and joints, for maintenance or improvement of the tonus and ligaments, for improvement of circulation of the blood and/or for the practise of physical exercises in general.



GYMNASTIC-CURATIVE APPARATUS

The invention concerns a gymnastic-curative apparatus suitable for motory rehabilitation of the limbs and joints, for maintenance and improvement of the tonus and ligaments, for improvement of circulation of the blood etc., substantially comprising a system of movement in which the pedals are coupled not only to at least one drive system of a flywheel, but also to a second means of transmission of the rotating motion, manually operated by means of a handle with opposite cranks.

It is known that in many therapeutic activities, in particular those relating to handicapped persons, like paraplegics and/or dystrophics, or to persons affected by shock and/or operated to the limbs, the need to practise motory activities is of prime importance for the maintenance, improvement and rehabilitation of the limbs and joints, the tonus, ligaments, and circulation of the blood.

To practise said activities, numerous gymnastic apparatuses have been constructed and are used, specifically designed to reproduce or make the users reproduce calibrated movements in order to improve, develop or rehabilitate the parts of the body involved.

It was noted, however, that, for some particular needs, no suitable gymnastic apparatus at present exists; this is the case, in particular, in motory rehabilitation of the lower limbs of persons affected by paraplegy or dystrophy or patients suffering from heavy shock or those who have undergone operations to the lower limbs.

At present the motory activities of these invalids are substantially obtained with the sole help of specialized workers who stimulate and provoke the movements of the sick limbs of the patients, supporting them and manually simulating the rehabilitative action they must perform.

While the human relationship with health workers is very often stimulating for invalids, particularly for said rehabilitative activities, it is evident that each worker can assist only a limited number of invalids and that, at any rate, the activity of each of them is extremely weakening.

Another important problem consists in the fact that the number of health workers specialized in this training is rather limited, even at specialized centres, and it therefore very often happens that each worker must assist many more invalids than is humanly possible, with the result that patients are forced to spend very long periods in hospital, and that rehabilitation, improvement and/or motory maintenance of the limbs cannot reach the maximum of the possibilities foreseen; moreover, irreversibly handicapped or seriously traumatized patients must continue maintenance treatment for

their whole life, or for long periods, in their homes, using, when possible, very expensive home assistance, or must renounce as it is too expensive.

The object of the present invention is to eliminate the above problems.

The invention, as characterized by the claims, solves the problem by means of a gymnastic-curative apparatus, with which the following results are obtained: the apparatus is equipped with a double control of the rotating movement, one with pedal cranks alignable to the lower limbs and one with cranks alignable to the upper limbs; these two controls are applied to a frame which may take up different positions starting from a totally horizontal one.

The advantages of the present invention mainly consist in the fact that the apparatus may be adjusted to the position most suitable for the needs of each invalid; it can, in fact, take up a horizontal position and can be placed on the ground or on an examination couch, or take up an inclined position to permit the patient to remain seated or supported by the back-rest, and can take up a position in which it can be placed alongside and coupled, for example, to an invalid carriage, and permit invalids to practise gymnastic exercises remaining seated on the carriage.

Another basic advantage consists in the fact that the invalid himself, using his healthy limbs, personally provokes the movement of the sick limbs, without the direct assistance of any worker, who, in this case, can follow and assist many more patients.

The action of the invalid on the gymnastic apparatus consists in the fact, for example, of provoking the movement of the lower infirm limbs, with the movement of the upper healthy limbs.

For this it is sufficient to support, or fix with brackets, shoe or boot, the feet on the pedal cranks, then start them moving by means of the drive control manually operated by means of the handles.

The invention is described in greater detail below, according to a constructive and illustrative form, referring to the enclosed drawings, in which:

fig. 1 is a schematic diagram of the side view of the gymnastic-curative apparatus

fig. 2 is a constructive example of the stress-regulating brake, applied to the flywheel,

fig. 3 is a schematic plan view of the apparatus, and

figs. 4 and 5 show two methods of use of the apparatus.

The figures illustrate a gymnastic-curative ap-

paratus, substantially consisting of a supporting frame (1), preferably equipped with a joint (2) round which it can rotate, in the direction of the arrow (3) to take up inclined positions. A locking means, not illustrated, allows to fix the frame in the required position.

Two fulcra (5) are present on the same frame, formed by pins round which they can rotate and take up different positions, a first supporting pole (7) and a telescopic regulating arm (8).

Both the pole (7) and arm (8) are equipped with length regulating means, e.g. plurality of holes (9) with restop pins (10), which are used to obtain any desired inclination of the structure, in the direction of the arrows (11), and to adapt the apparatus to the physical structure of the user. The supporting pole (7) and regulating arm (8) are preferably constructed, for example, with telescopically coupled tubular structures.

At the upper end of the supporting pole (7) a transversal tubular body (12) is fixed, which extends in the same direction as the underlying supporting frame (1), at the front end of which is applied a vertical fork (13) and a transversal support on which two pedal cranks (14) are applied.

The vertical fork (13) supports the flywheel (15), while on the connecting axle of the pedal cranks (14) are keyed the drive pulley (16) of the flywheel and a toothed sprocket (17), which, by means of a chain (18), is connected to a second toothed sprocket (19) mounted on a transversal support, present at the rear end of an extensible body (20), mounted telescopically in the tubular body (12).

Length regulating means, e.g. plurality of holes (21) with restop pin (22) are also present in said telescopic connection.

On the axle of the second toothed sprocket (19) is keyed a cranked handle (23).

Said cranks may be of traditional type, with the handles (24) substantially fixed to the ends of the opposite levers, or applied to the ends of extension pins (25).

The extension of the cranks (23) by means of the extensions (25) preferably consents coupling with alternate motion, more similar to the alternation of the natural movements between the lower and upper limbs, preventing interferences or impact between the knee and the hands operating the cranks.

The position between said pedal cranks (14) and said cranks (23) can, however, be varied to suit the needs of the user and the specific characteristics of the physical motory exercises.

Once the apparatus has been placed and positioned according to the physical conformation and therapeutic needs of the users, movement can be produced either only by the arms, by means of the

crank handle (23), or only by the legs, by means of the pedal cranks (14), or also with simultaneous action of the arms and legs.

In the first case, the action is fundamentally valid to consent the rehabilitation and motory improvement of the lower limbs for users affected by paraplegia, dystrophy or those who have suffered heavy shock, which have partially or totally paralyzed said limbs, and for all those conditions which affect the lower parts of the body, in particular the lumbosacral zone, the pelvis or the lower limbs.

To do this, the user incapable of moving can be placed in supine position on the frame (1) covered with mattress (26), if his conditions are such that he does not have sufficient support from the backrest, or can remain seated, for example, on an invalid carriage (27), or other suitable seat, while the feet are connected to the pedal cranks (14) by means of brackets (28), shoes or boots (29). If these devices are insufficient to fix the lower limbs and keep them aligned to the pedal cranks and prevent their incorrect movements, on the transversal body (12) a movable bracket can be applied equipped with double padded sides for containment and guidance, in which the knees are freely forced to exercise their movement.

In this way the lower limbs, fixed to the pedal cranks (14) are forced to follow the movement of same, produced by the drive imposed by the cranks (23), operated by the healthy upper limbs, through the coupled transmission members, composed of toothed sprockets (17) and (19) and the transmission chain (18) which connects them.

In the second case, similarly, the rehabilitation and/or motory improvement can also be applied to the lower limbs affected by similar handicaps. For this it is necessary to fix no longer the feet to the pedal cranks, but the hands to the handles (24) with corresponding means, like brackets, glove grips and similar, and provoke the driven motion of the sick upper limbs by means of the action of the healthy lower limbs, acting on the pedal cranks (14).

Finally, the apparatus can be used to advantage by healthy users who only need to perform motory activities of maintenance and improvement of the tonus, or by athletes needing special body conditioning.

In this case it is obvious that the apparatus is used as simple gymnastic means in which both the upper and lower limbs can actively and passively intervene, according to the user's wishes and objects.

In each case the gymnastic-health apparatus is preferably equipped with a brake (30), which may be operated by a handle (31) placed in hand at the extensible body (20), which is screwed to or unscrewed from a threaded pin (32) to which a cable

(33), connected to said brake (30), is fixed. The brake (30), entering more or less in adherence with the peripheral surface of the flywheel (15), imposes the application of a greater or minor muscular action on the cranks (23) or on the pedal cranks (14), or on both, to drive the means of movement or execute the motory exercises to be performed.

Considering the characteristics and objects of the gymnastic-curative apparatus, it is evident that different solutions from those illustrated and described may be implemented without leaving its sphere. For example, the apparatus may be constructed with a stiff or folding supporting frame (1), suitable for application on normal or hospital beds, or also connectable or modular with invalid carriages or similar, or designed for fixed applications in gymnasiums, clinics, hospitals or sports centres, with pre-established or variable positioning.

Other possible solutions are provided with means of transmission, between pedal cranks (14) and cranks (23), consisting of pulleys and belts, or of cardan devices or helical worm screw couplings etc.; in addition, said means of transmission can also be equipped with speed variators with one or more fixed or continuous ratio, or even with differentiated fixed ratio, according to the applications and/or needs of use.

Claims

1) Gymnastic-curative apparatus characterized by the fact of comprising two drive devices, with pedal crank (14) and crank (23), connected and synchronized to each other; said devices being applied to a single supporting frame (1), equipped with position-regulating and/or positioning means.

2) Gymnastic-curative apparatus according to claim 1, characterized by the fact that the frame (1) comprises a pole (7), a transversal body (12) and an arm (8), composed of telescopically coupled tubular structures equipped with length-regulating means (9), (10), (21), (22).

3) Gymnastic-curative apparatus according to claims 1 and 2, characterized by the fact that the drive devices, with pedal crank (14) and crank (23) are connected to each other and also to a flywheel (15), which regulates stress.

4) Gymnastic-curative apparatus according to claims 1 to 3, characterized by the fact that the supporting frame (1) is independent, or can be connected to normal or hospital beds, or connected or coupled to invalid carriages and similar.

5) Gymnastic-curative apparatus according to claims 1 to 4, characterized by the fact that the pedal cranks (14) are equipped with brackets (28)

or shoes or boots (28), fixed to them, in which the feet or hands of the users are engaged during motory actions.

6) Gymnastic-curative apparatus according to claims 1 to 5, characterized by the fact that the connection between the drive means with pedal cranks (14) and cranks (23)* consist of toothed sprockets (17) and (19) connected by a transmission chain (18), or of pulleys and belts, cardan device and helical worm screw coupling, equipped, or not equipped, with speed variators with one or more fixed ratio, or with continuous speed ratios, or even with fixed or equal differentiated ratios.

7) Gymnastic-curative apparatus according to claims 1 and 2, characterized by the fact that the pole (7) and arm (8) are fixed to fulcrum pins (5) round which they can rotate and take up different positions.

8) Gymnastic-curative apparatus according to claims 1, 3, 5 and 6, characterized by the fact of having cranks (23) of traditional type, with the handles (24) applied at the ends of the opposite levers, or of widened type with the handles (24) applied to the ends of extension pins (25).

9) Gymnastic-curative apparatus according to claims 1, 3, 5, 6 and 8, characterized by the fact that the drive devices, with pedal crank (14) and crank (23) are connected according to any preferred position.*

10) Gymnastic-curative apparatus according to claims 1 to 9, characterized by the fact of comprising a brake (30) to regulate motory action, preferably acting on the flywheel (15).

11) Gymnastic-health apparatus according to claims 1 to 10, characterized by the fact of comprising a movable bracket equipped with double sides to contain and guide the knees; said bracket being connected to the transversal body (12).

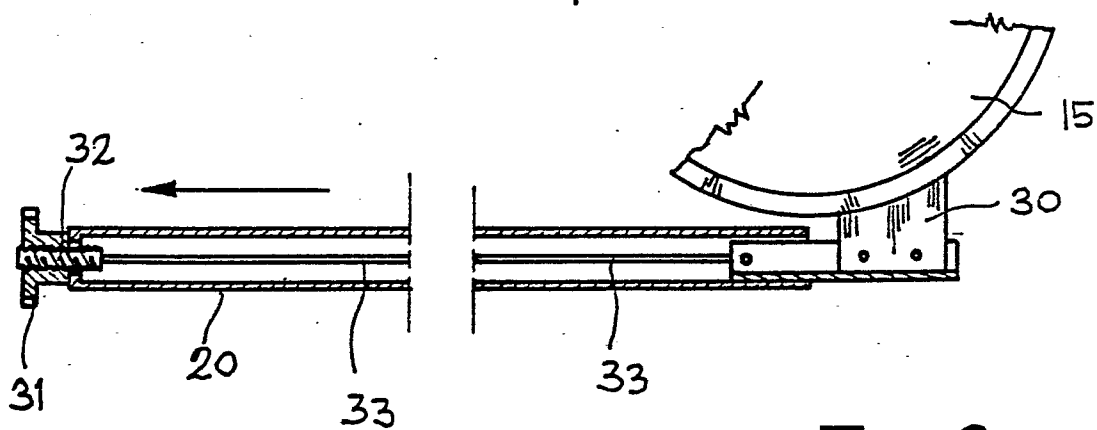
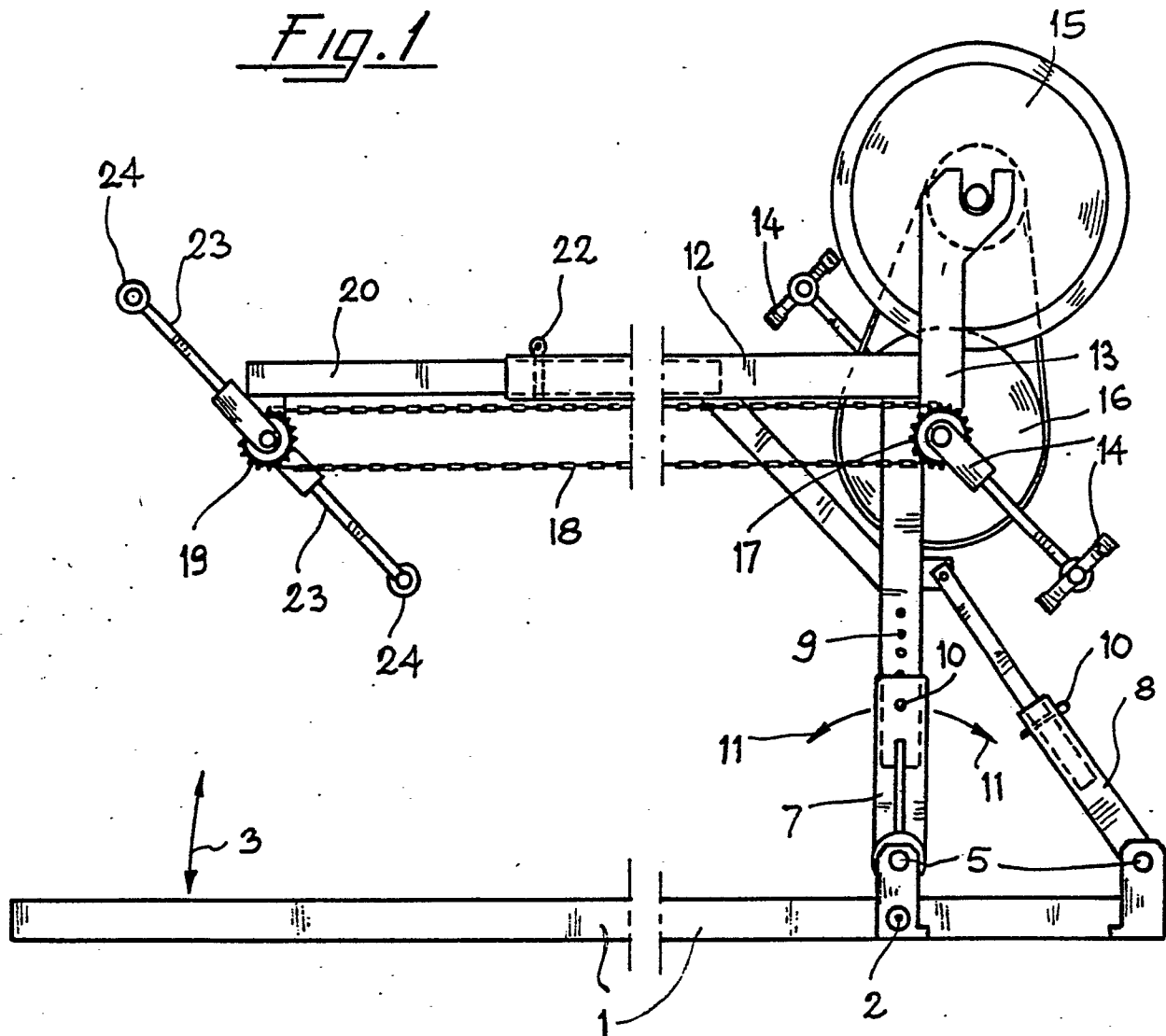
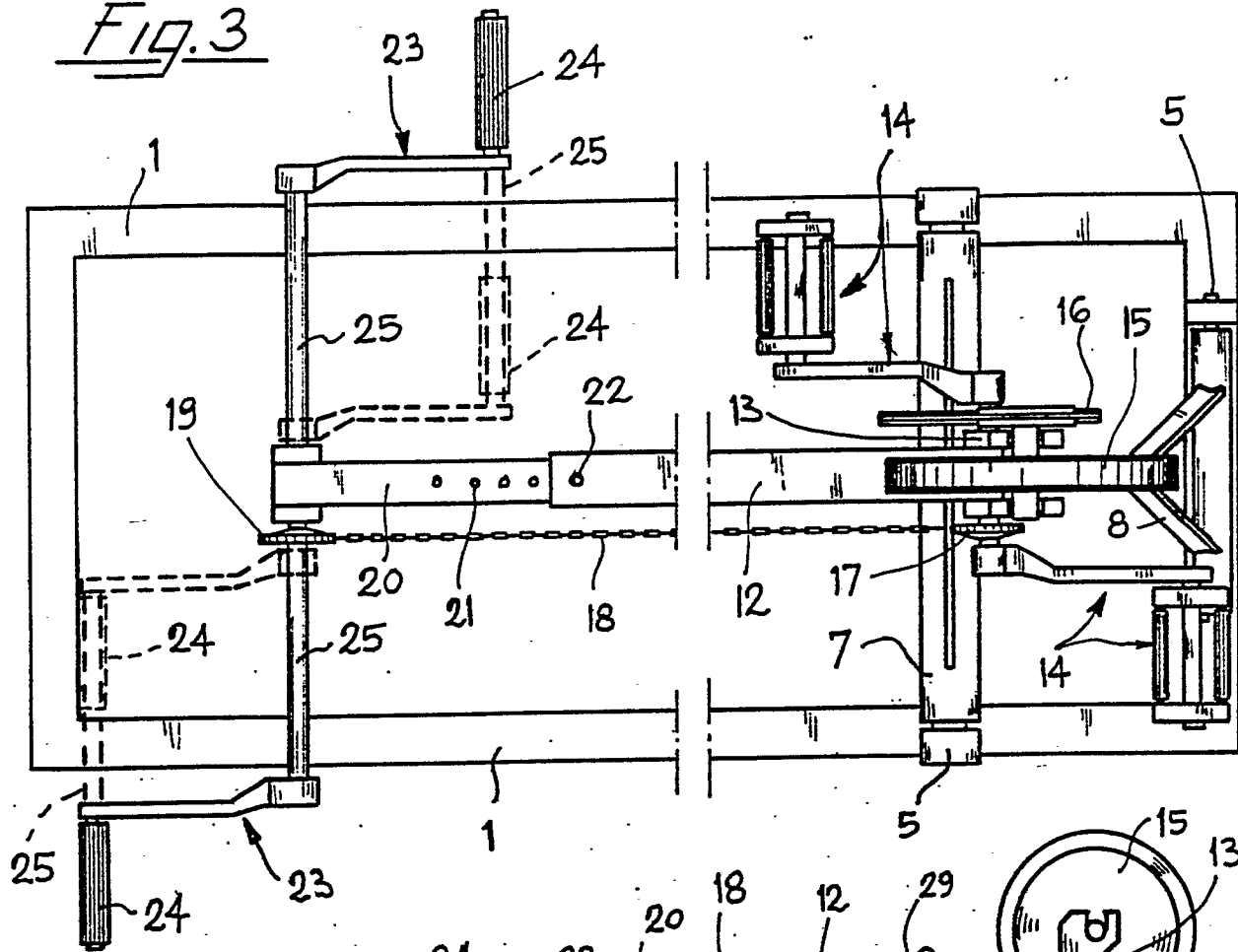
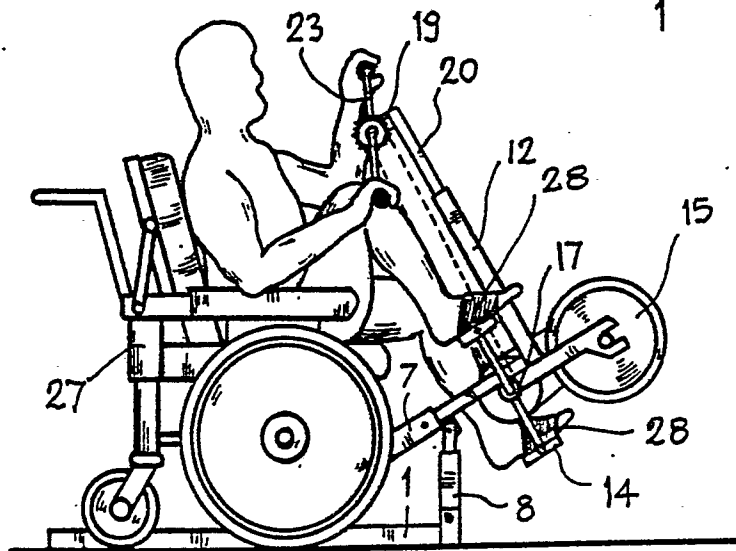
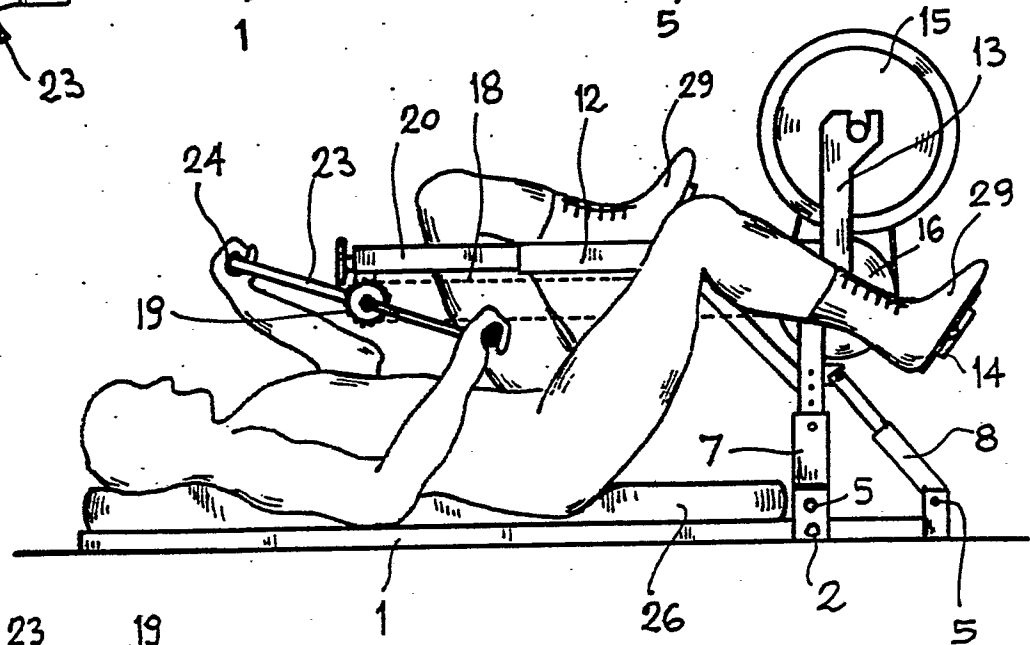
Fig. 1Fig. 2

Fig.3Fig.4Fig.5



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. 4)
X	GB-A-2 156 693 (KOPNICKY) * Page 1, lines 90-124; page 2, line 56 - page 3, line 40; page 4, lines 34-82; figures 1,3 *	1,2,4-10	A 61 H 1/02 A 63 B 23/04
Y	---	12	
X	DE-A-2 449 440 (CARNIELLI) * Page 3, line 5 - page 7, line 2; figures 1,3-5 *	1-4,6-10	
X	WO-A-8 402 082 (TIMOTIJEVIC) * Page 4, line 10 - page 10, line 11; figures 1-3 *	1,2,4,6	
X	US-A-4 071 235 (ZENT) * Column 2, line 56 - column 4, line 30; figures 1-3 *	1-3,10	
Y	EP-A-0 075 131 (RECK) * Abstract; figure 1 *	12	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			A 61 H A 63 B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 17-07-1989	Examiner SCHOENLEBEN J.E.F.
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	