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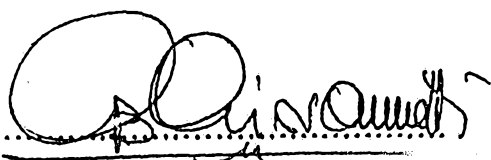
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PATENTS ACT 1990

NOTICE OF ENTITLEMENT

I, GIOVANNI BATTISTA GIOVANNETTI, of Via Peccioli, 18 - 00139, Rome, Italy, being the applicant in respect of Application No. 34624/93, state the following:-

1. The person nominated for the grant of the patent is the actual inventor.
2. The person nominated for the grant of the patent is the applicant of the application listed in the declaration under Article 8 of the PCT.
3. The basic application listed in the declaration under Article 8 of the PCT is the first application made in a Convention country in respect of the invention.



(Signature)



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APPARATUS FOR THE ANTIGRAVITY MODIFICATION OF THE MYOTENSIONS ADAPTING THE
HUMAN POSTURE IN ALL OF THE THREE PLANES OF THE SPACE
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- (56) Prior Art Documents
FR 2252108
EP 2188
DE 4027317
- (57) Claim

1. A diagnostic and therapeutic apparatus for correcting the posture of the backbone of a human patient, said apparatus including traction means for applying differential traction at different levels of said patient in order to cancel out all or a part of the weight of said patient, limiting means for correcting postural defects by constraining movement of the patient to within predetermined postural limits, monitoring means adapted to monitor the 3-dimensional orthostatic posture of the patient whilst walking, said monitoring means also being adapted to measure the weight resting on each foot of the patient, in order to correct said patient's posture and to encourage the patient to adopt a new scheme of posturally correct movements.



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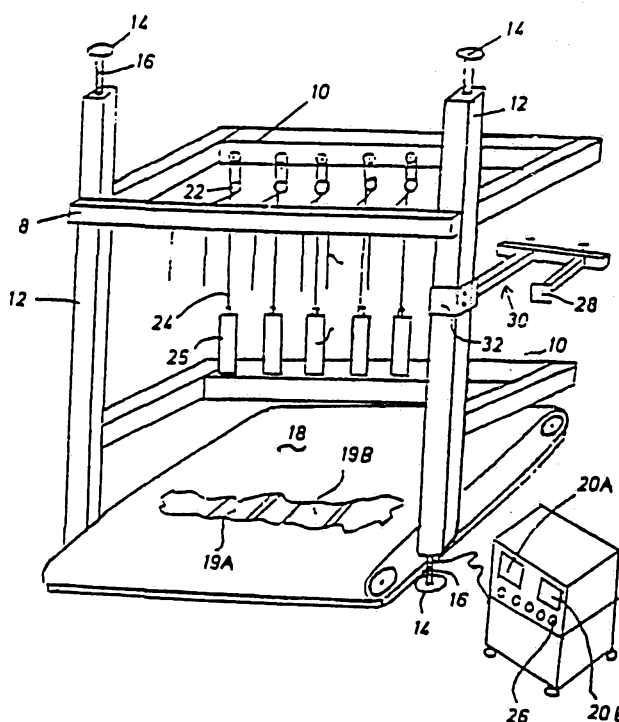
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(54) Title: APPARATUS FOR THE ANTIGRAVITY MODIFICATION OF THE MYOTENSIONS ADAPTING THE HUMAN POSTURE IN ALL OF THE THREE PLANES OF THE SPACE

(57) Abstract

A diagnostic and therapeutic apparatus for re-educating the posture of the backbone includes in combination means for controlling the orthostatic posture of the patient, means for carrying out a differential traction on the same patient at different levels in order to cancel out all or a part of his weight, means for correcting the postural defects in the three planes of the space and for blocking the patient within postural limits in order to prevent him from assuming postures other than that therapeutic even during the deambulation. In particular, the orthostatic posture is controlled by measuring the weight resting on each foot of the patient through footboards (19A, 19B) sensitive to changes in pressure placed under a travelling band (18), and the traction means are lacings or traction slings (24) slidable around pulleys (22) carried by a rigid framework and put under tension manually by the operator or automatically by a microprocessor receiving data measured from the footboard (19A, 19B) sensitive to changes in pressure.



APPARATUS FOR THE ANTIGRAVITY MODIFICATION OF THE
MYOTENSIONS ADAPTING THE HUMAN POSTURE IN ALL THREE
DIMENSIONS.

The present invention relates to an apparatus for re-educating the posture of the
5 backbone of an individual in all three dimensions, i.e. frontal, sagittal, and transversal,
thus avoiding some of the posture defects and some of the pathologic consequences
arising therefrom, under antigravity, dynamic conditions and through deambulation on a
travelling band.

As known, the weight of the human body is supported by the skeleton, muscles,
10 ligaments, and fasciae. The line representing that weight goes down from above along
the backbone, bifurcates at the third lumbar vertebra, turns to the two opposite coxae
(hip-joints), goes down along the lower limbs and goes up again by the same way until it
rejoins at the centre of the pubic bone to form a closed loop of forces. However,
skeleton is very seldom postured in a physiologically correct way so as to absorb the
15 most of the weight of the human body. Actually men assume comfort postures or
postural bad habits requiring the aid of supports constituted by muscular tensions,
fasciae, and ligaments to restore the balance. Such "dynamic compensations" of a "static
defect" become permanent in time such as to constitute a pseudo scheme of movement
(the automatic total scheme of movements) that, even if it is not physiologically correct,
20 becomes definitively functional, thus causing pathologic modifications in capsules,
ligaments and joint surfaces and occurrence of aches and pains of different nature and
intensity.

The physiatrics is aware of such problem for some time so that several equipment
have been manufactured to try to solve it. The latter, however, have never considered
25 the "global problem", i.e. the functional and dynamic whole of the human body.

From FR-A-2 252 108 it is known an apparatus for re-education of the human
backbone comprising means for carrying out differential traction at different levels,
means for correcting the postural defects and for blocking the patient and means for
allowing the patient to walk. However this apparatus does not permit both a diagnostics
30 investigations of postural defects and a programmed treatment since there is no means of
monitoring the orthostatic position of the patient. It is already known from the



Biomedizinische Technik Vol. 32 October 1987, the possibility to control the weight resting on each patient's foot lying on a footboards to investigate the standing and walking motor control and to value neuromuscular diseases without the possibility of corrections.

5 An object of the invention is to overcome, or substantially ameliorate at least one of the disadvantages of the prior art.

 According to the invention there is provided a diagnostic and therapeutic apparatus for correcting the posture of the backbone of a human patient, said apparatus including traction means for applying differential traction at different levels of said
10 patient in order to cancel out all or a part of the weight of said patient, limiting means for correcting postural defects by constraining movement of the patient to within predetermined postural limits, monitoring means adapted to monitor the 3-dimensional orthostatic posture of the patient whilst walking, said monitoring means also being adapted to measure the weight resting on each foot of the patient, in order to correct said
15 patient's posture and to encourage the patient to adopt a new scheme of posturally correct movements.

 An aspect of the inventive concept of the present invention is of providing an apparatus by which the patient can be subjected to differential tractions at different levels by cancelling out all or a part of his weight and effecting a number of successive
20 corrections such as to force the patient to assume a correct posture in the frontal, sagittal, and transversal planes in static attitude, and by forcing the patient to keep such posture even in dynamic attitude, i.e. during the deambulation, until he reaches stably and definitively a new correct total scheme of movements, while keeping the orthostatic position of the patient under continuous monitoring.

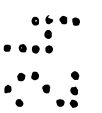
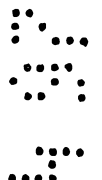
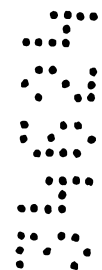
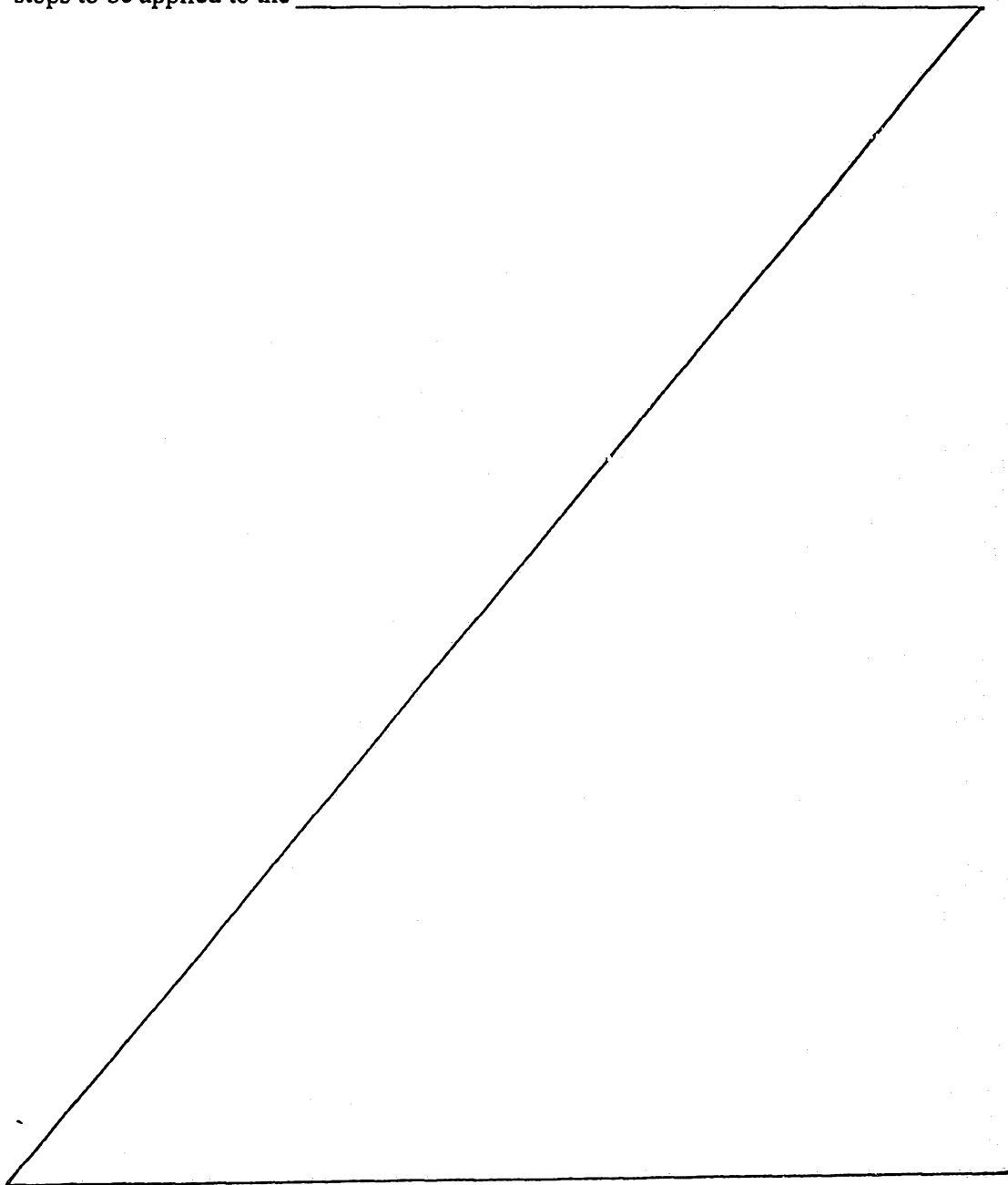
25 This can be achieved by continuously monitoring the weight resting on either patient's foot whose unbalance shows postural defects of the subject or alternately by detecting the displacements of reference points or the patient's body with respect to an ideal line.

 According to a first preferred embodiment the apparatus of the present invention
30 includes in combination a travelling band for the deambulation provided with two footboards sensitive to changes in pressure and adapted to indicate on a display the



weight resting on each foot of the patient standing thereon, and a rigid framework which can be firmly anchored to the floor and/or to the ceiling of the operational room above said travelling band, and to which the patient is secured by a number of traction slings fastened to five suspension points, e.g. pulleys. Such slings allow both the displayed
5 data to be set, i.e. the weight resting on both feet to be compensated, and such weight to be partially released in a symmetric way at different levels so as to display the wrong postural attitudes of the patient through the loss of the previously reached balance between the weights resting on the two feet.

The apparatus also includes a number of movable arms provided with retainers or
10 stops to be applied to the _____



patient's body at different (pelvic, sacral, sternal, humeral and dorsal) levels in order to prevent him from assuming postures different from those therapeutic even during the deambulation. According to a preferred
5 embodiment such retainers consist of oleodynamic pistons assembled in suitable hydraulically driven structures and controlled for an optimum positioning.

The description of the invention will be better
10 understood with reference to the accompanying drawings which illustrate only by way of a non-limitative example a preferred embodiment thereof.

In the drawings:

15 Fig. 1 is a perspective view of the apparatus of the invention;

Fig. 2 is a schematic elevation side view of the same;

20 Fig. 3 is a plan view of a detail of one arm provided with retainers;

Figs. 4 and 5 are a frontal elevation view and a side view of a second embodiment of the invention,
25 respectively, in which the retainers are oleodinamically driven;

Fig. 6 is a detail of a movable framework where oleodynamic cylinders are provided.

30

With reference to Figs. 1 to 3 the apparatus includes a



bridge framework of tubular metal sections formed by a front beam 8, a rear beam or a pair of rear beams 10, and two uprights 12 extending from the floor to the ceiling of the operational room and secured thereto by mutual
5 abutment of pressure discs 14 adjustable through threaded pins 16 without drilling or permanent securing devices. A travelling band 18 for deambulation having a varying resistance is placed between the two uprights 12 on two footboards or load cells 19A and 19B sensitive to changes
10 in pressure and each adapted to transmit to a corresponding display 20A and 20B the weight resting on each patient's foot.

Attached to the rear beam 10 are a certain number (five in the illustrated example) of pulleys 22 around which
15 traction lacings 24 are wound which are subjected to tension by devices 25 of the known type such as electric or hydraulic pistons, counterweight systems of conventional mechanical (rocker arm) or hydraulic type, or other equivalent systems shown only schematically. The
20 traction values are displayed by suitable indicators to the operator. Such lacings pass around pulleys 23 of front beam 8 and are provided with the ordinary accessories used in the traction techniques such as traction bands and slings, length regulators, a.s.o.
25 The apparatus is also provided with a number of rigid retainers or stops 28 to be attached to the patient's body for its blocking in the posture forced by the correction traction means. Such retainers are carried by horizontal arms 30 which can vertically slide along
30 uprights 12 by means of sleeves 32 and be adjusted in their lengths as they are formed of several pieces 30A.



30B and 30C slidable perpendicularly to one another.

The described apparatus has both diagnostic and
therapeutic functions. It is thereby possible to show
first of all the comfort postures or postural defects of
5 the subject and then to lead the same subject to take on
correct postures which becomes stable and definitive as
the therapy proceeds.

It is now disclosed by way of example the treatment of a
subject having five suspension points, and namely: one at
10 the cranium, two at the thorax, and two at the ischium
(inguen).

The patient is placed on travelling band 18 with his feet
resting exactly on the corresponding footboards sensing
the weight. The right display 20A shows the weight
15 resting as a whole on the right foot and the left display
20B shows the weight resting as a whole on the left foot.
Such weights are almost different from each other because
the total weight divides equitably very seldom but rests
more on the right side or the left side than the other
20 side according to the importance of the posture defect to
be corrected.

The right or left ischiatic suspension acts for levelling
the values of the two displays 20 through the
corresponding traction lacing 24. This operation aims at
25 balancing the pelvis to avoid resting defects on one side
or on the other side.

Now a symmetric thoracic traction. i.e. a balanced weight
release on the right and left sides, is carried out in
order to compensate about 20% of the body weight. The
30 preceding values of displays 20 are very likely varied at
the end of such operation. Actually. if the subject had.



for example, a posture of the trunk inclined to the right side due to the rotation of the backbone or to the retraction of the muscles responsible for that movement towards that side, the indifferentiated upwards traction
5 of the trunk will raise the pelvis on that side and will deduct a weight equal to the intensity and amplitude of the postural lack of balance.

The traction is then differentiated by means of a lateral thoracic tie-rod 24 so as to compensate the values of
10 displays 20.

Finally, a light cervical traction is carried out for excluding the weight of the cranium: the patient is then subjected to differential tractions at several levels, the intensity thereof expressing the existing myofascial
15 reactions.

The pelvic, sacral, sternal, humeral and dorsal retainers or stops 28 are then fastened to the patient's body in order to discourage any attempt of compensation by an attitude other than that forced by the correcting
20 tractions.

Patient is invited to walk by setting a very low resistance at the beginning.

It is self-evident that under such conditions the patient cannot make use of his usual (and wrong) scheme of
25 deambulation as:

- his proprioceptive sensations of his own weight are deeply changed and then he cannot make use of his usual scheme of movement;
- the attempts of compensation made by the assumption of
30 different, less tiring, comfort postures are cancelled by the differential tractions of lacings 24 and by stops 25



fixing the therapeutic posture.

Any pressure sensor on stops 23 can display the different thrusts of the several points of the body and then the attitude against a back thrust which rotates the backbone.

Under such conditions the subject is forced to invent a new way of movement and shall do this by using skeleton, muscles, a.s.o. which are now correctly postured. If at the beginning he moves with extreme difficulty, as the therapy proceeds the subject will stably reach a new global, now correct scheme of movement.

The displays can translate into objective data the progress of the therapy. In fact, as the therapy proceeds and the several defective bends of the backbone and the myofascial reactions are compensated and cancelled, it is as though the trunk of the patient got longer. As a consequence the efficiency of the thoracic traction will be progressively reduced, and the displays will show it by an increase of the weight shown. The responsible personnel can then draw up a hospital file of the patient in which the detected values in the several therapy sessions will be recorded until stable values not subjected to change are reached. Thus a graph as well as digital data of the reached, global and definitive, correct posture can be obtained.

The described apparatus is susceptible to be used in combination with a microprocessor capable of storing treatment beginning and end data, the evaluation of the differences detected, and data during the treatment to statistic research purposes. It is also possible to use a microprocessor for controlling the function on the base



of a stored program.

Alternatively, the orthostatic posture of the subject can be put under control by detecting the displacement of a reference point of the patient's body in the space. To this purpose a photoelectric cell and a scanner can be used.

5 In Figs. 4 to 6 a second embodiment is shown, in which stops 28 are moved by oleodynamic cylinders 30' carried on frames 40 vertically movable along guides 50 parallel to uprights 12' between which slidable footboard 18 is placed. As can be seen, cylinders 30' can be horizontally displaced on the relative movable frames 40 and
10 cylinder 60 attached to a proper plate 62.

A preferred embodiment of the present invention seeks to overcome the limits of the existing apparatus and to provide an apparatus by which the correction of postural bad habits upstream of the several peripheral symptoms which can occur in different ways becomes total, permanent, spontaneous and directed in all three dimensions.

15 A preferred embodiment of the invention also provides an apparatus as described above, wherein the means for controlling the weight resting on each foot supplies data to a microprocessor adapted to automatically control the operation of the traction means for leading the patient again to a predetermined postural attitude.

A preferred embodiment of the invention further provides an apparatus as
20 described above wherein the data of the displays is transmitted to a computer adapted to store the data of the beginning and the end of the treatment and to issue a graphic representation of the same.

A preferred embodiment also provides an apparatus including, instead of the means for measuring the patient's weight, optical and/or electronic means for detecting
25 the spatial variation of the position of a reference point attached to the patient's body.



THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A diagnostic and therapeutic apparatus for correcting the posture of the backbone of a human patient, said apparatus including traction means for applying differential traction at different levels of said patient in order to cancel out all or a part of the weight
5 of said patient, limiting means for correcting postural defects by constraining movement of the patient to within predetermined postural limits, monitoring means adapted to monitor the 3-dimensional orthostatic posture of the patient whilst walking, said monitoring means also being adapted to measure the weight resting on each foot of the patient, in order to correct said patient's posture and to encourage the patient to adopt a
10 new scheme of posturally correct movements.
2. The diagnostic and therapeutic apparatus as claimed in the preceding claim, wherein said monitoring means feeds data to a microprocessor controlling automatically the operation of the traction means.
3. The diagnostic and therapeutic apparatus as claimed in any one of the preceding
15 claims, wherein said monitoring means include footboards sensitive to changes in pressure or load cells placed under the walking surface of a travelling or slidable band.
4. The diagnostic and therapeutic apparatus as claimed in any one of the preceding claims, wherein said traction means are lacings or traction slings adjustable in length and slidable around pulleys carried by a frame which can be firmly anchored to the floor
20 and/or to the ceiling of the operational room, and put under tension by electric, mechanical or hydraulic devices.
5. The diagnostic and therapeutic apparatus as claimed in the preceding claim, wherein said traction slings are designed for the treatment of the patient through five suspension points, namely one at the cranium, two at the thorax, and two at the ischium
25 (inguen).
6. The diagnostic and therapeutic apparatus as claimed in any one of the preceding claims, wherein said limiting means include a number of stops acting in the horizontal plane which are placed against the patient's body at predetermined points by vertically shifting and adjusting rigid support arms slidable by means of sleeves along the uprights
30 of the apparatus.



7. The diagnostic and therapeutic apparatus as claimed in the preceding claim, wherein said stops are provided with pressure sensors for measuring the thrust of the patient.

8. The diagnostic and therapeutic apparatus as claimed in claim 6 or 7, wherein said stops are carried by oleodynamic pistons attached to rigid, hydraulically driven support structures capable of positioning said oleodynamic pistons.

9. The diagnostic and therapeutic apparatus as claimed in claim 3 wherein an electronic central processing unit is provided which is adapted to receive data detected by the load cells of the travelling band and which is also adapted to receive the values of the tractions at the several levels of the patient's body during the therapy so as to plot the whole treatment.

10. The diagnostic and therapeutic apparatus as claimed in any one of the preceding claims, wherein a device detecting the position of a reference point attached to the patient's body is used for monitoring the orthostatic posture of the patient.

11. A diagnostic and therapeutic apparatus substantially as herein described with reference to any one of the embodiments of the invention shown in the accompanying drawings.

DATED this 24 Day of April 1997

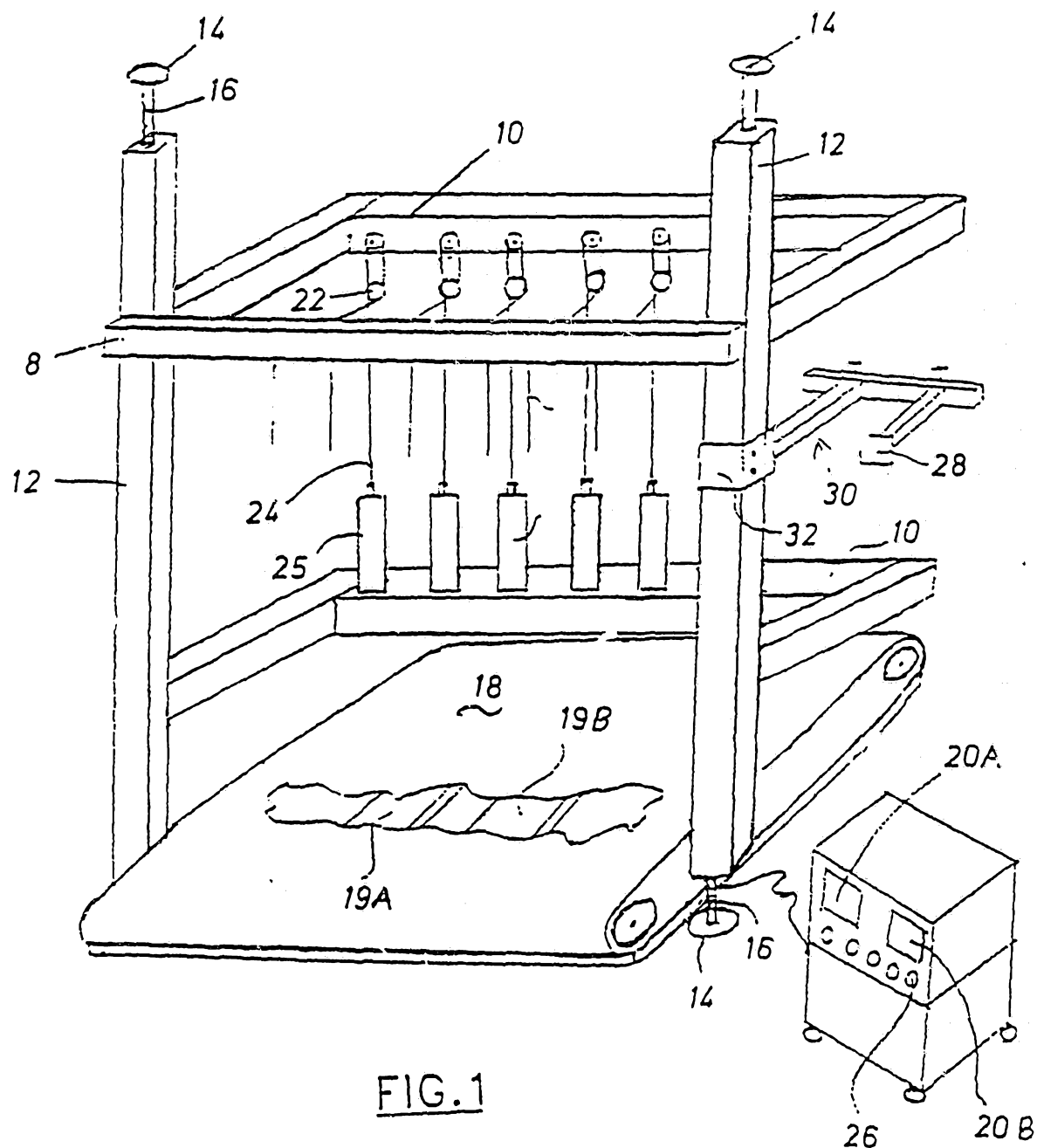
Giovanni Battista Giovannetti

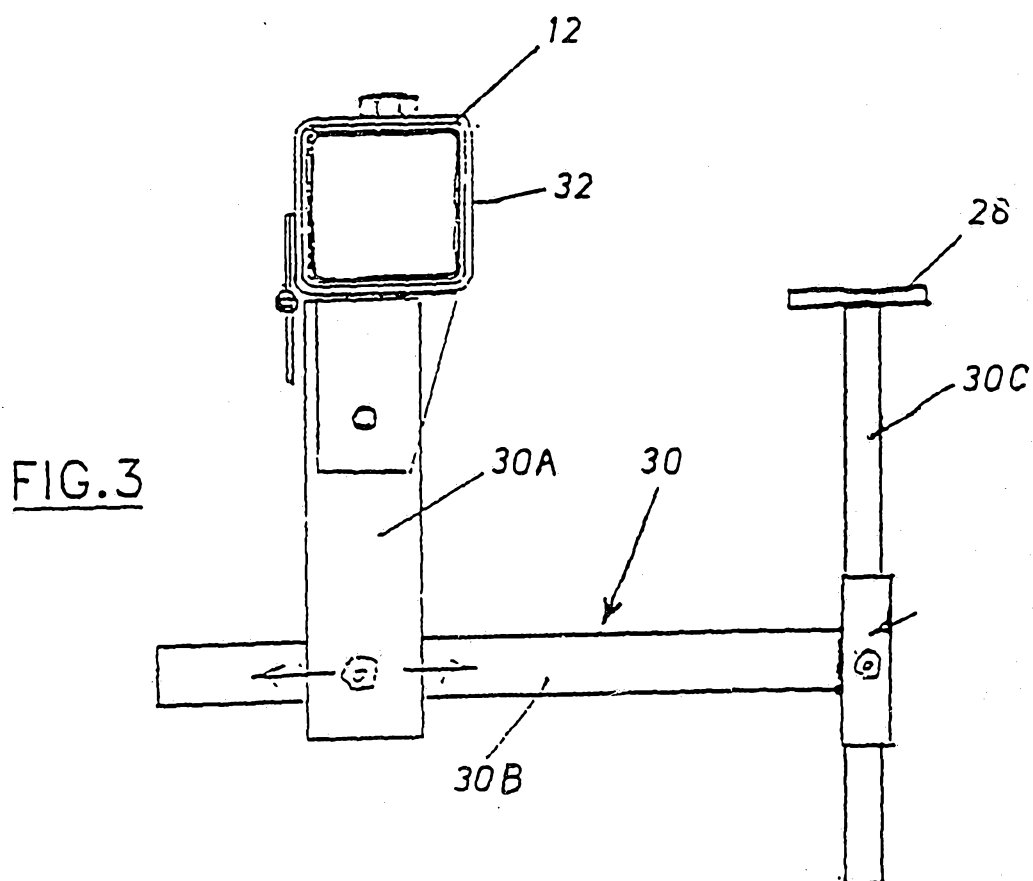
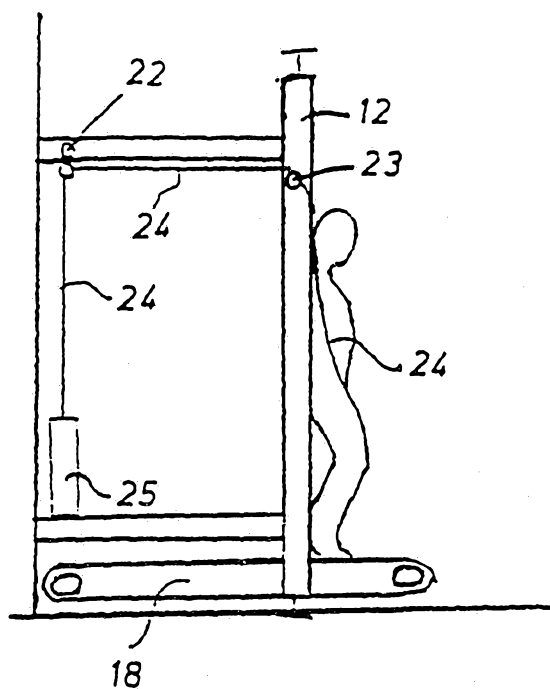
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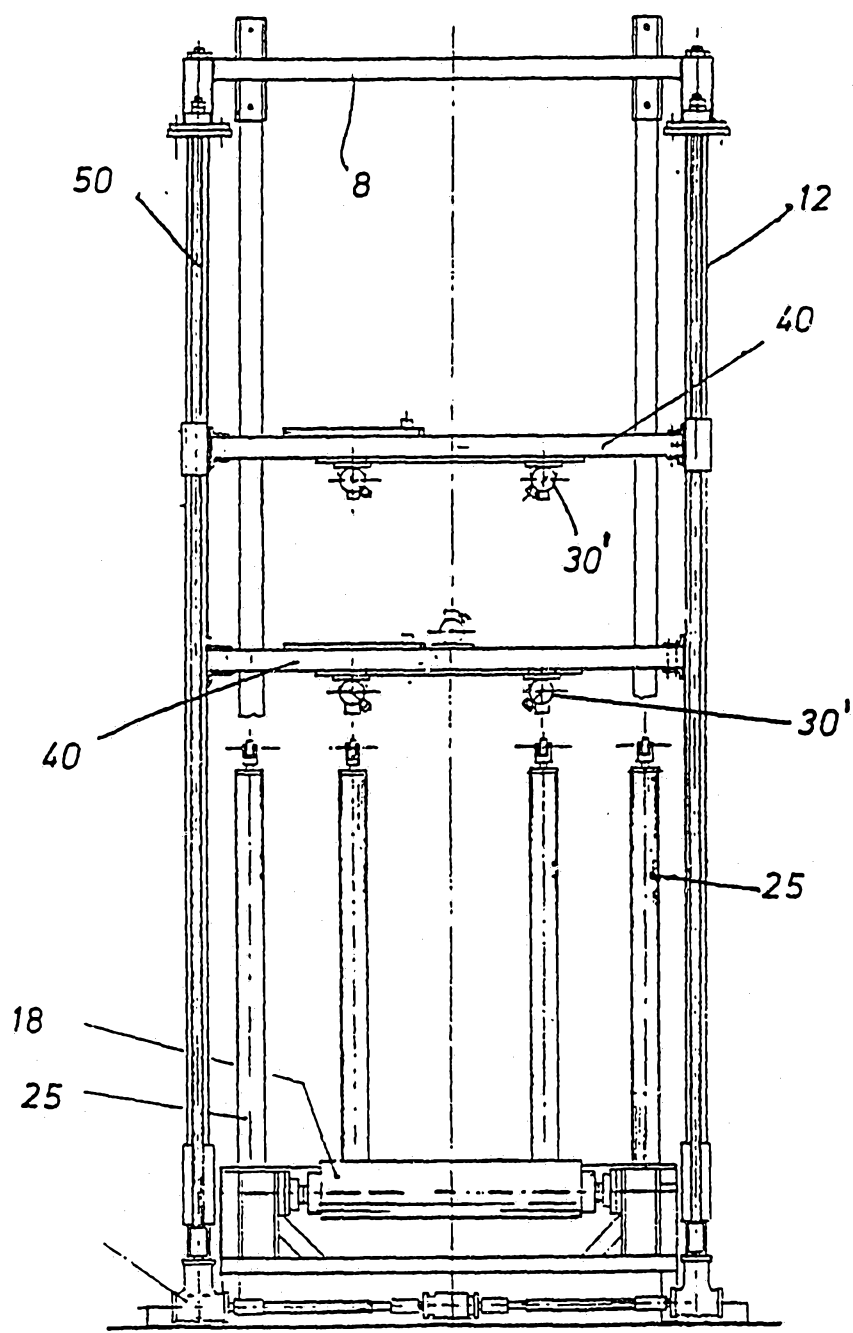


FIG. 4

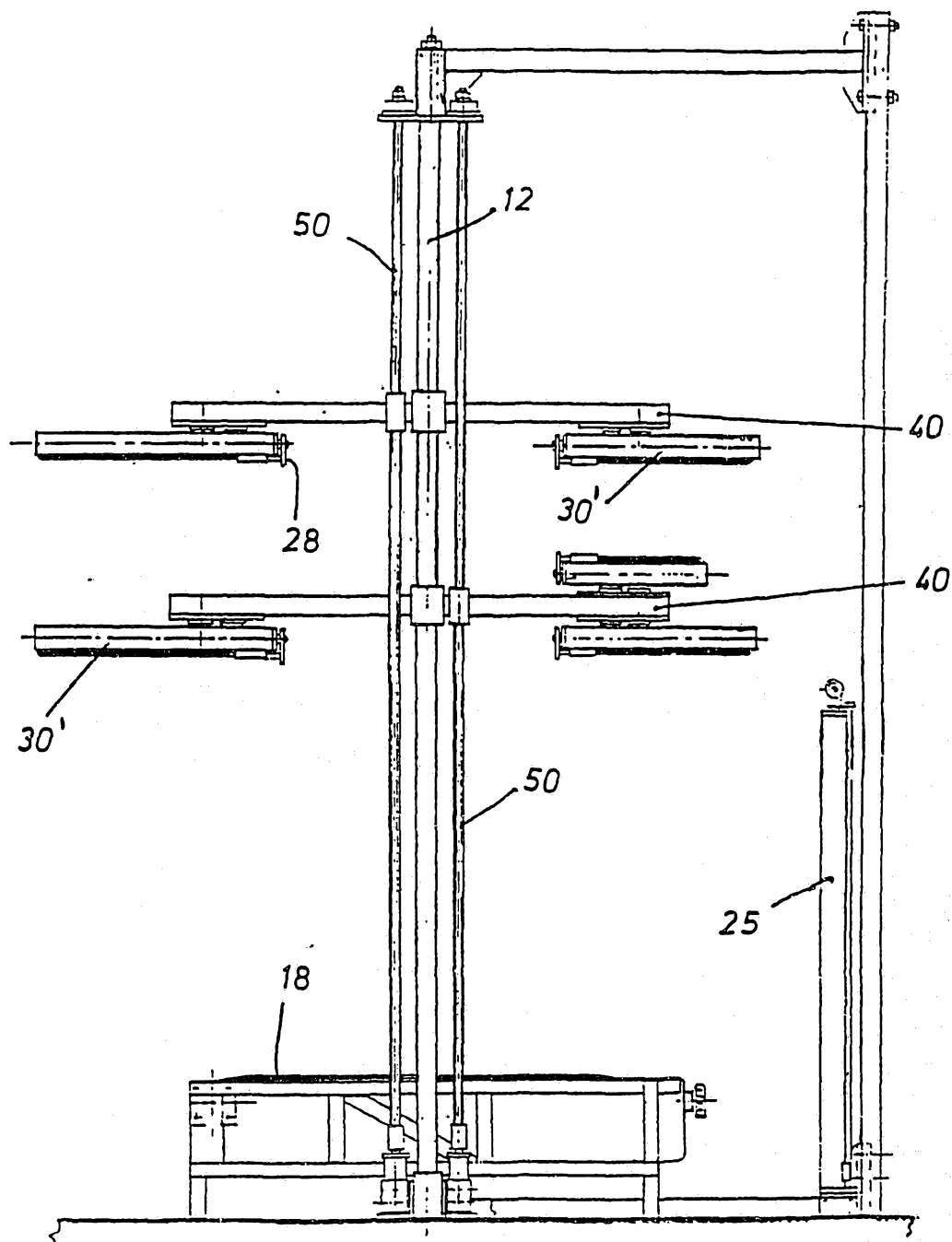


FIG.5

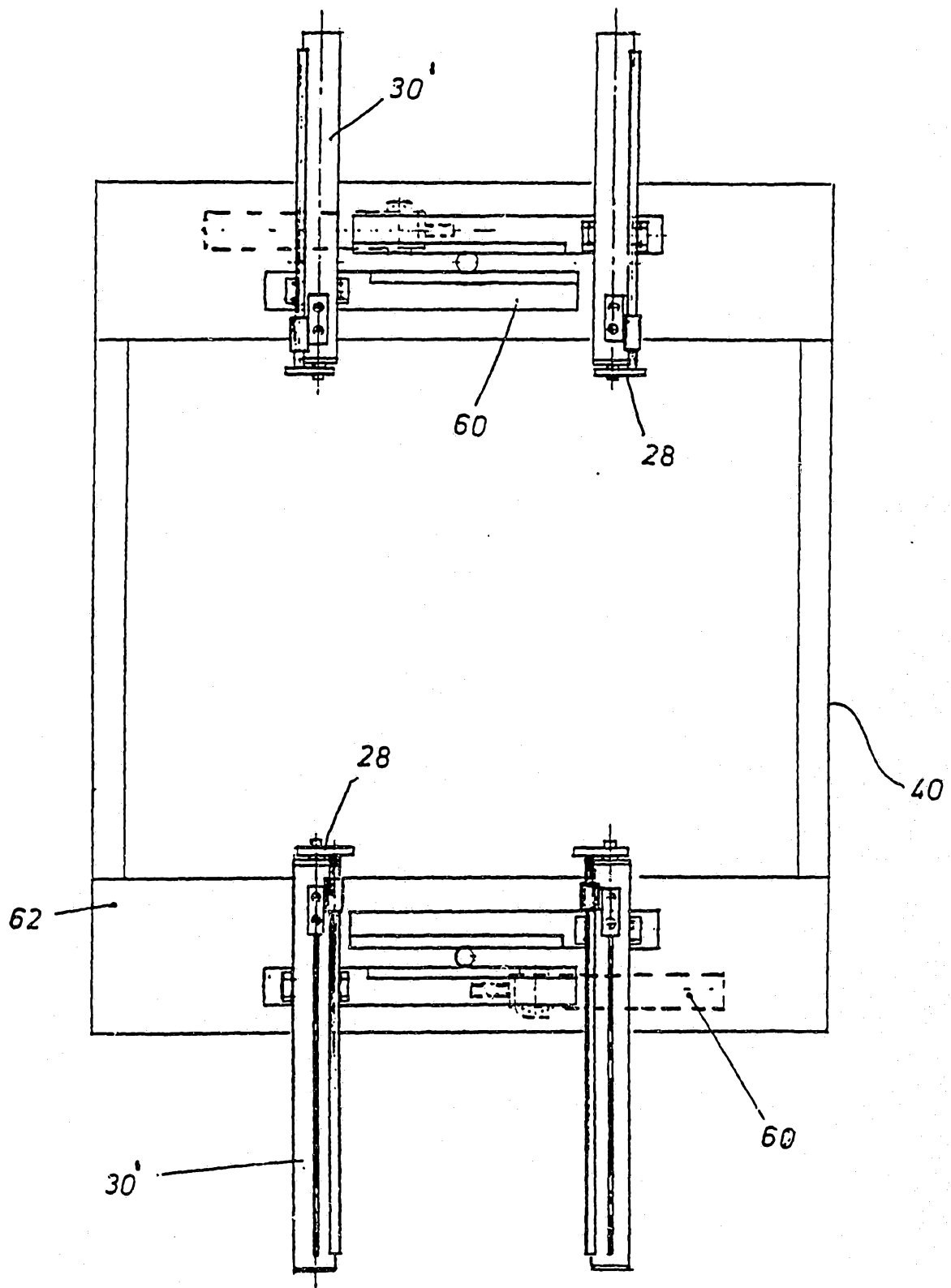


FIG. 6

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.**

IT 9306005
SA 69740

*This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on
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18/03/93

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR-A-2252108	20-06-75	None	
EP-A-0002188	13-06-79	None	
DE-U-9017709	26-09-91	DE-C- 4027317	05-12-91
DE-A-2151933	21-12-72	None	