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(54) POSTURE TRAINING MACHINE AND RELATED OPERATING METHOD OF THE SAME

KÖRPERHALTUNGS TRAININGSMASCHINE UND VERWANDTE BEDIENUGSVERFAHREN DER GLEICHEN

MACHINE D'ENTRAÎNEMENT DE POSTURE ET PROCÉDÉ DE FONCTIONNEMENT LIÉ À CELLE-CI

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Description

[0001] The present invention refers to a posture training machine and to a relative operating method of the same.

[0002] Apparatuses for controlling and correcting posture mainly used currently in general comprise supports, rigid or flexible, which are "worn" by the user, in other words applied to him for protracted periods through the day. Such devices generally apply corrective forces obliging the user to take up some positions or preventing others and/or deviate part of the loads acting on the back.

[0003] Such devices thus attempt to passively impose corrections to posture without taking into account the physiology of the muscle system responsible for it.

[0004] Other devices, on the other hand, carry out a detection on the posture taken up by the user for example while in seated position or when carrying out a gymnastic exercise.

[0005] Document US-A-5570301 describes a system for unencumbered measurement and reporting of body posture that monitors an individual by means of non-encumbering force or proximity sensors and analyzes the outputs of the sensors to estimate the body posture of the individual.

[0006] This allows the user to become more aware of the correct posture, but they do not carry out any specific training on it.

[0007] Increasingly great attention is now devoted by medical-sports clinics to achieving and maintaining a correct posture, which is scientifically recognised to be a necessary element for the correct balance of the entire human body.

[0008] It should be observed that in controlling posture an essential role is carried out by the muscle system, on which a differentiation must be made both in terms of anatomy and function.

[0009] Starting from this distinction two basic types of muscles can be identified: static and dynamic.

[0010] Static type muscles are to withstand gravity, they are fibrous and they have a strong tone; they represent 2/3 of our muscle mass and they never stop acting even at rest.

[0011] Dynamic type muscles, once they have ended their contraction, since they are not essential for the erect position of the back, standing up or sitting down, go back to their natural decontraction.

[0012] Therefore, the dynamic muscles always tend to relax, whereas the static muscles tend to shorten.

[0013] All of the static muscles are inevitably subjected to continuous and prolonged contracting activity, and this hyperactivity inevitably leads towards hypertonia and a retraction with a consequent reduction in their elasticity, one of the most important components of the muscle.

[0014] This alteration of the physiological tone of the static muscles, for example in some regions of the human body, leads to imbalance under load of the skeletal system that leads to discomfort and even over time to chronic disturbances for example under load of the joints.

[0015] The purpose of the present invention is to make a posture training machine and a relative operating method of the same that allows both isometric eccentric exercises and dynamic exercises to be carried out to train posture.

[0016] Another purpose of the present invention is to make a posture training machine and a relative operating method of the same that allows the correct posture to be gradually reached and for it to be maintained.

[0017] A further purpose is to make a posture training machine and a relative operating method of the same suitable for training both the standing posture and the seated posture.

[0018] Another purpose of the present invention is to make a posture training machine and a relative operating method of the same that are particularly simple and functional, with low costs.

[0019] These purposes according to the present invention are accomplished by making a posture training machine and a relative operating method of the same as outlined in the independent claims.

[0020] Further characteristics are foreseen in the dependent claims.

[0021] The characteristics and advantages of a posture training machine and of a relative operating method of the same according to the present invention will become clearer from the following description, given as an example and not for limiting purposes, referring to the attached schematic drawings, in which:

figure 1 shows a perspective view of a posture training machine according to a first embodiment;
figure 2 shows the machine of figure 1 from above;
figures 3 and 4 show the machine of figure 1 respectively in use by a tall and short user;
figure 5 shows a perspective view of a second embodiment of the posture training machine;
figure 6 shows a detail of the screen of the machines of figures 1 and 5;
figures 7 and 8 show a further embodiment of the posture training machine object of the present invention in the electronic version, respectively without and with a user according to two different angles;
figure 9 shows a detail of the screen of the machine of figure 7;
figures 10 and 11 show the operation of the posture training machine according to the present invention during training while seated.

[0022] With reference to the figures, a posture training machine is shown wholly indicated with 10, 10' or 100 and comprising a vertical support structure 12 that creates a support for the back of a user 11 in erected position, in other words rested straight against the vertical support 12, a footboard 13 and a screen 14, supported by an arm 15 in a user-visible position.

[0023] The vertical support structure 12 is adjustable

in height to adapt to users of even very different heights, like children and adults, schematised in dotted and dashed lines in figures 3 and 4.

[0024] The vertical support structure 12 is for example mounted on a telescopic shaft 16 and can be locked in any of the desired positions.

[0025] The adjustment in height of the vertical support structure 12 may be necessary also to prepare the machine for seated posture training. In this case, the adjustment is carried out after having positioned the user 11 seated on a support 28 without a backrest in front of the machine 10. The footboard 13 is provided with foot position control means that can be adapted to every user 11, which in the example of figures 1-5 consist of an adjustable heel stop bar 17.

[0026] The vertical support structure 12 comprises at least five rest elements 18, each modulable in height with respect to the plane of the vertical support structure 12 in an independent manner and equipped at its free end with a contact sensor 19, connected with the screen 14, for example shown in figure 6.

[0027] The adjustment in height of each rest element 18, for posture training when standing and seated, which must be carried out before each operating cycle, according to the physionomy of the user and the results to be obtained, can be carried out continuously, for example through screw means, or else through discrete positions, through known adjustment means, not shown.

[0028] The rest elements 18 are arranged in a "cross", in other words they are positioned in a number equal to at least three longitudinally, in other words along a vertical line Y, at the user's vertebral column 11. At the shoulders of the user 11, moreover, at least one rest element 18 is arranged on opposite sides of the vertical line Y, in a transversal direction X with respect to the other rest elements 18.

[0029] The rest elements 18 comprise adjustment means of the position in the plane of the support structure for the correct positioning of the rest elements 18 longitudinally close to the cervical, dorsal and lumbar curves of the vertebral column, as well as transversally close to the shoulders.

[0030] The adjustment can occur between discrete positions or even continuously.

[0031] In the seated posture training mode, the rest elements 18 close to the shoulders arranged in the transversal direction may also not be used. Indeed, at least two longitudinal rest elements 18 are sufficient, adjusted close to the lumbar zone to recreate the correct position to be maintained every time that the person is seated. According to an embodiment shown in figures 10 and 11 there are three rest elements 18 positioned close to the lumbar zone. There could also be a greater number depending on the morphology of the user.

[0032] Moreover, preferably, the at least two longitudinal rest elements 18 for the seated training of the lumbar zone are additional elements with respect to the at least three longitudinal rest elements 18 for the training of the back when standing. In this machine configuration, the setting of the rest elements 18 is carried out, for example with the help of specialised personnel, before carrying out the training cycle both for the standing position and for the seated position, so that the user can exercise in both training modes without modifying the machine at all.

[0033] According to the first embodiment of the machine 10, shown in figures 1-4, the vertical support structure 12 both longitudinally and transversally has plurality of holes 20 for the positioning of the rest elements 18.

[0034] Figure 5, on the other hand, shows a second embodiment of the posture training machine 10' according to the present invention, which has different adjustment means of the position in the plane of the support structure for the correct positioning of the rest elements 18. The vertical support structure 12 is provided with longitudinal and transversal grooves 21, in which the rest elements 18 are slidingly housed, which can then be locked in continuously identifiable positions.

[0035] The screen 14, preferably of the LED type, is connected to the contact sensors 19, so that by pressing on each contact element 18 the corresponding LED will light up in an indicator 22, shown in figure 6.

[0036] The screen 14 can be alongside or replaced by other means for the audio/visual signalling, which inform the user of which and/or how many rest elements are activated. For example, according to a simplified embodiment of the posture training machine according to the invention, the user is informed of simultaneous contact of all of the rest elements 18 by an acoustic indicator.

[0037] The posture training machine according to the invention could have more than five rest elements 18 for better posture control, distributed closer together longitudinally and transversally. The use of a large number of rest elements 18, theoretically also possible with manual posture training machines 10, 10', shown in figures 1 to 6, is however particularly advantageous in electronic-control machines, in which the position in height of each rest element 18 can be quickly set automatically.

[0038] For example, in the electronic control posture training machine 100, shown in figures 7 to 9, the rest elements 18 are longitudinally distributed very close together to form a continuous curved line of modulable curvature.

[0039] Further embodiments, not shown, could also have rest elements 18 transversally distributed to form a modulable continuous curve, or even rest elements distributed over the entire surface of the support structure, no longer just according to a "cross" arrangement, to form a three-dimensional plane of modulable shape.

[0040] The footboard 13 comprises electronic means for the control of the position of the feet and the balancing of the load between the right and left feet 23.

[0041] The control means 23 are connected with the screen 14, shown schematically in figure 9, which comprises an indicator of the weight distribution 24 on the footboard 13.

[0042] The electronic-control training machine 100 also comprises a control unit, connected to a programming interface 25 by the user and a memory support interface 26, which allows the historical training data, the setting of the machine and training programs of every user to be saved.

[0043] Indeed, the electronic-control training machine 100, according to the present invention, can be programmed to carry out more complex exercise protocols.

[0044] Moreover, the screen 14 can show the comparison between the actual performance of the exercise with the target.

[0045] All of the different embodiments of the posture training machines 10, 10', 100 described above, in other words both manual ones more suitable for domestic use, and electronic-control ones more suitable for professional use, are suitable for being used for posture training when standing and seated.

[0046] According to the posture training machine 10, 10' or 100 and the relative operating method of the same, before starting a cycle of exercises for standing posture training, the rest elements 18 arranged longitudinally, which are at least three in number, will be arranged in the area corresponding to the three physiological curves of the subject to be treated: lumbar, dorsal and cervical, whereas the rest elements 18 arranged transversally, which are at least two in number, will be placed at the shoulder area.

[0047] The user 11, possibly helped by a professional, must stand on the footboard 13 with the back in contact with the vertical support structure 12 maintaining a correct posture.

[0048] The rest elements 18 will be arranged and adjusted in height, for example by a professional or by the user himself, so as to adhere to the five points of the back on which it is necessary to rest to improve posture. The user, by pressing on the rest elements 18, will illuminate on the screen 14 arranged before him in the LED indicator 22 selectively the LEDs corresponding to the control sensors 19, which will indicate to him that a correct posture has been reached and maintained.

[0049] Keeping the LEDs 22 switched on will lead to a global effort both of the nervous and muscle system of the subject, thus creating adaptations useful for improving posture.

[0050] In seated posture training, the rest elements 18, for example three in number, are arranged close to the lumbar zone so as to keep the sacrum in contact with the machine and to be able to recreate the correct alignment of the lumbar column arranging it in lordosis.

[0051] As shown in figure 11, the lower rest element 18, which takes up the minimum possible height with respect to the plane of the rest structure 12 of the back, defines the resting of the sacrum at the vertical rest structure 12. The remaining two rest elements 18, arranged at different heights to one another, describe the desired lumbar curve.

[0052] The rest of the column, like when standing, will be arranged so as to also maintain other dorsal and cervical curves. Optionally, further rest elements 18 can also be used arranged at the cervical and dorsal area, as well as at the shoulders.

[0053] The training of the lumbar portion in seated position will increase the perception level of the body in seated state recreating, day after day, the nerve and structural adaptations useful for easily maintaining the position.

[0054] The operating method of the posture training machine 10, 10' or 100 according to the invention therefore comprises the steps of:

- adjusting the rest elements 18 in a three-dimensional position that constitutes a reference for a subjective correct posture;
- signalling to the user the contact with a sensor 19 of each of the rest elements 18 and the time for which the pressure lasts.

[0055] The step of adjusting the rest elements 18 comprises adjusting the position thereof in the plane of the support structure 12 and adjusting the height with respect to the plane of the support structure 12.

[0056] The adjustment can be carried out from one time to the next on the longitudinal rest elements 18 to set up the machine both for standing posture training cycles and for seated posture training cycles or, alternatively just for one of the two training modes as wished.

[0057] The posture training principle according to the new machine foresees that the user, through a voluntary muscle contraction, voluntarily takes up a position previously defined as the correct position and maintains it for a certain exercise time, thus performing an isometric eccentric exercise.

[0058] In particular, the resting against the contact sensors 19 is carried out by the user without external constraints that hold it against the vertical support structure 12.

[0059] A further optional training step foresees that the user can voluntarily contract and relax distinct muscle districts to make selective pressure against the rest elements, in other words a dynamic exercise.

[0060] The training machine according to the present invention intervenes on the two main components responsible for modifications in posture, which are the passive resistance of the connective tissue and the increase in muscle tone.

[0061] In order to influence muscle hypertonia the inverse stretch reflex is exploited, in other words a protective reflex that decreases the tension of the muscle when it becomes too strong and that originates from impulses that are generated by the proprioceptive receptors, known as Golgi tendon organs, which activate through eccentric isometric contraction, whereas to act on passive resistance intervention is made with socalled "creep", in other words the gradual stretching extended over time, to obtain a definitive lengthening beyond the

starting length.

[0062] Unlike common posture and stretching techniques, which act specifically on some muscle districts, all of the segments of the body are involved at the same time by making autopostures that evolve gradually and progressively, with the fundamental involvement of respiration, towards a final position of maximum stretching.

[0063] All of this translates into an effective preventive action against overloading pathologies, but also, given that it acts on the elimination of compensation and thus towards the economics of the system, into an increase in sporting performance.

[0064] The posture training machine object of the present invention has the advantage of being simple to use, even without the help of specialised personnel, either to perform training or for installation.

[0065] The machine thus conceived can undergo numerous modifications and variants, all of which are covered by the invention; moreover, all of the details can be replaced with technically equivalent elements. In practice, the materials used, as well as the sizes, can be whatever according to the technical requirements.

Claims

1. Posture training machine **characterised in that** it comprises a vertical support structure (12) for resting the back of the user in erected position, said vertical support structure (12) being of adjustable height and comprising at least five rest elements (18), of which at least three longitudinally positioned at the user's vertebral column and at least a respective one on each side arranged in transversal direction close to the user's shoulders, wherein each of said rest elements (18) is adjustable in height with respect to the plane of said vertical support structure (12) in an independent manner to identify a correct posture and is also equipped at its free end with a contact sensor (19), connected with means for the audio/visual signalling (14) of which and/or how many rest elements (18) are activated.

2. Training machine according to claim 1, **characterised in that** it comprises adjustment means (20, 21) of the position of the rest elements (18) in the plane of the vertical support structure (12).

3. Training machine according to claim 2, **characterised in that** said adjustment means of the position of the rest elements in the plane of the support structure comprise a plurality of holes (20) for the positioning of said rest elements (18) in discrete positions.

4. Training machine according to claim 2, **characterised in that** said adjustment means of the position of the rest elements in the plane of the support structure comprise grooves (21) in which said rest elements (18) are slidingly housed, lockable in continuously identifiable positions.

5. Training machine according to claim 2, **characterised in that** a plurality of said rest elements (18) are longitudinally and/or transversally distributed in positions brought closer to form a continuous curve of modulable curvature.

6. Training machine according to claim 2, **characterised in that** a plurality of said rest elements (18) are distributed on a surface of said support structure (12) to form a three-dimensional plane of modulable shape.

7. Training machine according to claim 2, **characterised in that** it comprises a footboard (13) provided with foot position control means adaptable to different users (17, 23).

8. Training machine according to claim 7, **characterised in that** said footboard (13) comprises electronic means for the control of the position of the feet and the balancing of the load between the right and left feet (23).

9. Training machine according to claim 2, **characterised in that** said means for the audio/visual signalling of which and/or how many rest elements are activated comprise a screen (14), supported by an arm (15) in a user-visible position, wherein said screen (14) comprises an LED indicator (22) equipped with a number of LEDs equal to said rest elements (18), capable of selectively lighting during the pressure of the corresponding contact sensor (19).

10. Training machine according to claim 2, **characterised in that** it comprises an electronic control unit connected to a programming interface (25) and to a memory support interface (26).

11. Training machine according to any one of the previous claims, **characterised in that** at least two further rest elements (18) are positioned longitudinally at the user's vertebral column in a lower portion of said vertical support structure (12), suitable for being adjusted on the intended lumbar zone in seated training.

12. Operating method of a posture training machine according to any one of the previous claims comprising the steps of:

    - adjusting said rest elements (18) in a three-dimensional position that constitutes a reference for a subjective correct posture;

- signalling to the user the contact with a sensor (19) of each of said rest elements (18) and the time for which the pressure lasts.

13. Method according to claim 12, **characterised in that** said step of adjusting the position of said rest elements (18) provides for:

- adjusting the height of each of said rest elements (18) in relation to the plane of said vertical support structure (12) and
- adjusting the position of said rest elements (18) in the plane of the support structure (12).

14. Method according to claim 13, **characterised in that** in an electronic-control machine there is added the step of comparing the signal of the effective execution of an exercise with a target and showing such difference.

15. Method according to any one of the previous claims, **characterised in that** said adjustment step is carried out on a user in standing or seated position.

Patentansprüche

1. Körperhaltungstrainingsgerät, **dadurch gekennzeichnet, dass** es eine senkrechte Stützkonstruktion (12) zum Anlehnen des Rückens des Benutzers in aufrechter Haltung umfasst, wobei diese senkrechte Stützkonstruktion (12) eine verstellbare Höhe hat und mindestens fünf Anlehnelemente (18) umfasst, von denen mindestens drei in Längsrichtung bei der Wirbelsäule des Benutzers angeordnet und mindestens ein entsprechendes eines auf jeder Seite in Querrichtung nahe den Schultern des Benutzers angeordnet sind, wobei jedes dieser Anlehnelemente (18) in Bezug auf die Ebene dieser senkrechten Stützkonstruktion (12) unabhängig höhenverstellbar ist, um eine richtige Körperhaltung zu bestimmen, und außerdem an seinem freien Ende mit einem Berührungssensor (19) versehen ist, der mit Mitteln (14) für die akustische/optische Meldung, welche und/oder wie viele Anlehnelemente (18) aktiviert sind, verbunden ist.

2. Trainingsgerät nach Anspruch 1, **dadurch gekennzeichnet, dass** es Mittel (20, 21) zum Einstellen der Position der Anlehnelemente (18) in der Ebene der senkrechten Stützkonstruktion (12) umfasst.

3. Trainingsgerät nach Anspruch 2, **dadurch gekennzeichnet, dass** die Mittel zum Einstellen der Position der Anlehnelemente in der Ebene der Stützkonstruktion eine Vielzahl von Löchern (20) zum Anordnen der Anlehnelemente (18) an unterschiedlichen Stellen umfassen.

4. Trainingsgerät nach Anspruch 2, **dadurch gekennzeichnet, dass** die Mittel zum Einstellen der Position der Anlehnelemente in der Ebene der Stützkonstruktion Nuten (21) umfassen, in denen diese Anlehnelemente (18) gleitend untergebracht sind, wobei sie in stufenlos festlegbaren Positionen arretiert werden können.

5. Trainingsgerät nach Anspruch 2, **dadurch gekennzeichnet, dass** eine Vielzahl von Anlehnelementen (18) in Längsrichtung und/oder Querrichtung auf stärker aneinander angenäherte Stellen verteilt ist, um eine durchgehende Kurve mit einer einstellbaren Krümmung zu bilden.

6. Trainingsgerät nach Anspruch 2, **dadurch gekennzeichnet, dass** eine Vielzahl von Anlehnelementen (18) auf einer Oberfläche der Stützkonstruktion (12) verteilt ist, um eine dreidimensionale Fläche mit einer einstellbaren Form zu bilden.

7. Trainingsgerät nach Anspruch 2, **dadurch gekennzeichnet, dass** es eine Trittplatte (13) umfasst, die mit an verschiedene Benutzer anpassbaren Mitteln zum Kontrollieren der Fußposition (17, 23) versehen ist.

8. Trainingsgerät nach Anspruch 7, **dadurch gekennzeichnet, dass** die Trittplatte (13) elektronische Mittel für die Kontrolle der Position der Füße und der Gewichtsverteilung zwischen dem rechten und dem linken Fuß (23) umfasst.

9. Trainingsgerät nach Anspruch 2, **dadurch gekennzeichnet, dass** die Mittel für die akustische/optische Meldung, welche und/oder wie viele Anlehnelemente aktiviert sind, einen Bildschirm (14) umfassen, der von einem Arm (15) an einer vom Benutzer einsehbaren Stelle getragen wird, wobei dieser Bildschirm (14) eine LED-Anzeige (22) umfasst, die mit einer der Anzahl der Anlehnelemente (18) entsprechenden Anzahl von LEDs versehen ist, die in der Lage sind, während des Drückens auf den entsprechenden Berührungssensor (19) selektiv zu leuchten.

10. Trainingsgerät nach Anspruch 2, **dadurch gekennzeichnet, dass** es eine elektronische Steuereinheit umfasst, die mit einer Programmierschnittstelle (25) und mit einer Speicherträgerschnittstelle (26) verbunden ist.

11. Trainingsgerät nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** mindestens zwei weitere Anlehnelemente (18) in Längsrichtung bei der Wirbelsäule des Benutzers an einer niedrigeren Stelle der senkrechten Stützkonstruktion (12) angeordnet sind, die geeignet sind, beim Training im Sitzen auf die Lendengegend eingestellt

zu werden.

12. Verfahren zum Bedienen eines Körperhaltungstrainingsgeräts nach einem der vorhergehenden Ansprüche, das die folgenden Schritte umfasst:

- Einstellen der Anlehnelemente (18) in einer dreidimensionalen Position, die einen Bezug für eine subjektive richtige Körperhaltung bildet;
- Melden an den Benutzer des Kontakts mit einem Sensor (19) von jedem dieser Anlehnelemente (18) und der Zeit, über die der Druck dauert.

13. Verfahren nach Anspruch 12, **dadurch gekennzeichnet, dass** der Schritt des Einstellens der Position der Anlehnelemente (18) Folgendes vorsieht:

- Einstellen der Höhe von jedem dieser Anlehnelemente (18) in Bezug auf die Ebene der senkrechten Stützkonstruktion (12), und
- Einstellen der Position dieser Anlehnelemente (18) in der Ebene der Stützkonstruktion (12).

14. Verfahren nach Anspruch 13, **dadurch gekennzeichnet, dass** bei einem elektronisch gesteuerten Gerät der Schritt des Vergleichens des Signals der tatsächlichen Ausführung einer Übung mit einer Vorgabe und des Anzeigens einer solchen Differenz hinzugefügt wird.

15. Verfahren nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der Einstellschritt bei einem Benutzer in stehender oder sitzender Haltung ausgeführt wird.

Revendications

1. Machine d'entraînement de posture **caractérisée en ce qu'**elle comprend une structure de support verticale (12) pour appuyer le dos de l'utilisateur en position debout, ladite structure de support verticale (12) étant de hauteur réglable et comprenant au moins cinq éléments d'appui (18), dont au moins trois positionnés longitudinalement au niveau de la colonne vertébrale de l'utilisateur et au moins un respectif de chaque côté disposé en direction transversale près des épaules de l'utilisateur, dans laquelle chacun desdits éléments d'appui (18) est réglable en hauteur par rapport au plan de ladite structure de support verticale (12) d'une manière indépendante pour identifier une posture correcte et est également équipé à son extrémité libre d'un capteur de contact (19), connecté avec des moyens pour la signalisation audio/visuelle (14) de quels et/ou combien d'éléments d'appui (18) sont activés.

2. Machine d'entraînement selon la revendication 1, **caractérisée en ce qu'**elle comprend des moyens de réglage (20, 21) de la position des éléments d'appui (18) dans le plan de la structure de support verticale (12).

3. Machine d'entraînement selon la revendication 2, **caractérisée en ce que** lesdits moyens de réglage de la position des éléments d'appui dans le plan de la structure de support comprennent une pluralité de trous (20) pour le positionnement desdits éléments d'appui (18) dans des positions discrètes.

4. Machine d'entraînement selon la revendication 2, **caractérisée en ce que** lesdits moyens de réglage de la position des éléments d'appui dans le plan de la structure de support comprennent des rainures (21) dans lesquelles lesdits éléments d'appui (18) sont logés de manière coulissante, blocables dans des positions identifiables de manière continue.

5. Machine d'entraînement selon la revendication 2, **caractérisée en ce qu'**une pluralité desdits éléments d'appui (18) est distribuée longitudinalement et/ou transversalement dans des positions ramenées plus proches pour former une courbe continue de courbure modulable.

6. Machine d'entraînement selon la revendication 2, **caractérisée en ce qu'**une pluralité desdits éléments d'appui (18) est distribuée sur une surface de ladite structure de support (12) pour former un plan en trois dimensions de profil modulable.

7. Machine d'entraînement selon la revendication 2, **caractérisée en ce qu'**elle comprend un marchepied (13) doté de moyens de contrôle de position des pieds adaptables à différents utilisateurs (17, 23).

8. Machine d'entraînement selon la revendication 7, **caractérisée en ce que** ledit marchepied (13) comprend des moyens électroniques pour le contrôle de la position des pieds et l'équilibrage de la charge entre les pieds droit et gauche (23).

9. Machine d'entraînement selon la revendication 2, **caractérisée en ce que** lesdits moyens pour la signalisation audio/visuelle de quels et/ou combien d'éléments d'appui sont activés comprennent un écran (14), supporté par un bras (15) dans une position visible par l'utilisateur, dans laquelle ledit écran (14) comprend un indicateur à LED (22) équipé d'un nombre de LED égal auxdits éléments d'appui (18), capables de s'allumer sélectivement durant la pression du capteur de contact correspondant (19).

10. Machine d'entraînement selon la revendication 2,

caractérisée en ce qu'elle comprend une unité de commande électronique connectée à une interface de programmation (25) et à une interface de support de mémoire (26).

11. Machine d'entraînement selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**au moins deux autres éléments d'appui (18) sont positionnés longitudinalement au niveau de la colonne vertébrale de l'utilisateur dans une portion inférieure de ladite structure de support verticale (12), adaptée pour être ajustée sur la zone lombaire concernée durant l'entraînement assis.

12. Procédé de fonctionnement d'une machine d'entraînement de posture selon l'une quelconque des revendications précédentes, comprenant les étapes suivantes :

- le réglage desdits éléments d'appui (18) dans une position tridimensionnelle qui constitue une référence pour une posture correcte subjective ;
- la signalisation à l'utilisateur du contact avec un capteur (19) de chacun desdits éléments d'appui (18) et du temps que la pression dure.

13. Procédé selon la revendication 12, **caractérisé en ce que** ladite étape de réglage de la position desdits éléments d'appui (18) prévoit :

- le réglage de la hauteur de chacun desdits éléments d'appui (18) par rapport au plan de ladite structure de support verticale (12) et
- le réglage de la position desdits éléments d'appui (18) dans le plan de la structure de support (12).

14. Procédé selon la revendication 13, **caractérisé en ce que**, dans une machine de commande électronique, il est ajouté l'étape de comparaison du signal de l'exécution effective d'un exercice avec une cible et la présentation de cette différence.

15. Procédé selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ladite étape de réglage est exécutée sur un utilisateur en position debout ou assise.

Fig.1

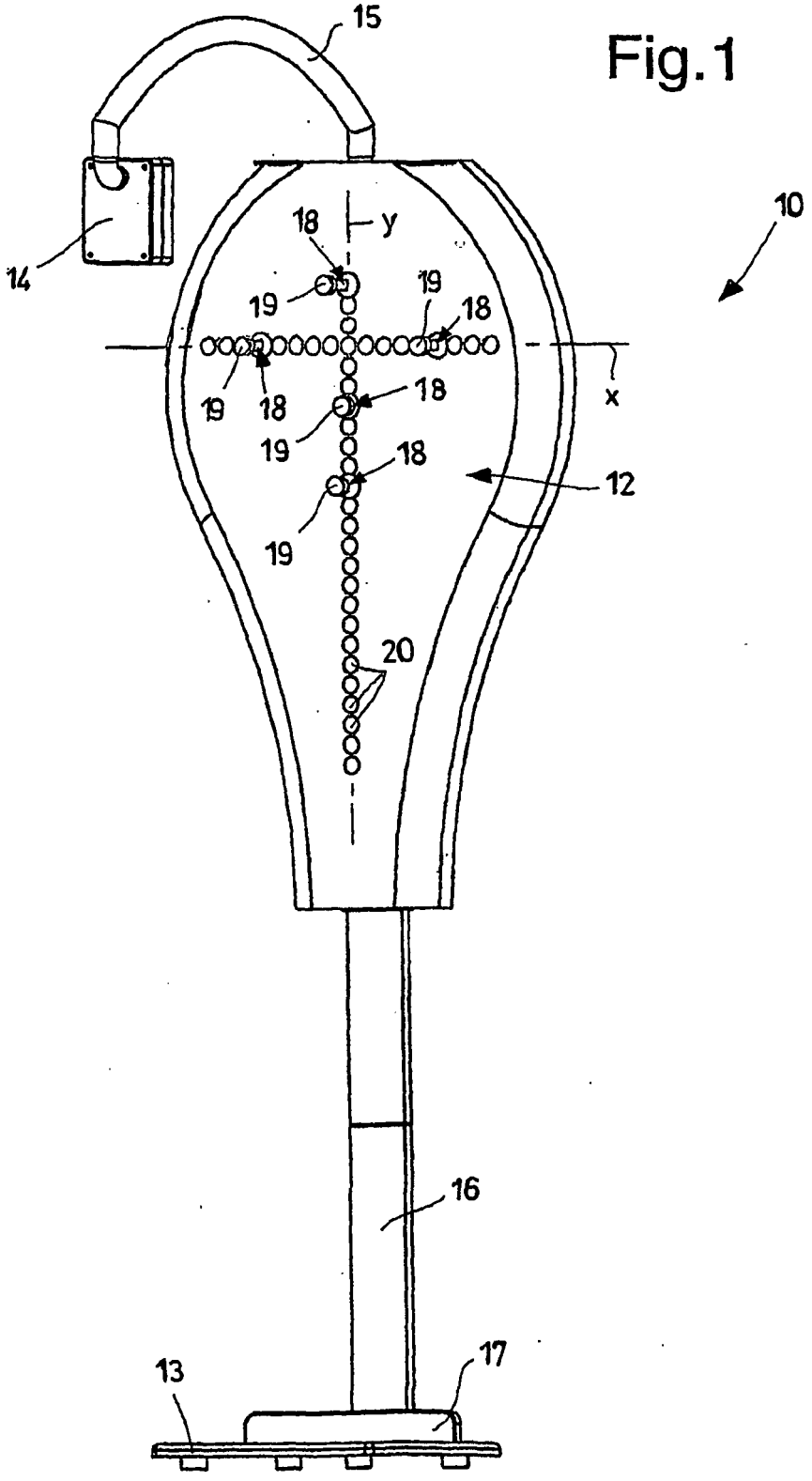


Fig.2

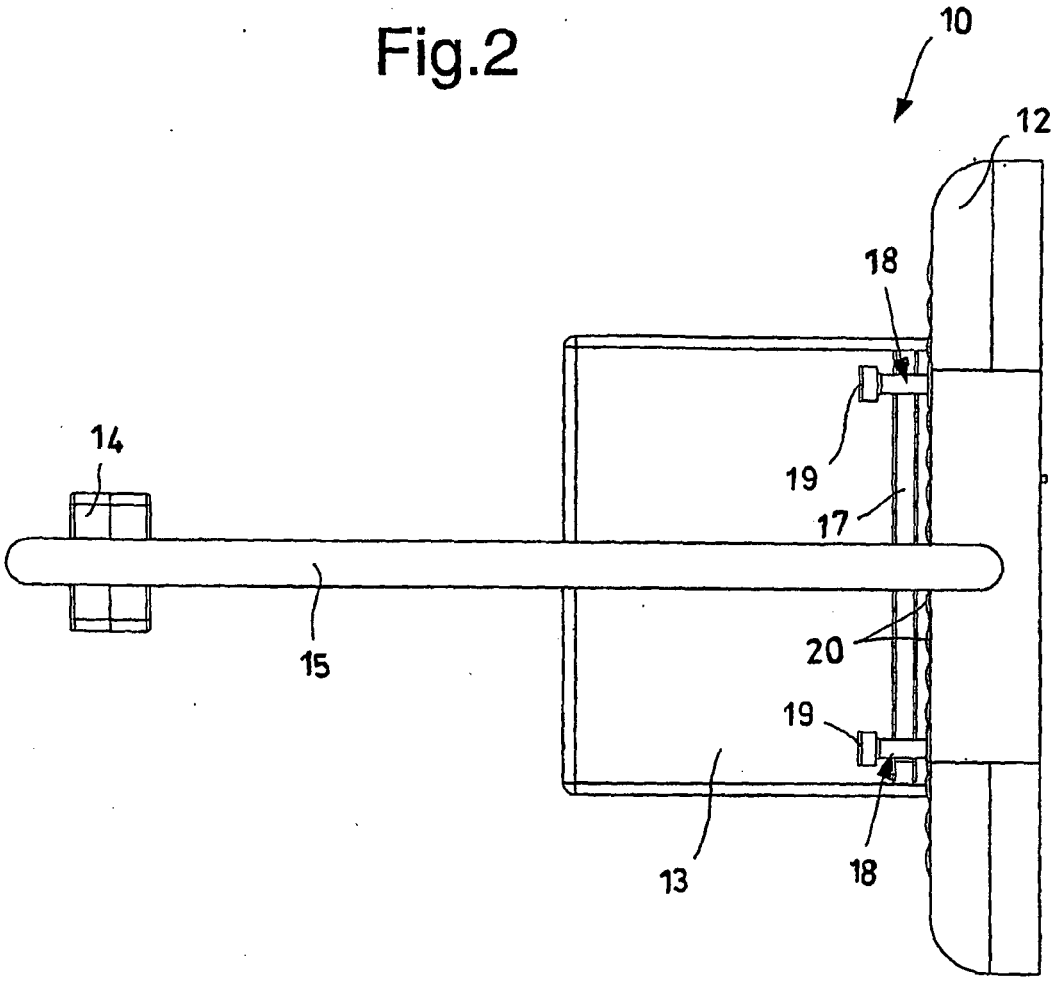
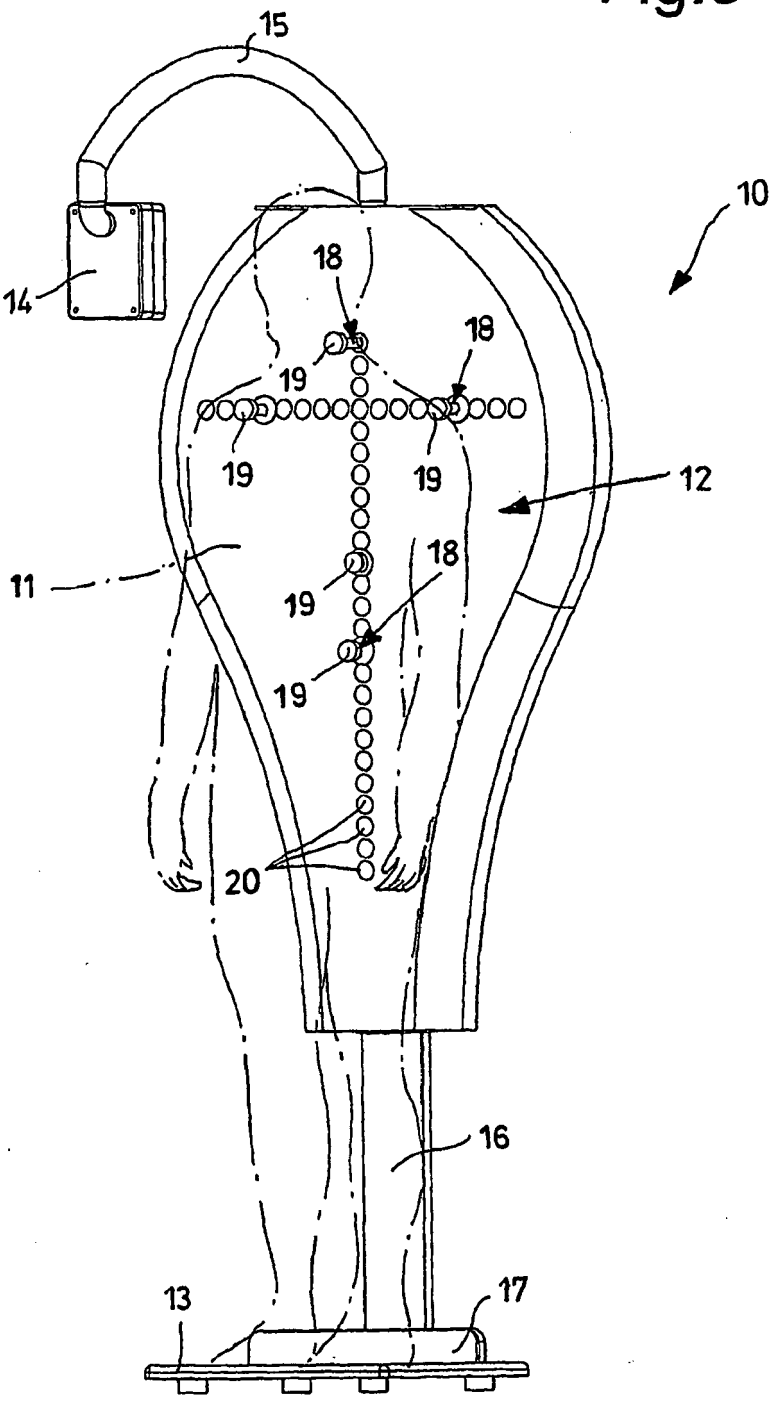


Fig.3



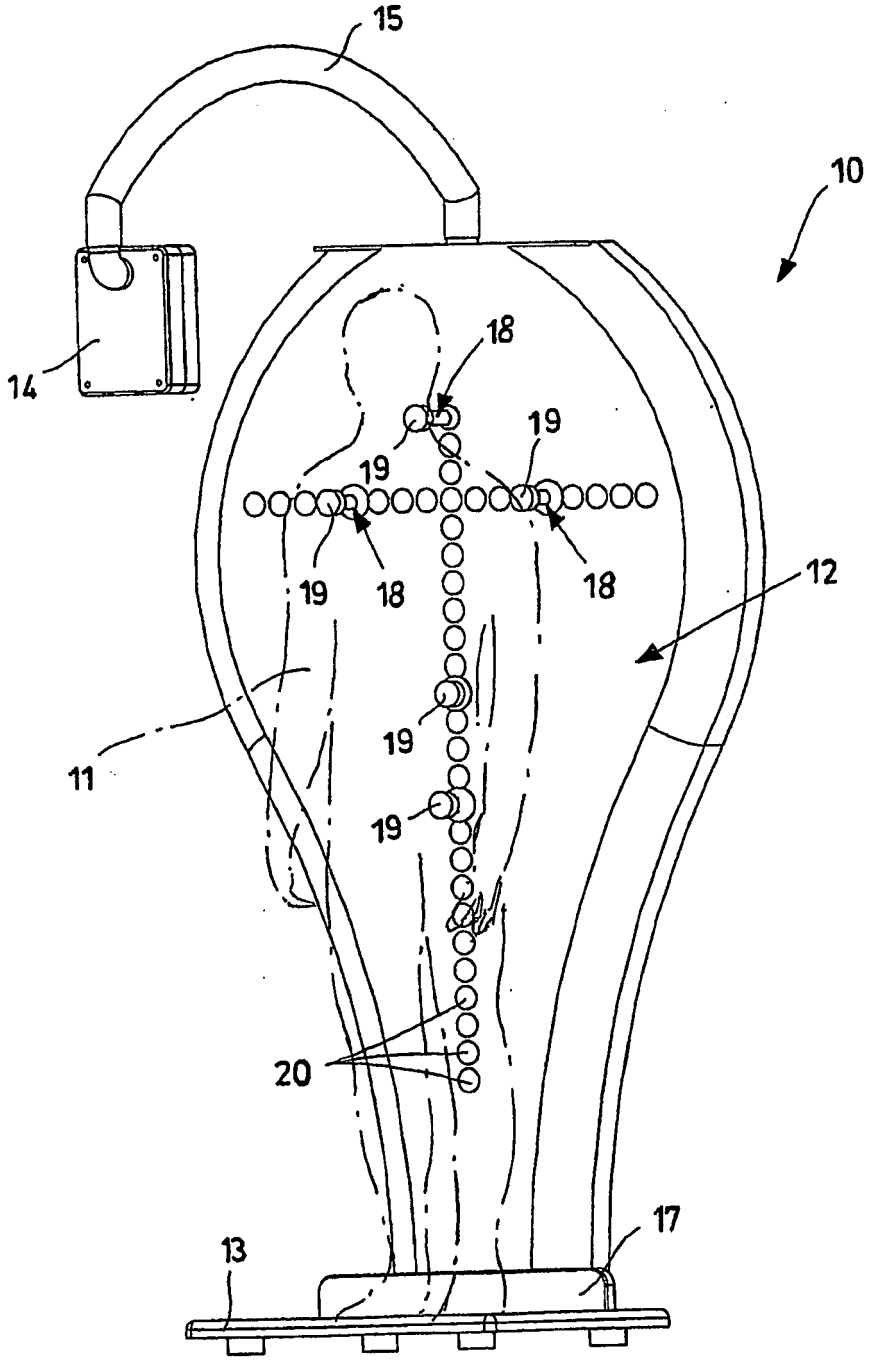
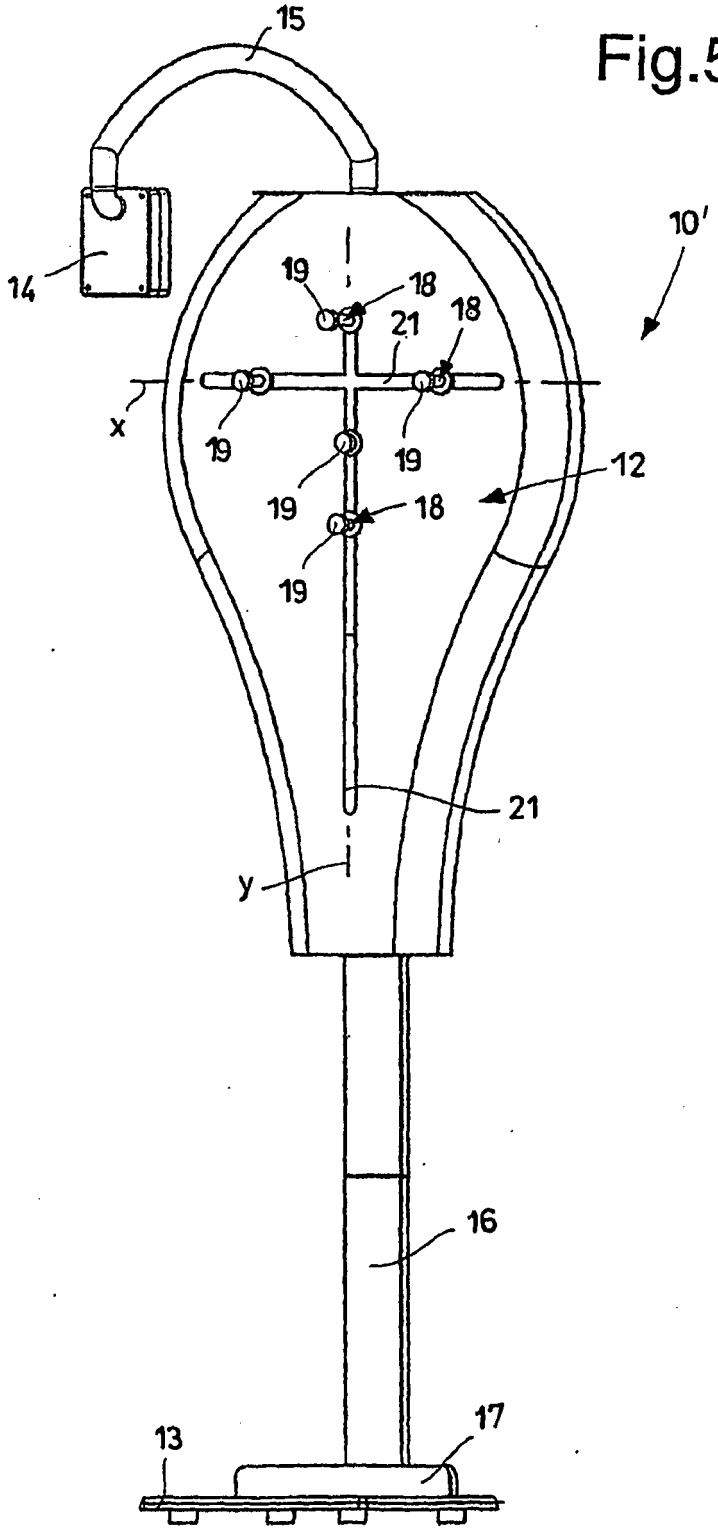


Fig.4

Fig.5



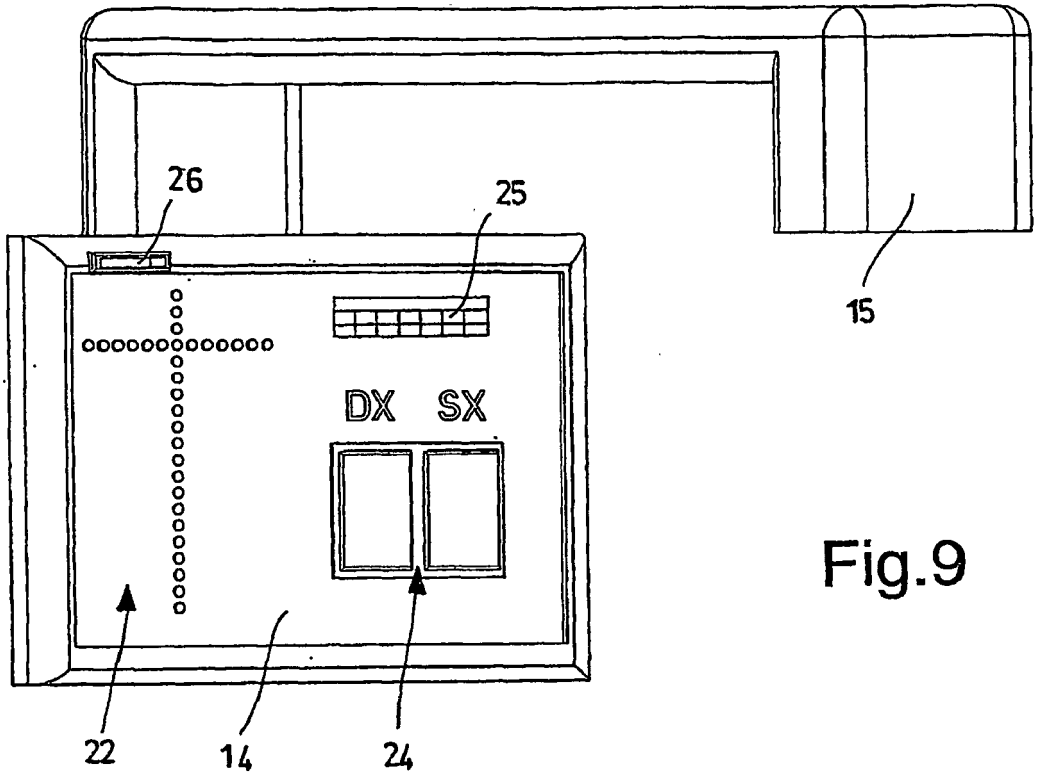


Fig.9

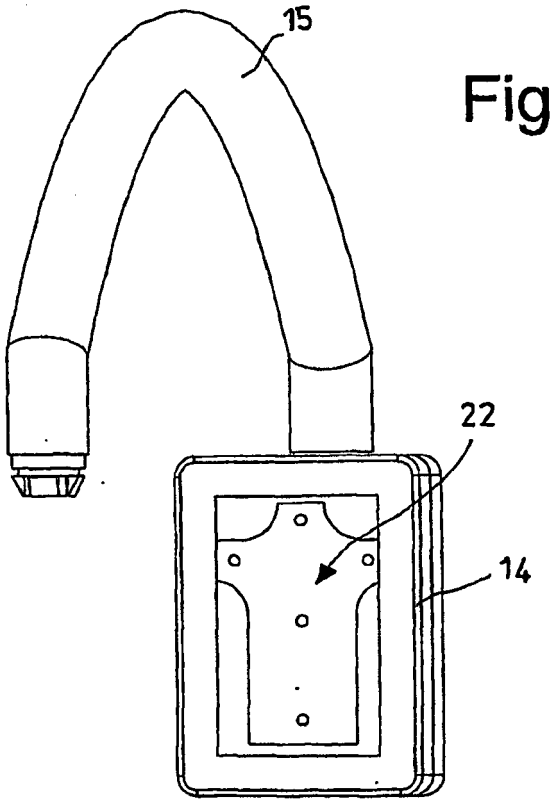


Fig.6

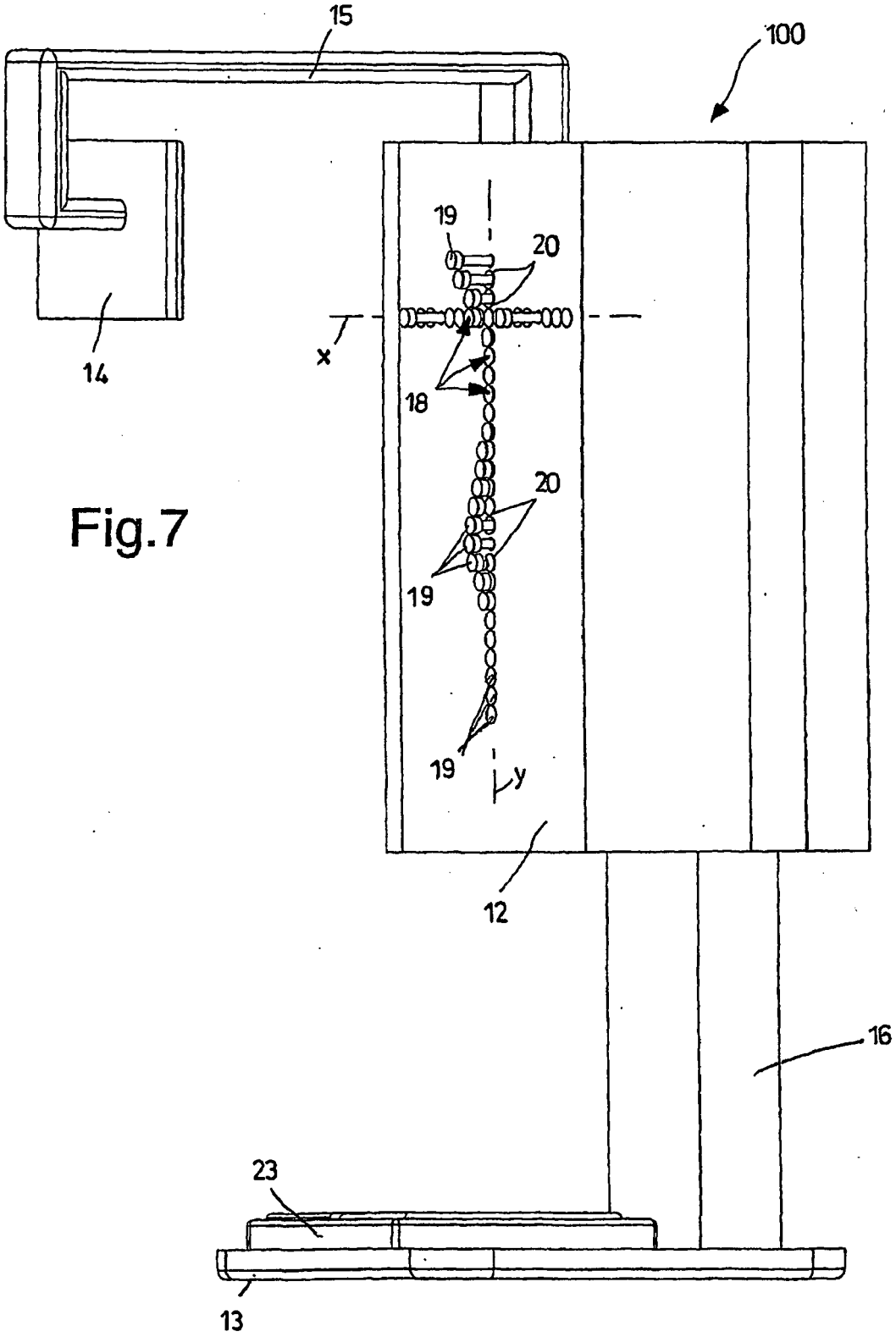


Fig.7

Fig.8

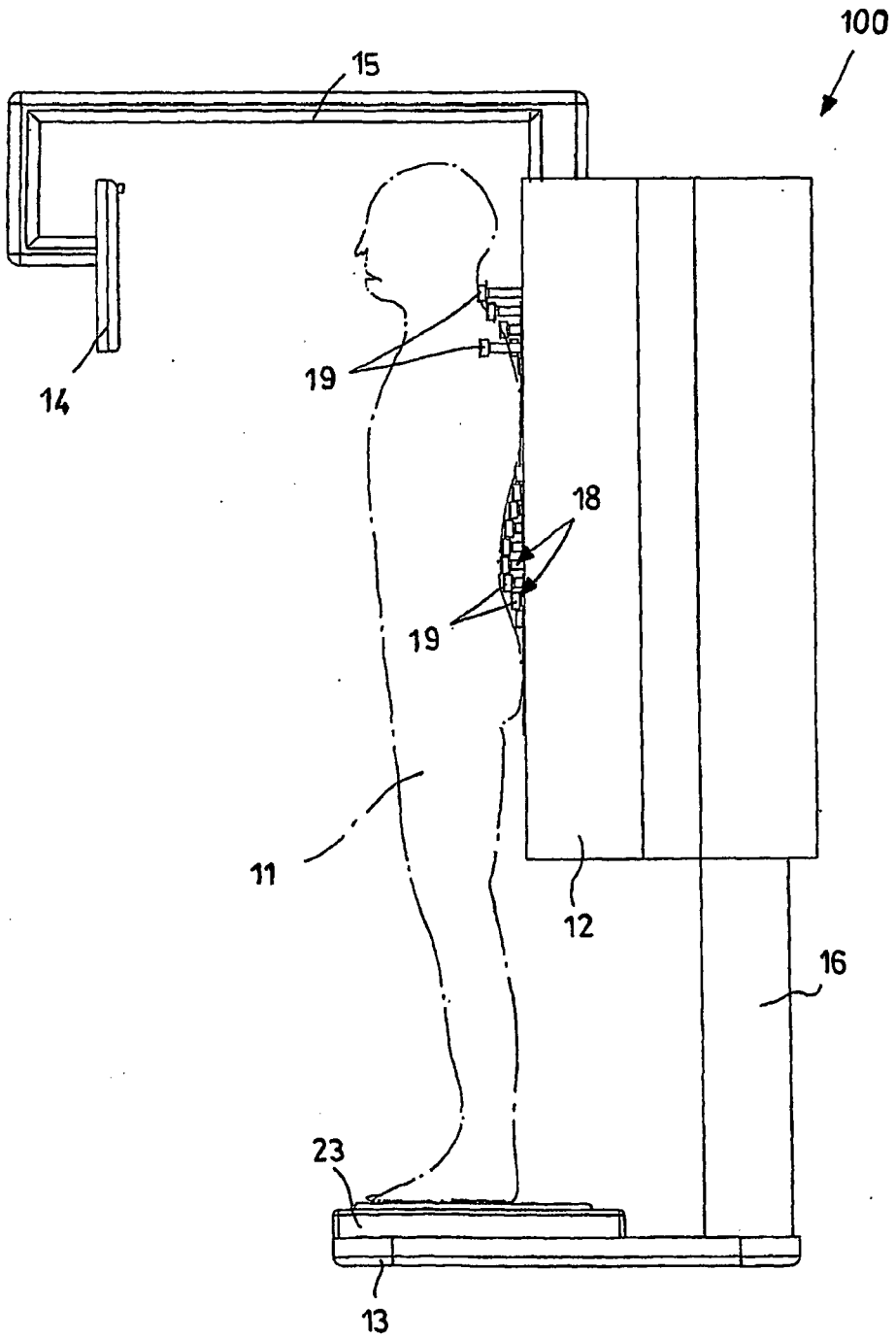


Fig.10

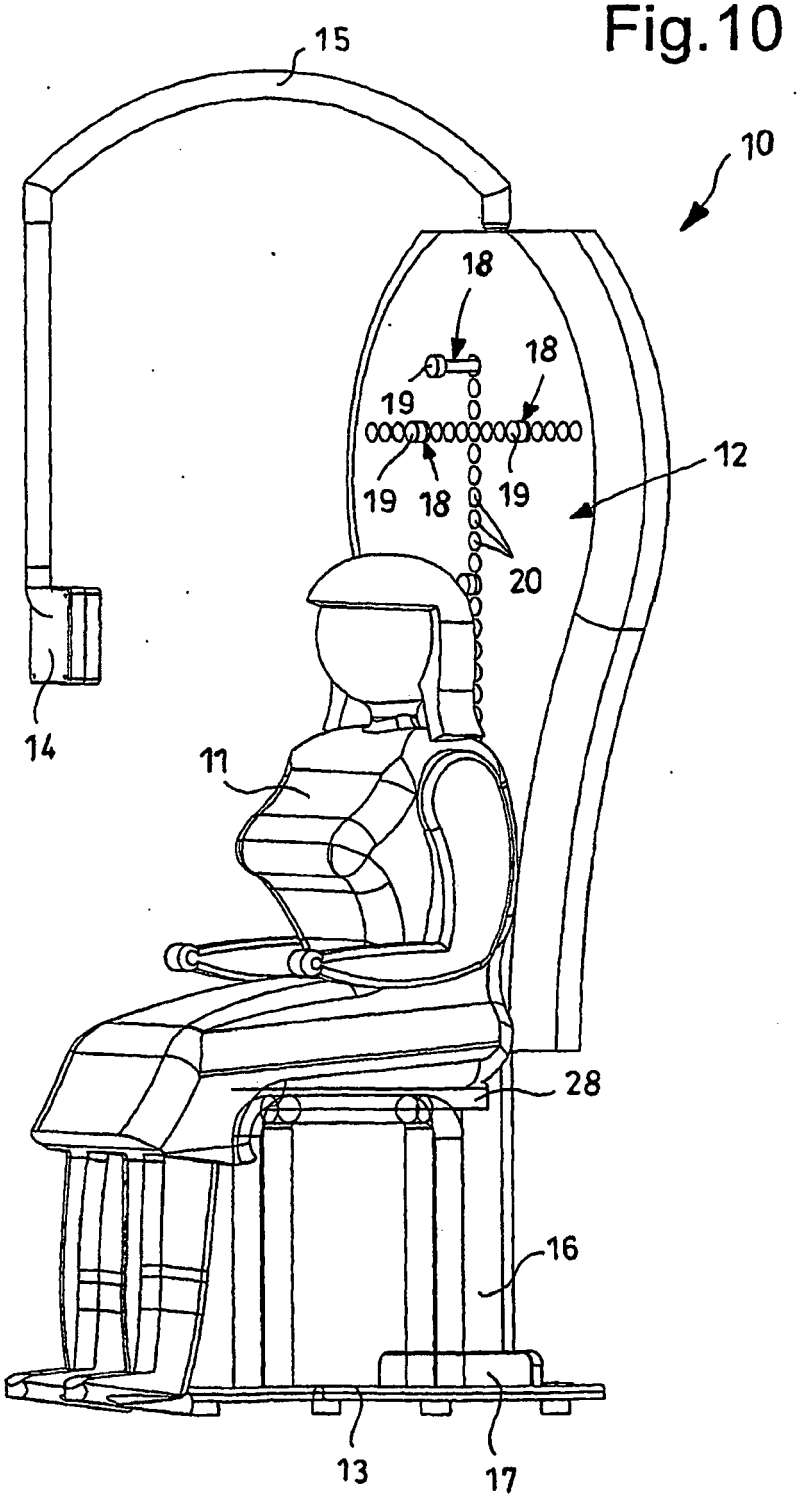
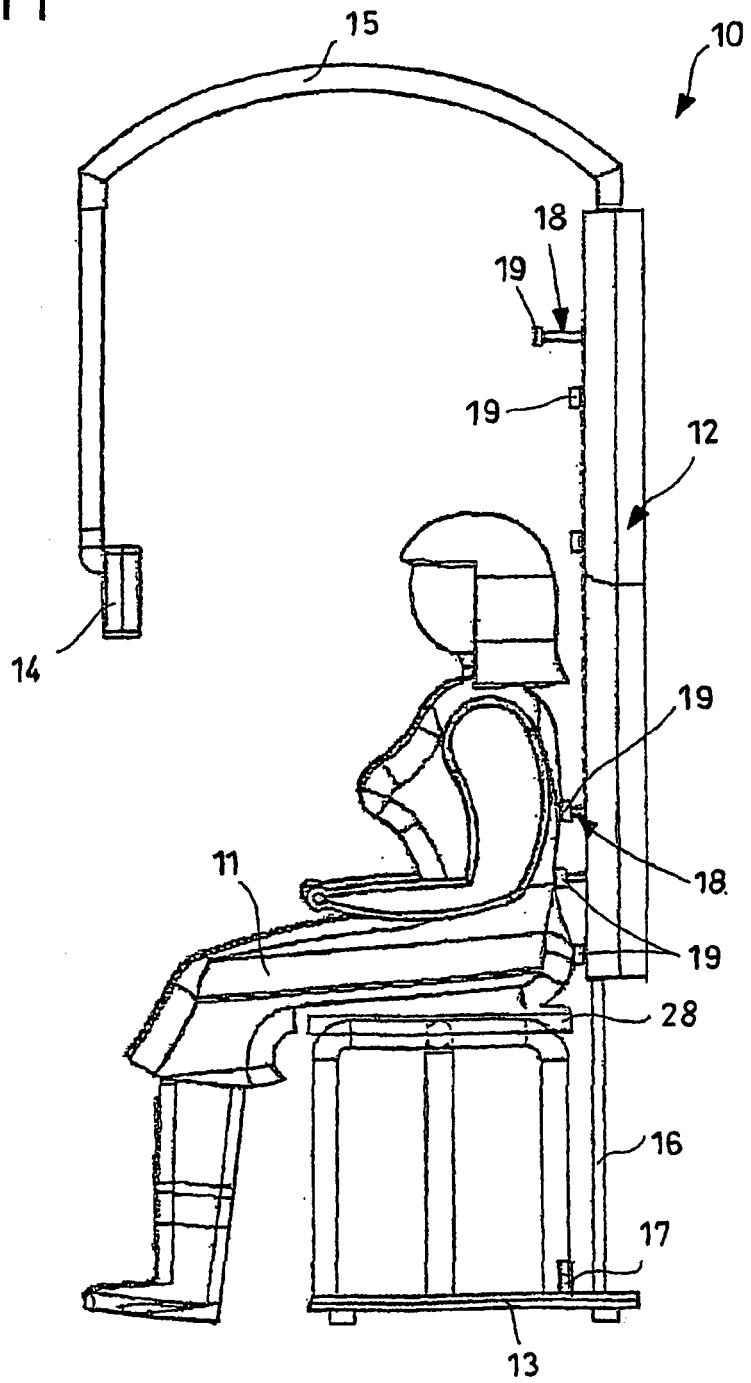


Fig.11



REFERENCES CITED IN THE DESCRIPTION

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