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(54) **SUPPORTING ARRANGEMENT FOR A PRESENTATION DEVICE**

STÜTZANORDNUNG FÜR EINE PRÄSENTATIONSVORRICHTUNG

ELEMENT SUPPORT DESTINE A UN DISPOSITIF DE PRESENTATION

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Description

Technical field

[0001] The present invention relates to the field of ergonomics at a working place, for instance in respect of computerised work and then in particular in connection with image screen work.

Background of the invention

[0002] The use of working stations for computerised terminal work varies from simple routines to a more complicated medicinal use.

[0003] The diagnostic examination of the images of patients obtained by x-ray investigations, magnetic resonance imaging, and ultrasound investigations required significant concentration and is more or less stressful, depending on prevailing circumstances with regard to light functions and also to the ergonomic strain to which the viewer is subjected.

[0004] The examination of analog images in so-called light cabinets is either adapted for a seated or for standing working posture, but, seen totally, is encumbered with serious ergonomic deficiencies with respect to both visual ergonomics and viewer-afflicting ergonomics.

[0005] However, the examination of digital images at computerised working stations affords many technical and ergonomic benefits that facilitate image handling processes, analyses and diagnoses in comparison with analog techniques. Unfortunately, the remainder of the equipment, so-called terminal work stations, are not adapted to suit the desiderata and requirements of vision ergonomics and viewer-afflicting ergonomics.

[0006] It is generally known that a change in working posture will relieve the load on the spine and on the extremities of the person concerned, in addition to being restful. For example, the transition from an upright sitting posture to a rearwardly inclined sitting posture results in a significant change in the position of the said person and also in his or her positional relationship with the image presentation device. In respect of an upright sitting posture, the head of the viewer should be inclined slightly forwards and with his/her eyes directed downwards, so as to facilitate the function of the eyes' tear ducts, among other things. The transition to a rearwardly inclined seated working posture makes viewing of the presentation screen difficult to achieve, because the screen is too far away, wrongly angled and does not permit perpendicular focusing, and because the viewer is too low and is necessitated to bend his/her head forwards. This is particularly problematic for users that wear progressive spectacles, whose optical properties mean that the lower field of vision is adapted to a focal distance that deviates in relation to the image presentation screen. This drawback constitutes a serious vision ergonomic and tiring disadvantages, partly as a result of a wrong working posture, which sooner or later results in strain-induced injuries.

[0007] It is impractical to adjust every image presentation screen when changing a working posture, both from an ergonomical aspect and from a time-consuming aspect.

[0008] The need to adjust the angle of the equipment to varying extents in order to suit the differences in body structure of individual users is also found in a standing working posture. A typical example in this regard is found in old-fashioned writing desks, which in practical use resulted in a tabletop that was angled to the vertical plane to a greater or lesser extent.

[0009] U.S. Patent Specification 5,339,750 teaches an adjustable worktable that includes two individually raisable and lowerable work surfaces where the angular position of each work surface can also be adjusted individually. It is also disclosed in this patent specification that a convenient field of use is computer usage, where one work surface is used to support a computer screen and one work surface is used to support a keyboard, etc.

[0010] Available workstations, for instance workstations operating in accordance with the principle described in the aforesaid patent specification, are generally equipped for motorised vertical height adjustment for limited adaptation of the position of the tabletop and image presentation screens in relation to different users.

[0011] The ergonomical deficiencies of computerised workstations can be summarised as follows: The distance of the user's eyes from the screen concerned is varied considerably both horizontally and vertically in the transition between an upright sitting position and a rearwardly inclined position, and also in combination with a standing working posture. The tabletop cannot be adapted with regard to a standing posture. Moreover, manoeuvring of the different tabletops in achieving said adjustments cannot be effected quickly and simply.

Object of the invention

[0012] The invention eliminates the aforesaid drawbacks by minimising deviations in the distance of the user's eyes to the image presentation screen both horizontally and vertically in a transition between an upright sitting posture and a rearwardly inclined posture.

[0013] In addition, there is achieved a continuous optimised working posture in relation to the presentation device and the work surface despite changes between an upright sitting posture and a rearwardly inclined posture through the medium of only one single manoeuvring device, thereby enabling the vertical position and the inclination of a presentation device and a work surface to be adjusted quickly and simply.

[0014] The manoeuvring device also enables the tabletop to be angled in the horizontal plane to suit a standing working posture without altering the distance of the user's eyes from the presentation screen concerned.

Summary of the invention

[0015] These objects are fulfilled by the present invention as defined in the accompanying independent Claim. Suitable embodiments of the invention will be apparent from the depending Claims.

[0016] As illustrated in the following exemplifying embodiment of the invention, the invention relates to a supporting arrangement in an image screen working station, including co-ordinated multifunctional motorised or mechanical counterbalanced movement of the tabletop and the image presentation screen relative to the different sitting and standing working postures of the user. A station for image screen work including co-ordinated multifunctional motorised or mechanical counterbalanced movement for the user's work surface and image screen supporting device relative to the different sitting and standing working postures of the user is effective in optimising the eye distance and position of the user in relation to an image presentation screen. Several image presentation screens may be handled simultaneously.

[0017] The relationship between the user's work surface and the image screen supporting arrangement can be controlled mechanically, wherein the design of the supporting device can be adapted to a desired change in the relative position between said surface and said supporting arrangement, for instance by providing the stand with a guide groove as in the case of the illustrated exemplifying embodiment. The relationship between the user's work surface and the image screen supporting arrangement may be controlled mechanically, wherein the design of said supporting arrangement can be adapted to a desired change in position between said surface and said supporting arrangement, either by replacing appropriate parts of the arrangement or by providing said arrangement with adjustable functions.

[0018] The invention also provides a limitation and adaptation of said multifunctional movement in respect of a standing working posture. Also provided is automatic limitation of the co-ordinated multifunctional movement, whose limitation is activated by the vertical height movement above a maximum height in respect of a seated working posture, so as not to alter the distance between the user's eyes and the image screen when angling the work surface with the user in a standing posture.

[0019] The multifunctional movement is co-ordinated with the movement of the inventive subject in a vertical direction, so as to maintain a constant distance between the shortest distance of the tabletop to the surface of the floor. A co-ordinated function is provided between the angling of the work surface in the horizontal plane, caused by said multifunctional movement, with the movement in said vertical direction, so as to maintain a constant distance between the shortest distance of the work surface to the surface of the floor.

[0020] Also included is a horizontal tabletop which retains its position in the event of a change in the angle and height of the movable desk shelf and image screen shelf. Also included is a horizontal work surface that retains its position in the event of a change to the angle and height of the movable table surface and to the arrangement for supporting the image screen unit.

[0021] It also lies within the scope of the invention to connect the means for achieving said angular and height changes to the seat in which the user sits, so that the user is able to react immediately to his/her changed sitting position, by changing the angle of the chair backrest and/or by changing the height position of the chair cushion.

Brief description of the drawings

[0022] The invention will now be described in more detail with reference to an exemplifying embodiment thereof and also with reference to the accompanying drawings, in which

- Figure 1 illustrates an embodiment of the invention intended for an upright sitting posture, and shows units and distances of significance;
- Figure 2 illustrates the embodiment in an angularly changed position for a rearwardly inclined seating posture;
- Figure 3 illustrates an embodiment in a position for a standing working posture;
- Figure 4 illustrates an embodiment in an angularly changed position for a standing working posture; and
- Figure 5 illustrates the function of the guide groove in respect to the relative movement of the tabletop and the image presentation screen, where reference 5a indicates an unchanged position between work surface and screen and where reference 5b indicates a first angularly changed position, while reference 5c indicates a second angularly changed position. The illustrations 4-7 in Figure 5d show four possible designs of the guide groove for four different patterns of movement between the angular positions of the tabletop and the screen.

Description of the invention

[0023] The exemplifying embodiments of the invention illustrated in Figure 1 include a presentation device in the form of a display screen 2 in connection with a work surface in the form of a tabletop 3. The screen is releasably mounted on a supportive device in the form of a screen plate 4. All of these units can be displaced vertically at one and the same time, by virtue of being fixedly mounted on a stand 5 which, in turn, is mounted on a vertically extendable leg arrangement 13, for instance a telescopic arrangement.

[0024] To enable the screen 2 and the tabletop 3 to be positioned as desired and as necessary in relation to the

user's eyes, referenced 1 in the figure, and different postures of the user's body, the stand 5 is provided with a guide groove 7 into which a stand bearing S is intended to be displaced by one end of a manoeuvring device 6. The manoeuvring device 6 may have the form of a pneumatic spring or of a motorised setting device whose other end is mounted on the stand 5, either directly or indirectly. In the case of the illustrated embodiment, the bearing is placed on the uppermost part 13A of the leg arrangement 13. The tabletop 3 is fastened to an angle-adjustable or pivotal frame 8 which is mounted in the stand 5 in a frame bearing 8A. One end of a forwardly located link arm 9 is mounted on the pivotal frame 8, while the other end of said arm is mounted on an attachment arm 11 on which the screen plate 4 is firmly mounted. One end of a rearwardly located link arm 10 is mounted on a displaceable frame bearing S while the other end of said arm 10 is also mounted on the attachment arm 11.

[0025] This construction of a link mechanism 8, 9, 10, 11 enables the movements and degrees of freedom of the screen and the tabletop to be varied to an extent greater than the actual need, by appropriate dimensioning of the units consisting of the manoeuvring device 6, the guide groove 7, the pivotal frame 8, the forwardly located link arm 9, the rearwardly located link arm 10 and the distance between the bearings in the attachment frame 11, with respect to size and placement.

[0026] The guide groove 7 is provided on the fixed stand 5, which is not angled. The manoeuvring device 6 and the rearwardly located link arm 10 are fastened in the guide groove 7. The pivotal frame 8 constitutes a fourth link between a rearwardly located link bearing 81 and a forwardly located link bearing 82. This results in a four-link mechanism, which is adapted for movement by the manoeuvring device 6, while the mechanism as a whole - which is supported by the fourth link - is also pivotal about the frame bearing 8A.

[0027] The following distances or spacings have been shown in Figure 1 with the intention of further illustrating the geometries concerned: a perpendicular image screen distance aX1, a horizontal image screen distance bX1 and the horizontal table height bY1, the image screen height cY1 and the height of the user's eyes aY1, all in relation to a floor surface 12. The angle defined by the image screen and the table surface has been referenced $\alpha 1$.

[0028] Figure 2 shows a changed angular position, corresponding to a rearwardly inclined working posture. As will be seen from Figure 2, the forwardly located link arm 9 and the rearwardly located link arm 10 form a flexible parallelogram such that the forward link arm 9 will be controlled by the rearward link arm 10. The region in which the manoeuvring device 6 moves and its length of stroke, coupled with the length and design of the guide groove 7 and the lengths 9L and 10L of respective link arms and their mutual length relationships control the coordinated movement regions of the tabletop 3 and the image screen 2.

[0029] In this case, the geometries have been changed by reducing the height of the user's eyes 1 to aY2, which corresponds to cY1, and the front edge of the table surface has been lowered to bY2. The perpendicular screen distance aX1 and the horizontal screen distance bX1 and the angle of the screen to the table surface $\alpha 1 = \alpha 2$ are, however, constant.

[0030] Figure 3 illustrates the arrangement adapted for an upstanding working posture, where the geometries in respect of the perpendicular screen distance aX1 and the horizontal screen distance bX1 are the same as those shown in Figure 1, although the distance of the horizontal table surface bY3, and the screen height cY3 and the height of the user's eyes aY3 from the surface of the floor have, of course, been increased. The angle defined by the image screen with the table surface is constant, i.e. $\alpha 3 = \alpha 1 = \alpha 2$.

[0031] However, according to Figure 4, an increase in the angle of the tabletop 3 and the screen plate 4 of equal magnitude is particularly beneficial, or indeed necessary, in the case of a standing working posture, where the user's eyes 1 relative to the screen 2 in the case of a desk-like angling of the tabletop 3 does not change as when a transition is made between an upright sitting posture and a rearwardly inclined posture. It is therefore appropriate to restrict angling of the tabletop 3 to the synchronised region of the screen plate 4 above the maximum height of said tabletop 3 intended for a seated working posture. This limitation may, for instance, be activated by the unit responsible for the vertical height movement 13 in the transition between a seated and a standing working posture. The geometries concerning the perpendicular screen distance aX1 and the horizontal screen distance bX1 and the screen angle to the horizontal plane are still constant, i.e. $\alpha 3 = \alpha 1 = \alpha 2$. However, the tabletop is given an angle $\alpha 4$ to the horizontal plane, since the stand bearing S has been moved along an angled part of the guide groove 7, solely by the manoeuvring device 6. bY3 (Fig. 3) has herewith been reduced by bY4, while cY3 and aY3 remain constant.

[0032] As will be evident from Figure 5, the pattern of movement of the tabletop 3 and the image screen 2 can be varied without practical limitations to construction and measurement geometry, by giving the guide groove 7 the shape and size illustrated in Figures 5d4, 5d5, 5d6 and 5d7. When necessary, this flexibility can be utilised by replacing the stand 5, or parts thereof, with another desirable guide groove, or by enabling the shape and length of the guide groove to be adjusted (not shown).

[0033] The design of the guide groove shown in Figure 5d4 is identical with the design of the guide groove shown in Figures 5a, 5b and 5c. The synchronised angling of the tabletop and the image screen can be increased by increasing the inclined radius-forming part of the guide groove in accordance with Figure 5d5. The design of the guide groove 7 according to Figure 5d6, i.e. in the absence of radius-controlled movement and synchronisation, provides a comparatively slow increase in the an-

gling of the image screen in relation to the tabletop, while the design according to Figure 5d7 provides a faster increase in the angular difference.

[0034] The distance between the front part of the tabletop and the surface of the floor 12 can be kept constant, by synchronising vertical movement away from the floor surface 12 with the unit responsible for said vertical height movement 13A, in parallel with angling of the tabletop 3.

[0035] The angle defined by the tabletop 3 with the screen plate 4 can be increased, e.g. synchronised, by forming the guide groove 7 as a radius with its origin of co-ordinates in the rotational centre 8A of the pivotal frame 8, see Figure 5d5. This part of the guide groove may otherwise be straight, see Figure 5d4, instead of being radius-forming, depending on the mutual measurement conditions.

Claims

1. An arrangement (4) for supporting a presentation device, for example in the form of an image screen (2), wherein a work surface (3) is connected to the supporting arrangement (4), and wherein the supporting arrangement (4) and the work surface (3) are both vertically and transversely movable and pivotally disposed, **characterised in that** the pivotal movement of the work surface (3) is forcibly coupled to the pivotal movement of the supporting arrangement (4) such as to achieve simultaneously a change in the angle of the supporting arrangement (4) in relation to a stand (5), on the one hand, and a change in the angle of the work surface in relation to the stand (5), on the other hand, in response to the influence exerted by a manoeuvring device (6).

2. An arrangement according to Claim 1, **characterised in that** the forced or controlled angular movement is controlled by a link mechanism (8, 9, 10, 11).

3. An arrangement according to Claim 2, **characterised in that** the link mechanism includes a frame (8) which is pivotal about a bearing (8A) in the stand (5), a forwardly located link arm (9), a rearwardly located link arm (10) and an attachment arm (11), wherein the rearwardly located link arm is connected to the pivotal frame (8) through the medium of a rearwardly located link bearing (81), and wherein the forwardly located link arm (9) is connected to the pivotal frame (8) through the medium of a forwardly located link bearing (82).

4. An arrangement according to Claim 3, **characterised in that** one end of the rearwardly located link arm (10) is provided with a stand bearing (S), which is movable in a guide groove (7) in the stand (5).

5. An arrangement according to Claim 4, **characterised in that** the manoeuvring device (6) is adapted to cause displacement of the stand bearing (S) in the guide groove (7).

6. An arrangement according to Claim 5, **characterised in that** the manoeuvring device (6) has the form of a pneumatic piston-cylinder device, which is connected at one end to the stand bearing (S) and at the other end to the stand (5).

7. An arrangement according to Claims 1-6, **characterised in that** the supporting arrangement (4), the working surface (3), the manoeuvring device (6) and the stand (5) are mounted on an upper part (13A) of a vertically extendable leg support (13), for instance a telescopic device which is manoeuvred by means of a further manoeuvring device.

8. An arrangement according to any one of Claims 4-7, **characterised in that** at least a part of the guide groove (7) is rectilinear.

9. An arrangement according to Claim 8, **characterised in that** the guide groove (7) either extends in a horizontal direction or defines an angle with the horizontal plane.

10. An arrangement according to any one of Claims 8-9, **characterised in that** the guide groove (7) also includes a part which is angled in relation to said rectilinear part.

11. An arrangement according to Claims 8-10, **characterised in that** the angled part of the guide groove (7) is either rectilinear or includes part of the arc of a circle with its radius in the bearing (8A) of the pivotal frame (8).

12. An arrangement according to any one of Claims 1-11, **characterised in that** the manoeuvring device (6) is controlled by vertical and/or angular movements of the cushion and/or backrest of a chair.

Patentansprüche

1. Anordnung (4) zur Stützung einer Präsentiervorrichtung, beispielsweise in Form eines Bildschirms (2), wobei eine Arbeitsfläche (3) mit der Stützanordnung (4) verbunden ist, und wobei die Stützanordnung (4) und die Arbeitsfläche (3) sowohl vertikal als auch transversal bewegbar und schwenkbar angeordnet sind, **dadurch gekennzeichnet, dass** die Schwenkbewegung der Arbeitsfläche (3) unter Kraftaufwand an die Schwenkbewegung der Stützanordnung (4) derart gekoppelt ist, dass gleichzeitig zum einen eine Veränderung des Winkels der Stützanordnung (4) in Relation zu einem Ständer (5), und

zum anderen eine Veränderung des Winkels der Arbeitsfläche in Relation zu dem Ständer (5) ansprechend auf die von einer Manövriervorrichtung (6) ausgeübten Einwirkung erzielt wird.

2. Anordnung nach Anspruch 1, **dadurch gekennzeichnet, dass** die erzwungene oder gesteuerte Winkelbewegung mit Hilfe eines Gelenkmechanismus (8, 9, 10, 11) gesteuert wird.

3. Anordnung nach Anspruch 2, **dadurch gekennzeichnet, dass** der Gelenkmechanismus ein Gestell (8), welches um ein Lager (8A) in dem Ständer (5) schwenkbar gelagert ist, einen vorne angeordneten Gelenkarm (9), einen hinten angeordneten Gelenkarm (10) sowie einen Befestigungsarm (11) aufweist, wobei der hinten angeordnete Gelenkarm mit dem Schwenkgestell (8) mittels eines hinten angeordneten Gelenklagers (81) verbunden ist, und wobei der vorne angeordnete Gelenkarm (9) mit dem Schwenkgestell (8) mittels eines vorne angeordneten Gelenklagers (82) verbunden ist.

4. Anordnung nach Anspruch 3, **dadurch gekennzeichnet, dass** ein Ende des hinten angeordneten Gelenkarms (10) ein Ständerlager (S) aufweist, welches in einer Führungsnut (7) in dem Ständer (5) bewegbar ist.

5. Anordnung nach Anspruch 4, **dadurch gekennzeichnet, dass** die Manövriervorrichtung (6) derart ausgelegt ist, dass sie eine Verlagerung des Ständerlagers (S) in der Führungsnut (7) bewirkt.

6. Anordnung nach Anspruch 5, **dadurch gekennzeichnet, dass** die Manövriervorrichtung (6) die Form einer pneumatischen Kolben-Zylinder-Vorrichtung aufweist, welche an einem Ende mit dem Ständerlager (S) und an dem anderen Ende mit dem Ständer (5) verbunden ist.

7. Anordnung nach einem der Ansprüche 1 bis 6, **dadurch gekennzeichnet, dass** die Stützanordnung (4), die Arbeitsfläche (3), die Manövriervorrichtung (6) und der Ständer (5) auf einem oberen Abschnitt (13A) einer vertikal verlängerbaren Fußstütze (13), beispielsweise einer mit Hilfe einer weiteren Manövriervorrichtung manövrierten Teleskopvorrichtung, befestigt ist.

8. Anordnung nach einem der Ansprüche 4 bis 7, **dadurch gekennzeichnet, dass** zumindest ein Abschnitt der Führungsnut (7) geradlinig ist.

9. Anordnung nach Anspruch 8, **dadurch gekennzeichnet, dass** sich die Führungsnut (7) entweder in eine horizontale Richtung erstreckt oder einen Winkel zur Horizontalebene definiert.

10. Anordnung nach einem der Ansprüche 8 und 9, **dadurch gekennzeichnet, dass** die Führungsnut (7) darüber hinaus einen Abschnitt aufweist, der bezüglich des geradlinigen Abschnitts abgewinkelt ist.

11. Anordnung nach einem der Ansprüche 8 bis 10, **dadurch gekennzeichnet, dass** der abgewinkelte Abschnitt der Führungsnut (7) entweder geradlinig ist oder einen Abschnitt des Kreisbogens aufweist, dessen Radius in dem Lager (8A) des Schwenkgestells (8) liegt.

12. Anordnung nach einem der Ansprüche 1 bis 11, **dadurch gekennzeichnet, dass** die Manövriervorrichtung (6) durch Vertikal- und/oder Winkelbewegungen des Polsters und/oder der Rücklehne eines Stuhls gesteuert wird.

Revendications

1. Agencement (4) pour le support d'un dispositif de présentation, par exemple sous la forme d'un écran d'affichage (2), dans lequel une surface de travail (3) est connectée à l'agencement de support (4), et dans lequel l'agencement de support (4) et la surface de travail (3) sont tous deux mobiles de façon verticale et transversale et disposés de façon pivotante, **caractérisé en ce que** le pivotement de la surface de travail (3) est couplé, de façon forcée, au pivotement de l'agencement de support (4) de façon à obtenir simultanément une modification de l'angle de l'agencement de support (4) par rapport à un socle (5), d'une part, et une modification de l'angle de la surface de travail par rapport au socle (5), d'autre part, en réponse à l'action exercée par un dispositif de manoeuvre (6).

2. Agencement selon la revendication 1, **caractérisé en ce que** le déplacement angulaire forcé ou commandé est commandé par un mécanisme de liaison (8, 9, 10, 11).

3. Agencement selon la revendication 2, **caractérisé en ce que** le mécanisme de liaison comprend un châssis (8) qui est pivotant autour d'un palier (8A) du socle (5), un bras de liaison positionné vers l'avant (9), un bras de liaison positionné vers l'arrière (10) et un bras de fixation (11), dans lequel le bras de liaison positionné vers l'arrière est connecté au châssis pivotant (8) au moyen d'un palier de liaison positionné vers l'arrière (81), et dans lequel le bras de liaison positionné vers l'avant (9) est connecté au châssis pivotant (8) au moyen d'un palier de liaison positionné vers l'avant (82).

4. Agencement selon la revendication 3, **caractérisé en ce qu'**une extrémité du bras de liaison positionné

vers l'arrière (10) est munie d'un palier de socle (S) qui est mobile dans une rainure de guidage (7) du socle (5).

5. Agencement selon la revendication 4, **caractérisé en ce que** le dispositif de manoeuvre est agencé pour provoquer un déplacement du palier de socle (S) dans la rainure de guidage (7).

6. Agencement selon la revendication 5, **caractérisé en ce que** le dispositif de manoeuvre a la forme d'un dispositif pneumatique à piston/cylindre qui est connecté à une extrémité au palier de socle (S) et à l'autre extrémité, au socle (5).

7. Agencement selon les revendications 1 à 6, **caractérisé en ce que** l'agencement de support (4), la surface de travail (3), le dispositif de manoeuvre (6) et le socle (5) sont montés sur une partie supérieure (13A) d'un support formant pied extensible verticalement (13), par exemple un dispositif télescopique qui est manoeuvré au moyen d'un dispositif supplémentaire de manoeuvre.

8. Agencement selon l'une quelconque des revendications 4 à 7, **caractérisé en ce qu'**au moins une partie de la rainure de guidage (7) est rectiligne.

9. Agencement selon la revendication 8, **caractérisé en ce que** la rainure de guidage (7) soit s'étend dans une direction horizontale, soit fait un angle avec le plan horizontal.

10. Agencement selon l'une quelconque des revendications 8 et 9, **caractérisé en ce que** la rainure de guidage (7) comprend, de même, une partie qui est inclinée par rapport à ladite partie rectiligne.

11. Agencement selon les revendications 8 à 10, **caractérisé en ce que** la partie inclinée de la rainure de guidage (7) est soit rectiligne, soit comprend une partie en arc de cercle avec un rayon centré sur le palier (8A) du châssis pivotant (8).

12. Agencement selon l'une quelconque des revendications 1 à 11, **caractérisé en ce que** le dispositif de manoeuvre (6) est commandé par des déplacements verticaux et/ou angulaires de l'assise et/ou du dossier d'une chaise.

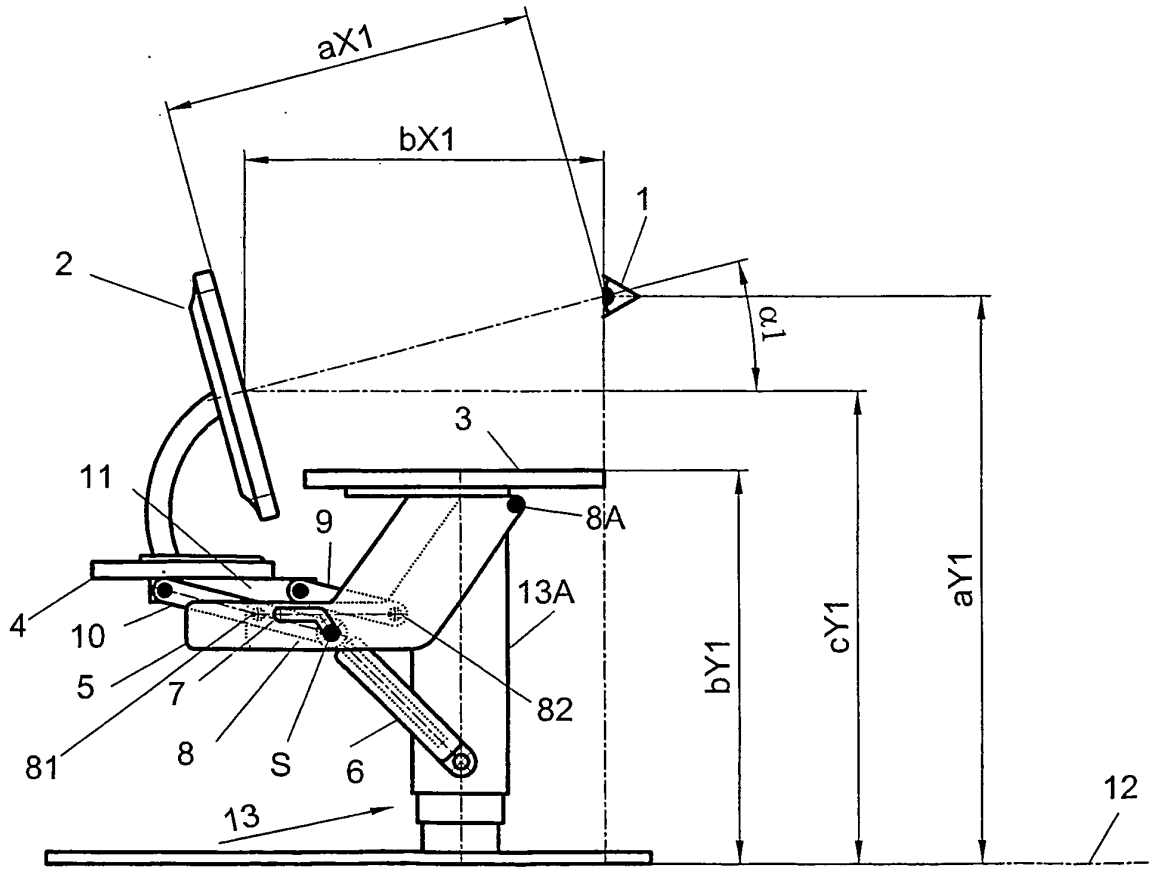

Fig 1

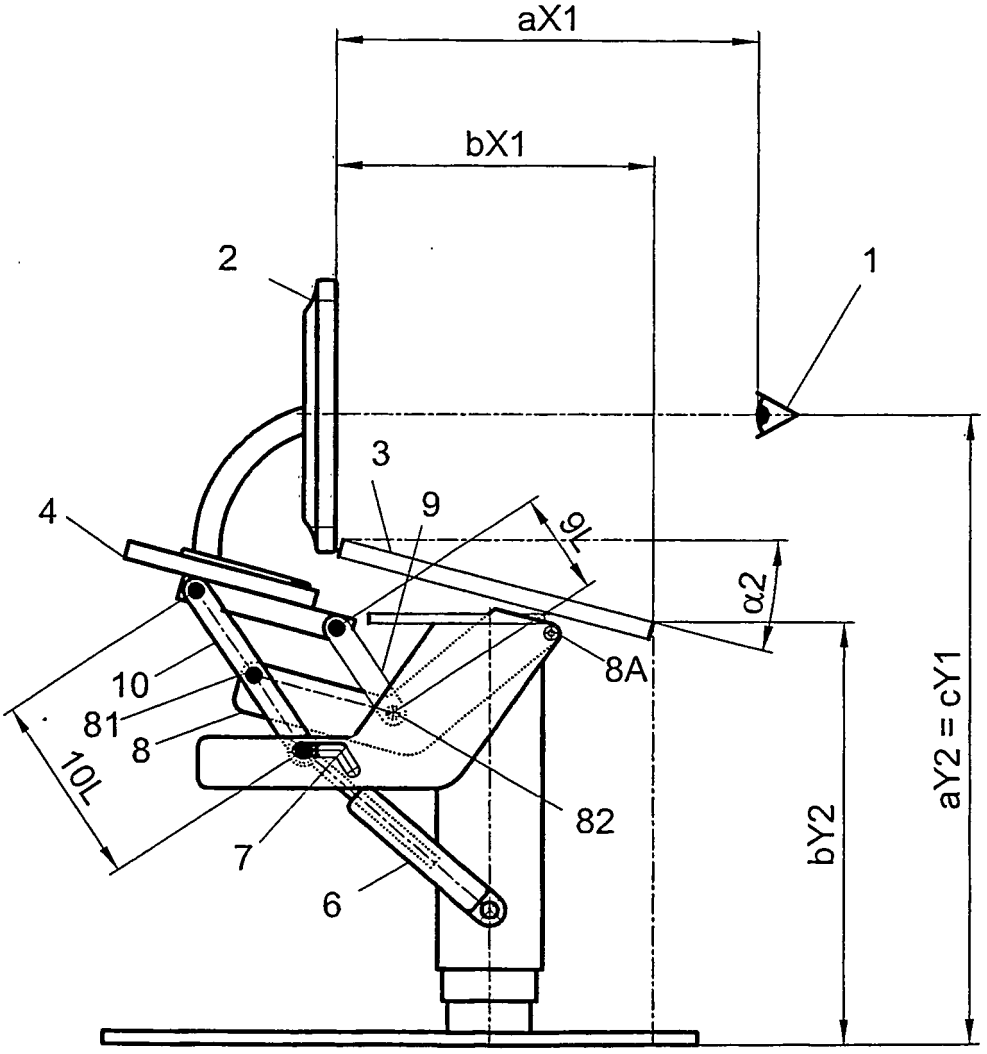

Fig 2

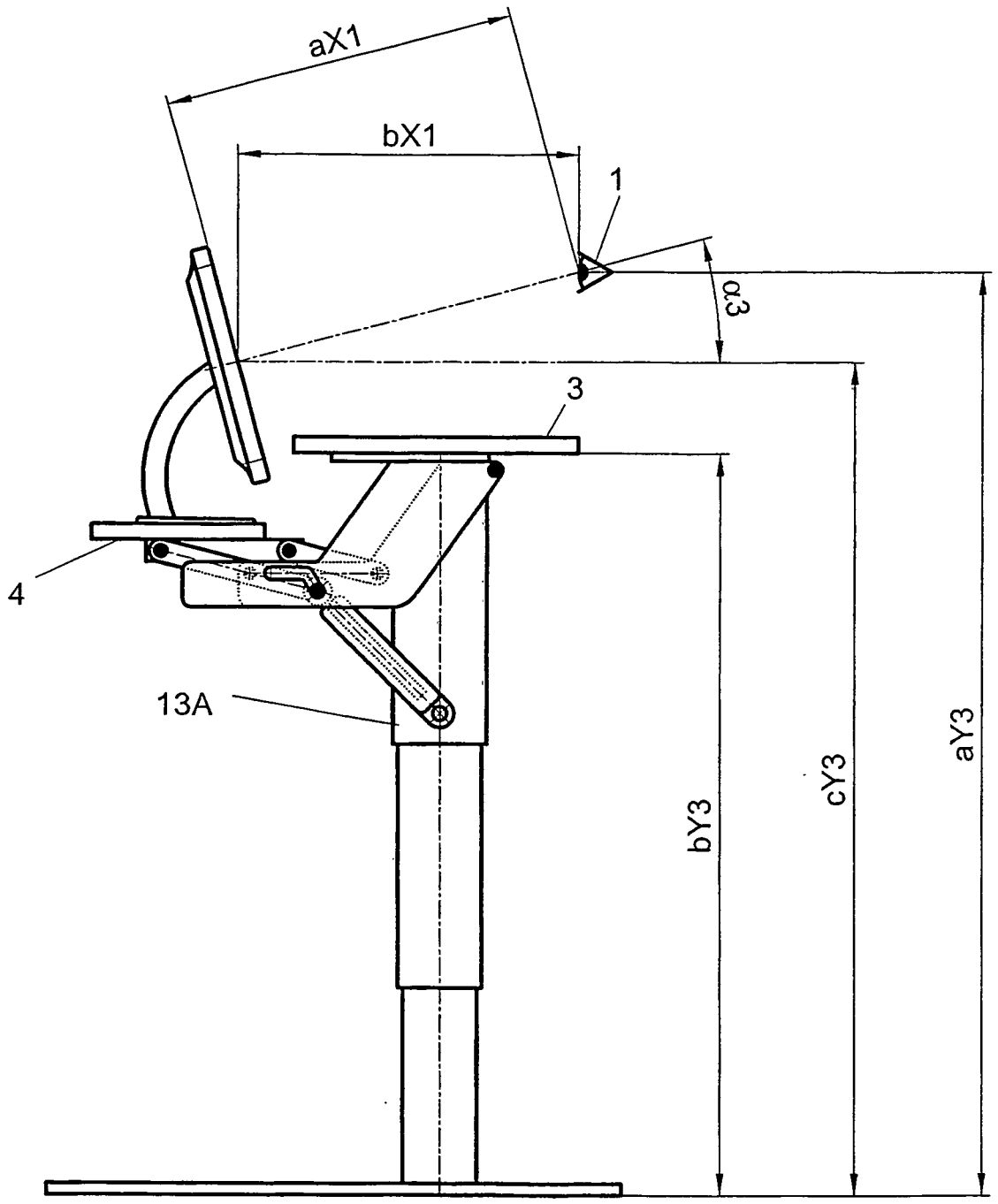

Fig 3

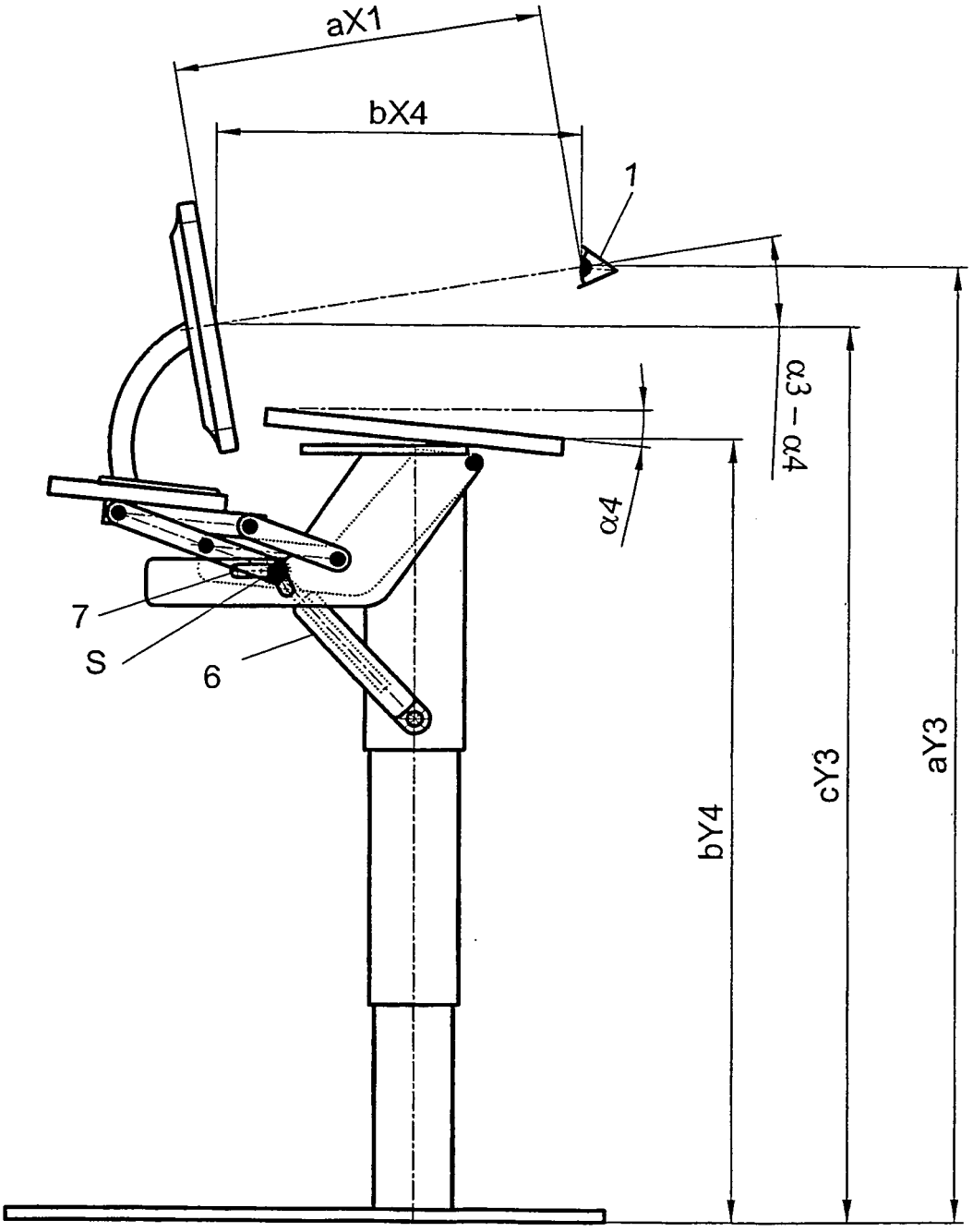

Fig 4

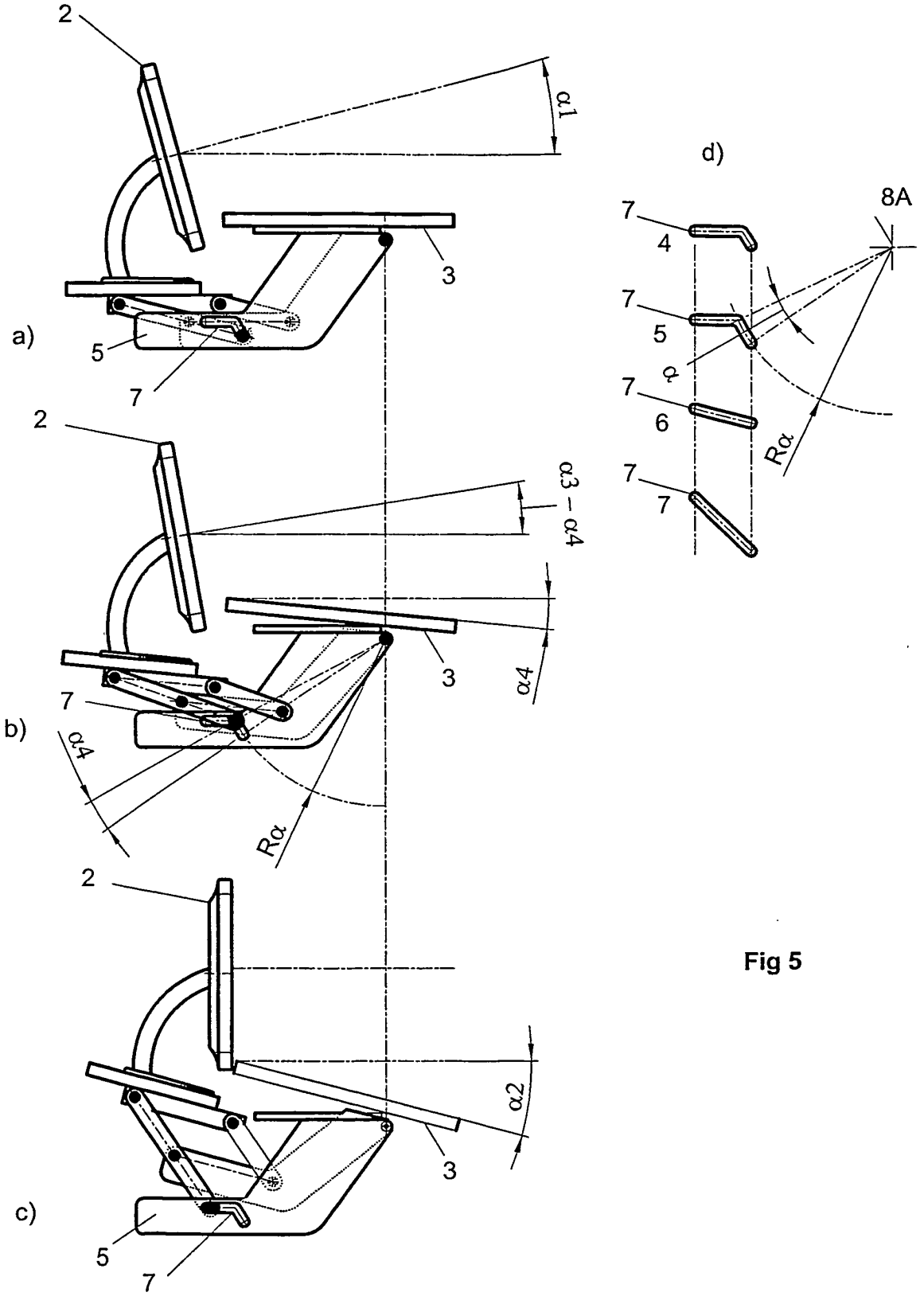

Fig 5