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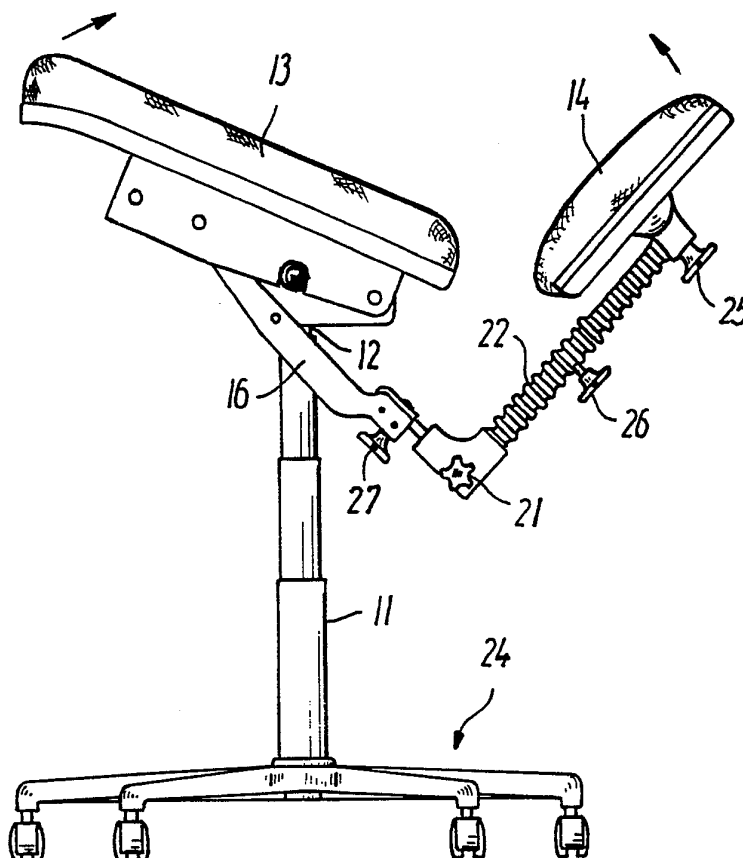
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(54) Title: A CONVERTIBLE CHAIR

(57) Abstract

The chair can be converted from a state where a person traditionally sits on the approximately horizontal seat (13) of the chair to another state where the person sits on the now inclined seat of the chair, one and the same means being used as back rest in one state and as knee rest in another state. The combined back and knee rest is arranged on one end of a two-armed lever (16) on whose other end there is provided a shaft (18) which is movable in a U-shaped guide (19) in firm connection with the seat. This ensures simple and rapid conversion of the chair between its two states.



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A convertible chair

The invention concerns a chair as defined in the introductory portion of claim 1, i.e. a chair which can be converted from one state where a person can traditionally sit on the approximately horizontal seat of the chair, to another state where the person can sit on the now inclined seat of the chair, one and the same means being used as a back rest in said one state and as a knee rest in said other state.

Such a convertible chair is known e.g. from the US Patent Specification 4 793 655. To lock the movable part of this chair in the traditional state with approximately horizontal seat and with back rest, there is provided a hook below the seat, and to convert the chairs to the other state with inclined seat and with knee rest some dexterity must be exercised to find and to release the hook, and the person must moreover bend to be able to see the hook below the seat. In the other state of said chairs with inclined seat and with knee rest, the seat and the knee rest are not locked in this state, which is therefore unstable. The chair therefore involves the risk that the seat and the knee rest will tilt in case of certain loads with unfortunate consequences for the person.

The US Patent Specification 4 763 982 discloses a convertible chair where a transverse rod on a two-armed lever, which carries the back/knee rest, is to be positioned in a specific gap between downwardly facing teeth on an open rack on the lower side of the seat. The conversion is difficult to perform and involves some uncertainty, and great care is to be exercised in practice to localize the rod in precisely the tooth gap giving the desired angular position between the seat and the rest. The great drawback of

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this chair is that it is potentially unstable in both of its positions. If a person sitting on the chair places his weight on the seat toward the back/knee rest, the seat can unintentionally tilt toward the back/knee rest with the
5 unfortunate consequence that the seat with the rack will be lifted out of engagement with the rod, so that the back/knee rest falls down, and the seat loses its support. The same risk exists when the chair is in the traditional sitting position with back rest, and the person intends to
10 move the chair and therefore naturally lifts and pulls the front edge of the seat. This can entail that the seat tilts upwardly, and that the transverse rod thereby disengages from the adjusted engagement, following which the back rest swings downwardly.

15 When the chair has been converted for knee rest use, and the person wants to sit on it, he will initially straddle the knee rest and can hereby unintentionally apply a downward pressure to the seat end most adjacent to the knee
20 rest, so that the seat and thereby the engagement means and the arm are tilted out of the preadjusted knee rest position. This involves the risk of the user sitting down on a seat which is not locked in the angular position and will consequently tilt forwardly, while the knee rest dis-
25 appears rearwardly. When converting the chair it is moreover necessary to look for the correct adjustment and make sure that the engagement means have really engaged.

The object of the present invention is to provide a convertible chair where seat and back/knee rest in both
30 states of the chair are locked and cannot be released from the state concerned with a person sitting on the chair. Moreover, the chair must be capable of being converted from one state to the other easily and safely with a
35 simple and uncomplicated manipulation and provide great security against wrong operation.

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This is achieved with a chair constructed as stated in claim 1. The controlling engagement between the engagement means ensures a well-defined and safe conversion of the chair under all circumstances.

5

The engagement means may advantageously be provided with a terminated guide groove with two ends and a projection, respectively, which protrudes into the guide groove. With a U-shaped guide groove both the seat and the back/knee rest must be lifted for the chair to be converted. A person on the chair cannot unintentionally perform this combined movement, and the chair is therefore completely stable in both of its states.

10 Since the engagement means engage with each other during the entire conversion, the user avoids having to look for the final engagement position, just as also the need for subsequent control of the engagement after conversion is eliminated.

20

In relation to the previous known chairs, the user will be more inclined to convert from one sitting position to the other as soon as he feels just a slight need for this, because of the operationally very simple conversion of the chair. This is of great importance ergonomically for the user to obtain the intended advantage of using a knee rest chair.

25 The users feeling of the chair being simple to operate is additionally improved in that a specific mutual position of the engagement means during the adjustment movements corresponds to a specific swing position of the arm, this giving a clear visual indication of the conversion process.

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A construction advantageous and simple in terms of production is obtained with the embodiment of the chair defined in claim 3, said construction giving a reliable and almost frictionless control during conversion.

5

If the guide groove is given a U-shape with upwardly facing branches, the weight of the rest carrying arm entails that the projection is normally biased for movement in an upward direction, ensuring that the chair automatically
10 tries to adjust itself to a position of use when being converted.

When initiating the conversion, the user shall moreover activate both the seat and the rest for the projection to
15 be moved down into the bottom of the U-shaped guide groove, and this combined activation movement prevents unintentional conversion of the chair.

With a view to adapting the chair partly to persons of
20 different sizes, partly to one and the same person in the two positions of use, the chair may be adjustable in various manners.

For example, the arm may have two angularly arranged sections which are connected through a fixable pivot link to
25 adjust the distance between the rest and the seat.

With particular view to adjustability to persons of various sizes the length of the arm may be varied in a preferred embodiment, where a first, rest carrying arm section is slidable transversely to a second arm section
30 forming a connection between the first arm section and the support column.

35 The invention will be described more fully below with reference to the drawing, in which

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fig. 1 shows the chair in one state,

fig. 2 shows the chair in another state,

5 fig. 3 shows the conversion mechanism of the chair in one state, and

fig. 4 shows the conversion mechanism of the chair in the other state.

10

It appears from figs. 1 and 2 that the chair has a supporting structure consisting of a pipe 11 and a column 12 which is slidable in the pipe 11, so that the chair can be adjusted in height in traditional manner. The pipe 11 is
15 secured in a known manner to a support 24 which rests on the floor. The chair moreover has a seat 13 as well as a rest 14, which serves as a back rest in fig. 1 showing the chair in one state, and serves as a knee rest in fig. 2 showing the chair in the other state. The rest 14 is
20 called back/knee rest below and is of a known structure like the seat 13.

As shown in figs. 3 and 4, the column 12 carries a bracket 23, to which the seat 13 is swingably journalled about a
25 horizontal axis 15. A two-armed lever 16 is likewise journalled to the bracket 23 at its horizontal axis of rotation 17. It appears from figs. 1 and 2 that the back/knee rest 14 is secured to one end of the two-armed lever 16, and it appears from figs. 3 and 4 that the other end of
30 the lever 16 has a transverse shaft 18 which is guided by a U-shaped guide 19 in firm connection with the seat 13. In the shown embodiment, the U-shaped guide 19 has its two guide branches extending tangentially with respect to the axis of rotation 15 of the seat.

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The transverse shaft 18 protrudes into or through the U-shaped guide 19, and the movements of the seat 13 and of the two-armed lever 16 are thus coupled to each other.

5 If the chair is to be converted from the position shown in
figs. 1 and 3 with back rest 14 and horizontal seat 13 to
the state shown in figs. 2 and 4 with knee rest 14 and
inclined seat 13, this takes place as shown by the arrows
in fig. 1 in that the front edge of the seat and the upper
10 edge of the back/knee rest are pressed towards each other,
whereby the automatic locked position is released and con-
version can take place. The seat is hereby caused to ro-
tate about the shaft 15, and the U-shaped guide 19 is
lifted together with the seat. It will be seen in fig. 3
15 that it is necessary also to lift the back rest 14, since
only hereby can the shaft 18 be moved freely (i.e. without
friction) in the groove 19. When the bottom of the U-
shaped guide is thus at the same level as the shaft 18,
this shaft can freely move to the right since the two-
20 armed lever 16 can rotate about its shaft 17. The shaft 18
is hereby moved to the other guide branch of the U-shaped
guide 19, while the back/knee rest 14 on the other end of
the lever is lowered to the position shown in fig. 2. The
seat 13 is then lowered until the shaft 18 abuts the end
25 stop in the right branch of the U-shaped guide 19, as
appears from fig. 4.

If the chair is to be converted again from the state shown
in figs. 2 and 4 to the state shown in figs. 1 and 3, the
30 seat 13 and the knee rest 14 are lifted, and this opera-
tion takes place in the opposite order.

It appears from figs. 3 and 4 that one of the branches of
the U-shaped guide accommodates a block 20 which is to
35 serve as an end stop. A variable end stop is obtained by
varying the length of this block 20, so that the mutual

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position of the seat 13 and the two-armed lever 16 and thereby the rest 14 may be varied.

In the shown embodiment the shaft 18 is arranged on the two-armed lever 16, and the U-shaped guide 19 is firmly connected with the seat 13. However, these might be exchanged with the same result so that a U-shaped guide is arranged on the two-armed lever 16, but with the branches facing downwardly, and such that the transverse shaft 18 is mounted in firm connection with the seat 13.

It appears from figs. 3 and 4 that both the front edge of the seat and the back/knee rest are to be lifted for the chair to be converted. A person sitting on the seat 13 in any of the two states of the chair will lock the chair in the state concerned.

It also appears from figs. 1 and 2 that the chair has other adjustment possibilities for individual adaptation to the user. A grip 27 permits the arm 22 with the back/knee rest to be displaced longitudinally of the lever 16 and to be fixed in any position. The angular arm 22 can be tilted and fixed with a grip 21 in any angle with respect to the lever 16, and the length of the angular arm 22 may be adjusted and fixed with a grip 26. The back/knee rest 14 may be positioned and fixed in any angular position with respect to the angular arm 22 with a grip 25.

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P a t e n t C l a i m s :

1. A convertible chair comprising a lower support structure with a support column, a seat swingably journalled with respect to the support column, and a back/knee rest carried by an oblong arm which is swingably journalled with respect to the support column, said seat and arm carrying their respective parts of associated engagement means which, in a first engagement position, position the arm such that the back/knee rest is in the back rest position, and, in a second engagement position, position the arm with the back/knee rest in the knee rest position, c h a r a c t e r i z e d in that the engagement means are in controlling engagement with each other during adjustment movements between the first and the second engagement positions.

2. A convertible chair according to claim 1, c h a r a c t e r i z e d in that a specific mutual position of the engagement means during the adjustment movements corresponds to a specific swing position of the arm.

3. A convertible chair according to claim 1 or 2, wherein the arm has the shape of a two-armed lever whose one arm carries the back/knee rest, and whose other arm carries the associated part of said engagement means, c h a r a c t e r i z e d in that one part of the engagement means has a terminated guide groove with two ends determining said first and second engagement positions, and that the other part of the engagement means has a projection protruding into the guide groove.

4. A convertible chair according to claim 3, c h a r a c t e r i z e d in that the guide groove has a U-shape with upwardly directed branches.

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5. A convertible chair according to claim 3 or 4, c h a -
r a c t e r i z e d in that the guide groove has an ad-
justable end stop to determine the knee rest position.

5 6. A convertible chair according to claims 1-5, c h a -
r a c t e r i z e d in that the back/knee rest is angu-
larly adjustable with respect to the arm, and that the
distance between the back/knee rest and the seat is ad-
justable.

10

7. A convertible chair according to claim 6, c h a -
r a c t e r i z e d in that the arm has two mutually
angularly positioned sections which are connected through
a fixable pivot link to adjust the distance between the
15 rest and the seat.

8. A convertible chair according to claims 1-7, c h a -
r a c t e r i z e d in that a first, rest-carrying arm
section is slidable longitudinally of a second arm section
20 forming the connection between the first arm section and
the support column.

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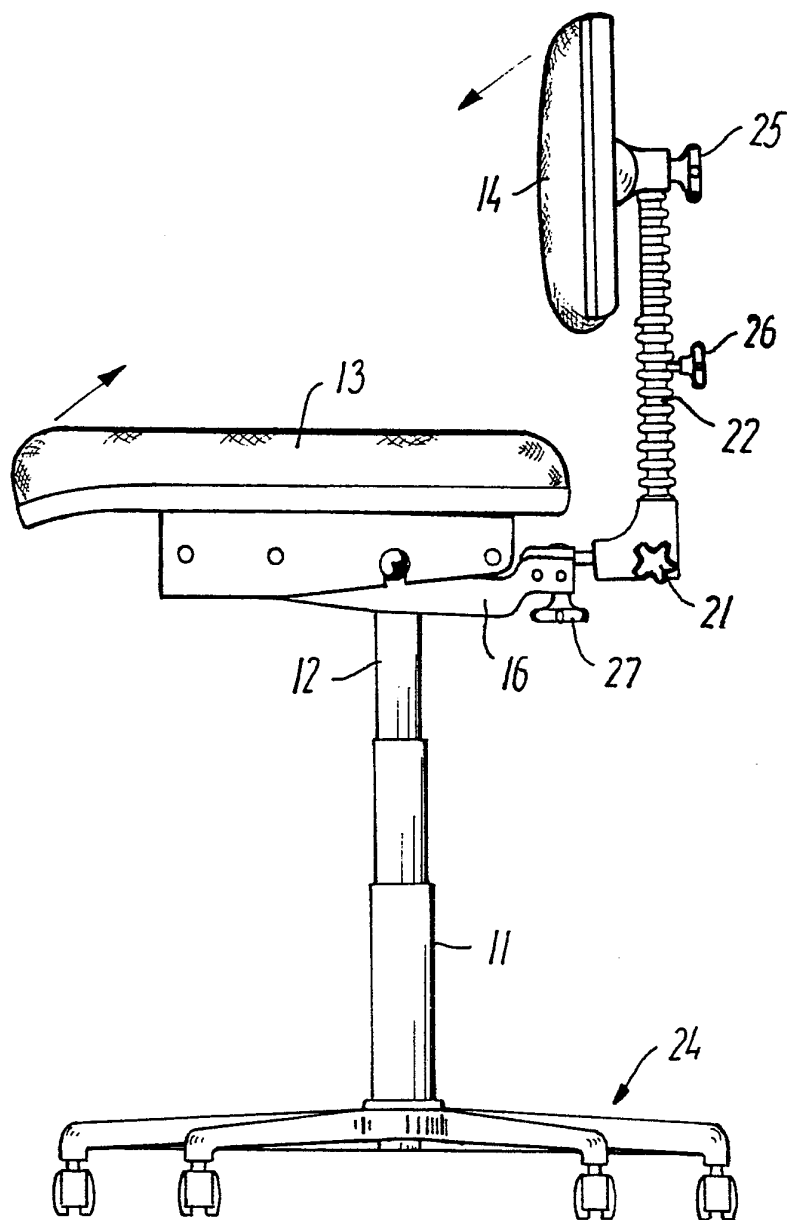


FIG. 1

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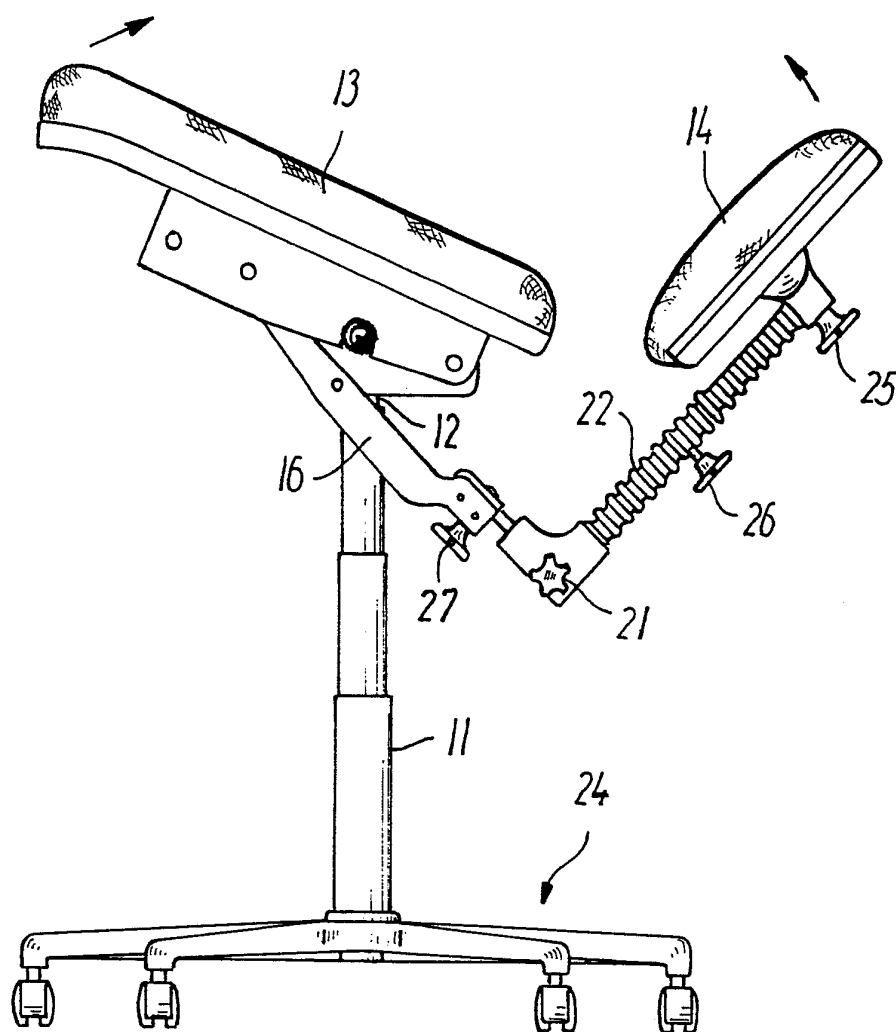
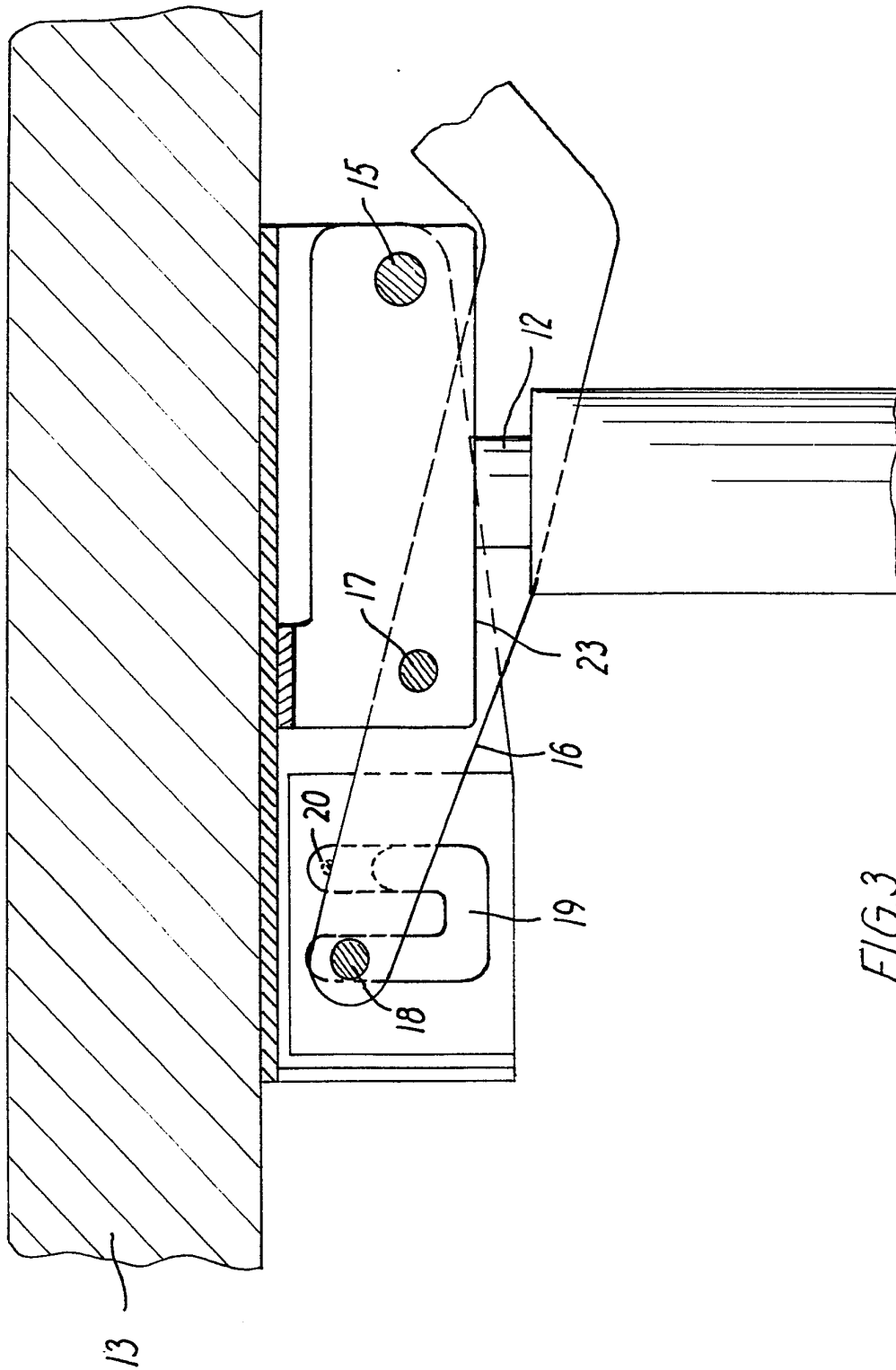


FIG. 2

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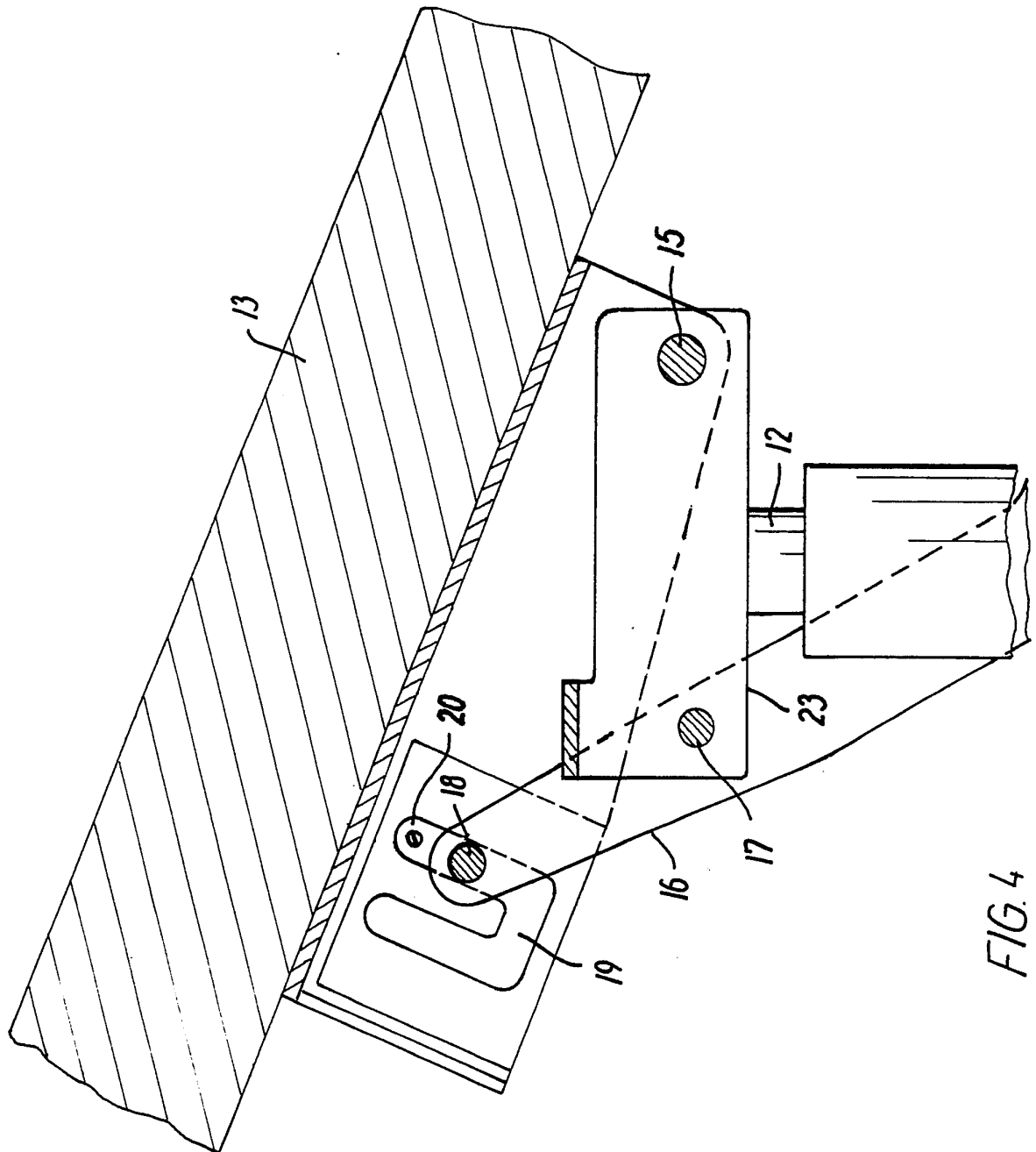
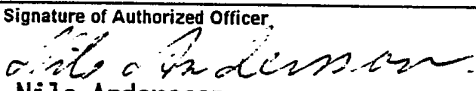


FIG. 4

INTERNATIONAL SEARCH REPORT

International Application No PCT/DK 91/00007

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶ According to International Patent Classification (IPC) or to both National Classification and IPC IPC5: A 47 C 9/00		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
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IPC5	A 47 C	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched ⁸		
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III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹		
Category *	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No., ¹³
A	US, A, 4736982 (SUNNY S. HWANG) 12 April 1988, see figures 9-13 --	1
A	US, A, 4793655 (KVALHEIM ET AL) 27 December 1988, see figures 6,7 -- -----	1
* Special categories of cited documents:¹⁰ "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "&" document member of the same patent family		
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Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
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**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.PCT/DK 91/00007**

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 4736982	88-04-12	NONE	
US-A- 4793655	88-12-27	DE-A- 3808939 GB-A-B- 2202138	88-09-29 88-09-21