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(72) Inventor: **Asbjørnsen, Svein**
NO-6230 Sykkylven (NO)

(74) Representative: **Bergheim, Olav**
Zacco Norway AS
Haakon VII's gt. 2
P.O. Box 2003 Vika
0125 Oslo (NO)

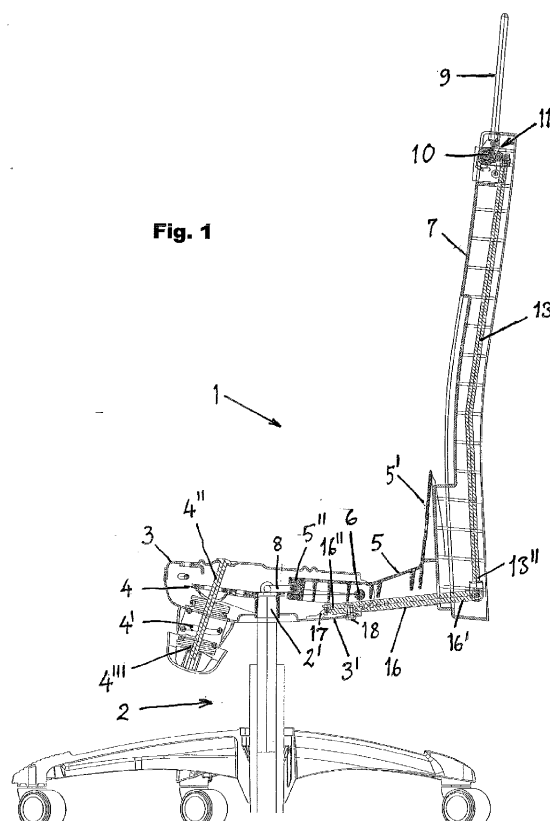
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(71) Applicant: **sapDesign AS**
6230 Sykkylven (NO)

(54) **Chair arrangement**

(57) A chair arrangement in which the seat and back of the chair are tiltable relative to one another and relative to the base (2) of the chair, where the seat frame of the chair consists of a forward, spring-loaded seat mounting (3) which is sprung against a balance board (4) attached to an upper portion (2') of the base, the seat mounting (3) at the rear (3') being tiltably connected to a connecting piece (5) via a first tilt shaft (6), wherein the connecting piece (5) at the rear (5') is rigidly connected to the chair back frame (7), and wherein the connecting piece (5) at its forward end (5'') is articulated to the forward seat mounting (3). The chair back (7) is equipped with a spring-loaded neck rest holder (9) which is tiltable about a pivot joint (10) in a neck rest mechanism (11). The neck rest holder (9) has at least one tilt arm (14) which is pivotally connected to a **single** back rod (13), which back rod (13) extends down along the back (7). The rod (13) at the bottom is articulated to a rear end (16') of a bar (16) that extends forwards towards a rear, lower portion (3') of the seat mounting (3); and the bar (16): either a) is at its forward end (16'') in engagement with (17), and at an area between the forward (16'') and rear (16') portion of the bar attached to, the rear, lower portion (3') of the seat mounting; or b) is at its forward end (16'') in tiltable engagement with the rear, lower portion (3') of the mounting, and at an area (16''') between the forward and rear portion of the bar tiltably connected to the connecting piece (5) via a second tilt shaft (19) that is operatively connected to the connecting piece (5) and extends transverse to the bar; or c) is at its forward end (16'') in tiltable engagement with the rear lower portion (3') of the seat mounting (3), and at an area between the forward and rear portion of the bar in abutment with the first tilt

shaft (6).



Description

[0001] The present invention relates to a chair arrangement in which the seat and back of the chair are tiltable relative to one another and relative to the base of the chair, where the seat frame of the chair consists of a forward, spring-loaded seat mounting which is sprung against a balance board attached to an upper portion of the base, the seat mounting at the rear being tiltable connected to a connecting piece via a first tilt shaft, wherein the connecting piece at the rear is rigidly connected to the chair back frame, and wherein the connecting piece at its forward end is articulated to the forward seat mounting close to an upper portion of the base.

[0002] Chairs are previously known where the chair seat and back are tiltable relative to one another and relative to the base of the chair, and where the chair back at the top is equipped with a neck rest that the chair user himself can tilt into a desired position

[0003] In other solutions, the angling of the chair seat and back in relation to the base or the mutual angling of the seat and back in relation to the base may control the position of the neck rest through the use of two control rods from the seat level up to the neck rest. These are solutions which, however, require a thick chair back to be able to provide satisfactory function.

[0004] For thin chair backs, the control of necks rests as a function of the tilted position of the seat and back has thus far been problematic to achieve in a technically simple and satisfactory manner.

[0005] The object of the present invention is therefore to remedy the problems which are especially associated with chairs that have thin chair backs.

[0006] According to the invention, the arrangement mentioned above is **characterised in**

- **that** the chair back is equipped with a spring-loaded neck rest holder which is tiltable about a pivot joint in a neck rest mechanism;
- that the neck rest holder has at least one tilt arm which is pivotally connected to a single back rod, which back rod extends down along the back;
- that the rod at the bottom is articulated to a rear end of a bar that extends forwards towards a rear, lower portion of the seat mounting; and
- that the bar:
 - either a) is at its forward end in engagement with, and at an area between the forward and rear portion of the bar attached to, the rear, lower portion of the seat mounting;
 - or b) is at its forward end in tiltable engagement with the rear, lower portion of the mounting, and at an area between the forward and rear portion of the bar tiltable connected to the connecting piece via a second tilt shaft that is operatively connected to the connecting piece and extends transverse to the bar;

- or c) is at its forward end in tiltable engagement with the rear lower portion of the seat mounting, and at an area between the forward and rear portion of the bar in abutment with the first tilt shaft.

[0007] Additional embodiments of the arrangement are set forth in attached patent claims 2-6, and in the description below with reference to the attached drawings which show exemplary embodiments that are non-limiting for the invention.

Fig. 1 shows a vertical section, partly cut away, of the arrangement in the starting position for a first and a second embodiment of the arrangement.

Fig. 2 shows a vertical section, partly cut away, of the arrangement with maximum tilting angle for the neck rest in connection with the first embodiment of the arrangement.

Fig. 3 shows a vertical section, partly cut away, of the arrangement with an alternative starting position for the second embodiment of the arrangement.

Fig. 4 shows a vertical section, partly cut away, of the arrangement with the chair in a tilted back position and with a maximum tilting angle for the neck rest in connection with a first aspect of the second embodiment of the arrangement.

Fig. 5 shows a vertical section, partly cut away, of the arrangement with the chair in a tilted back position and with a maximum tilting angle for the neck rest in connection with a second aspect of the second embodiment of the arrangement.

Fig. 6 shows a vertical section, partly cut away, of the arrangement with the chair in a tilted back position and with a maximum tilting angle for the neck rest in connection with a third aspect of the second embodiment of the arrangement.

Fig. 7 shows a vertical section, partly cut away, of the arrangement with the chair in a tilted back position and with a maximum tilting angle for the neck rest in connection with a fourth aspect of the second embodiment of the arrangement.

Fig. 8 shows a vertical section, partly cut away, of the arrangement with the chair in a tilted back position and with a maximum tilting angle for the neck rest in connection with a fifth aspect of the second embodiment of the arrangement.

Fig. 9 shows a vertical section, partly cut away, of the arrangement in the starting position for a third embodiment of the arrangement.

Fig. 10 shows a vertical section, partly cut away, of the arrangement in Fig. 9 with a maximum tilting angle for the neck rest in connection with the third embodiment of the arrangement.

Fig. 11 shows a simplified perspective view of a detail of the first embodiment of the arrangement.

Figs. 12, 13 and 14 show simplified perspective views of details of the second embodiment of the arrangement.

Fig. 15 shows a simplified perspective view of a detail of the third embodiment of the arrangement.

Figs. 16 and 17 show a side view, in partial section, of the neck rest tilting mounting with the neck rest in a maximum forward and backward position, respectively.

Fig. 18 is a rear view of a vertical section of the neck rest tilting mounting with the neck rest in a maximum backward position.

Figs. 19 and 20 shows the neck rest mounting in perspective view seen from in front and behind respectively; and

Fig. 21 shows a perspective view of the support mounting of the chair seat and a thin chair back without any upholstery fitted and where the arrangement according to the invention has been mounted. Fig. 1 shows a chair 1 in which the chair seat and back are tiltable relative to one another and relative to the chair base 2, where the seat frame of the chair consists of a forward spring loaded seat mounting 3 which is sprung against a balance board 4 fastened to an upper portion 2' of the base 2. The spring loading is provided by means of a spring 4' which can be tensioned by reducing the effective length of a bolt 4'' with the aid of an adjusting screw 4'''. The starting position for the mounting 3 is in Fig. 1 shown to be +4°. The seat mounting 3 at the rear is connected to a seat connecting piece 5 via a first tilt shaft 6. The connecting piece functions as a back attachment for the rear part of the seat. The connecting piece 5 at the rear 5' is rigidly connected to the chair back frame 7 or back shell. At its forward portion 5'', the connecting piece 5 is articulated to a bracket 8 that is tiltable connected to the forward seat mounting 3. The bracket 8 is positioned close to the central upper portion 2' of the base, i.e., closer to the forward area of the seat than the shaft 6.

[0008] As can be seen in more detail from Figs. 16 - 20, the chair back 7 is equipped at the top with a spring-loaded neck rest holder which has supporting uprights 9, and where the neck rest uprights 9 are tiltable about

a pivot joint 10 in a neck rest mechanism 11 which preferably has frictional properties. The spring loading is provided by means of a spring 12 which tightens partly against a cross member 9' associated with the uprights 9 and partly against a second cross member 13' associated with one single back rod 13. The reference numeral 11' indicates fastening nuts on the mechanism for securing to the chair back 7 with the aid of bolts (not shown).

[0009] The neck rest uprights 9 have at least one tilt arm 14 that is pivotally connected to the back rod 13 via the cross member 13'. Arranged to the cross member of the tilt arms is a lug 14' which is equipped with a pin 14'' that is movable in a groove 15 in the neck rest mechanism 11 to limit the angle of motion of the neck rest forwards and backwards in relation to the chair back 7.

[0010] As shown in Fig. 16, the back 7 may in a starting position have a backward inclination of an angle α , for example, 5°. In the maximum tilting position of the neck rest uprights 9 as shown in Fig. 17, their maximum tilting angle β in relation to the chair back is 34.9°, such that the angle of the neck rest uprights in relation to the vertical will be $\beta - \alpha = 29.3^\circ$.

[0011] The back rod 13 extends down along the rear of the back 7 in a recess 7' therein and at the bottom 13'' is articulated 21 to a rear end 16' of a bar 16 that extends forwards towards a rear, lower portion 3' of the seat mounting 3, where it is in engagement with a bracket 17 that is fastened to said portion 3'. The bar 16 is preferably solid with a square or rectangular cross-section, but may optionally be configured as a tube having such a cross-section.

[0012] As mentioned above in connection with the general description of the figures there are basically three embodiments.

[0013] In the first embodiment, as shown in Figs. 1, 2 and 11, and for clarification also Fig. 15, the bar 16 at its forward portion 16'' is connected to the bracket 17 and at an area between the forward 16'' and rear 16' portion of the bar is fastened to the rear, lower portion 3' of the mounting by means of a bolt 18, as shown in Figs. 1, 2 and 11. As indicated in Fig. 2, this solution permits a maximum tilt of the neck rest uprights 9 at an angle β , which in this case is the chosen example of 34.9°. This maximum deflection is not adjustable, unlike the possibilities provided in a second embodiment of the arrangement.

[0014] According to the second embodiment, the bar 16 at its forward end is in tiltable engagement with the rear lower portion 3' of the seat mounting via said bracket 17 and at an area 16''' between the forward 16'' and rear 16' portion of the bar 16 is tiltable connected to the connecting piece 5 via a second tilt shaft 19 that is fastened to the connecting piece 5 and which extends through a selected hole 16'''' transverse to the bar. Here, it will be understood that the bolt 18 as shown in Fig. 1 has not been mounted in this embodiment, such that the bar 16 thus - in this second embodiment - is tiltable in relation to the seat mounting 3. According to the embodiment

shown in Fig. 12, the tilt shaft 19 can be secured at the end thereof in suitable holes 5''' in the side members 5''' of the connecting piece 5. An alternative to the embodiment in Fig. 12 is that instead of the fixing holes 5''', a separate fixing mounting 20 is used which has side members 20' and fixing holes 20''. This means that the shaft 19 ends are thus delimited by the side members 5''' which lie external to the side members 20'. This mounting 20 has fastening nuts 20''' so as to be attachable with the aid of screws (not shown) to the connecting piece 5. In Fig. 14, for the sake of clarity, the connecting piece 5 is not shown mounted.

[0015] As will be seen, five holes 16'''' are proposed in the selected second embodiment, although the number could have been smaller or slightly larger. As will be illustrated by means of Figs. 3 - 8, the point where the second tilt shaft 19 cooperates with the bar 16, i.e., between the forward 16'' and rear 16' portion of the bar 16, will be determining for the maximum tilting angle of the neck rest relative to the chair back. As can be seen from Figs. 4 - 8, the tilting angle of the neck rest uprights 9 relative to the chair back is made to be increasing with increasing distance from said point 16'''' to the articulation 21 between said rod 13 and bar 16.

[0016] Fig. 3 shows that the seat mounting 3 is tilted forwards from +4° to -3°, i.e., 7° forwards in relation to that shown in Fig. 1. Here, the rear point 16'''' is used for the hole 16'''' and the neck rest uprights 9 stand at 7.5°, tilted backwards relative to the back.

[0017] When the seat and the back are then tilted backwards to the maximum, as shown in Fig. 4, β will be 14.7°, i.e., the neck rest uprights are tilted forwards 14.7° in relation to the back 7.

[0018] When the location of the tilt shaft is moved to the second hole 16'''' from the articulation 21 and the seat and the back are tilted backwards to the maximum, as shown in Fig. 5, β is 18.5°, i.e., the neck rest uprights are tilted forwards 18.5° relative to the back 7.

[0019] When the location of the tilt shaft is moved to the third hole 16'''' from the articulation 21 and the seat and the back are tilted backwards to the maximum, as shown in Fig. 6, β is 23.6°, i.e., the neck rest uprights are tilted forwards 23.6° relative to the back 7.

[0020] When the location of the tilt shaft is moved to the fourth hole 16'''' from the articulation 21 and the seat and the back are tilted backwards to the maximum, as shown in Fig. 7, β is 28.2°, i.e., the neck rest uprights are tilted forwards 28.2° relative to the back 7.

[0021] When the location of the tilt shaft is moved to the fifth and last hole 16'''' from the articulation 21 and the seat and the back are tilted backwards to the maximum, as shown in Fig. 8, β is 34.3°, i.e., the neck rest uprights are tilted forwards 34.3° relative to the back 7.

[0022] The second embodiment of the arrangement thus permits variation of the maximum angular position of the neck rest relative to the back adapted to the needs of the chair user.

[0023] The third embodiment of the arrangement is

shown in Figs. 9 and 10. Here, the starting position, as shown in Fig. 9, is with the seat mounting tilting backwards +4°, and the neck rest uprights 9 form 0° with the back 7. This embodiment corresponds to that shown in Figs. 1 and 2, apart from the fastening bolt 18 not being present. The bar 16 at its forward end 16'' is in tiltable engagement with a bracket 17 on the rear, lower portion 3' of the seat mounting 3, and at an area 16''' between the forward 16'' and rear 16' portion of the bar in abutment with the first tilt shaft 6. In this case, there is thus no possibility of adjusting the maximum angle of the neck rest uprights 9 relative to the back 7, as in said second embodiment. When the seat and back are tilted backwards from the position shown in Fig. 9 to the position shown in Fig. 10, the angle of the neck rest uprights 9 relative to the back 7 will be altered from 0° to 34.3°, i.e., $\beta = 34.3^\circ$.

[0024] The different modes of operation are obtained as a result of the reciprocal motion of the seat mounting 3 in relation to the common movement of the connecting piece 5 and the back 7, and of the mounting of the bar 16 in the three embodiments.

[0025] The mode of operation in the first and the third embodiment is largely controlled by the possibility of reciprocal motion between the seat mounting 3 and the connecting piece 5, where the bar 16 in the first embodiment is secured to the seat mounting 3 and thus follows the motions thereof. The simultaneous tilting of the connecting piece 5 and the back 7 relative to the seat mounting 3 causes the rod 13 to be pushed slightly upwards along the back so as to actuate the neck rest mechanism 11.

[0026] In the third embodiment, the bar 16 is fixed in relation to the seat mounting 3 in that it lies at all times against the shaft 6 which is fastened to the seat mounting 3. Actuation of the neck rest mechanism 11 in this case is like that in the first embodiment and with almost as great an angle of deflection for the neck rest holder 9.

[0027] The second embodiment, as will be understood, is related to reciprocal motion between the seat mounting 3 and the connecting piece 5/back 7, and in that the bar 16 is in tiltable engagement both with the seat mounting 3 and with the connecting piece 5. The adjustable distance between the shaft 6 and the shaft 19 will be determining for the size of the lever arm which acts on the bar 16 when the connecting piece 5 tilts about the shaft 6, limited by the engagement between the bracket 8 and the forward end 5'' of the connecting piece 5. Thus, this embodiment will be related to maximum tilting angles for the neck rest relative to the chair back as a function of the distance of the tilt shaft 19 from the articulation 21, with increasing maximum tilting angle with increasing distance of the tilt shaft 19 from the articulation 21. At the angular deflection of 34.3°, the neck rest holder 9 will pivot approximately as much as in the first embodiment, but in another way.

[0028] In the illustrated embodiments, the starting position for the neck rest holder 9 is normally 0° in relation

to the back, even though a deviation is shown in Fig. 3.

[0029] Normally, the starting position of the seat mounting 3 will be +4° (tilted backwards in relation to the horizontal). When a person sits on the chair, the seat mounting 3 will, for example, tilt 15° backwards. The connecting piece 5 with the back 7 fastened thereto will thus tilt 15° + 5.6° extra. These 5.6° extra thus give an application of force to the bar 16, and thence via the back rod 13 to the neck rest mechanism 11. Thus, the neck rest holder 9 is pivoted forward to a desired angle in relation to the back. A neck rest (not shown) mounted on the neck rest holder 9 will of course be adjustable in the vertical direction in a known way per se. A friction mechanism that is included in the neck rest mechanism 11 will be capable of being overridden by the chair user independent of the other parts of the arrangement. An angle of 35° has been chosen as maximum angular deflection for the neck rest holder 9 when sitting leaning back in the chair, whilst 8° has been chosen for the forward direction from the starting position.

[0030] The said angle values given above are merely non-limiting examples, as reciprocal size of functional parts and support points will change the angle values.

Claims

1. A chair arrangement in which the seat and back of the chair are tiltable relative to one another and relative to the base (2) of the chair, where the seat frame of the chair consists of a forward, spring-loaded seat mounting (3) which is sprung against a balance board (4) attached to an upper portion (2') of the base, the seat mounting (3) at the rear (3') being tiltable connected to a connecting piece (5) via a first tilt shaft (6), wherein the connecting piece (5) at the rear (5') is rigidly connected to the chair back frame (7), and wherein the connecting piece (5) at its forward end (5'') is articulated to a bracket (8) which is tiltable connected to the forward seat mounting (3), wherein

- the chair back (7) is equipped at the top with a neck rest holder (9) which is pivotally connected to a single back rod (13), which back rod (13) extends down along the back (7);

characterised in

- that the rod (13) at the bottom is articulated to a rear end (16') of a bar (16) that extends forwards towards a rear, lower portion (3') of the seat mounting (3); and

- that the bar (16):

- either a) is at its forward end (16'') in engagement with a bracket (17), and at an area between the forward (16'') and rear (16') portion of the bar attached to, the rear, lower portion (3') of the seat mounting;

- or b) is at its forward end (16'') in tiltable en-

gagement with the rear, lower portion (3') of the mounting, and at an area (16''') between the forward and rear portion of the bar tiltable connected to the connecting piece (5) via a second tilt shaft (19) that is operatively connected to the connecting piece (5) and extends transverse to the bar;

- or c) is at its forward end (16'') in tiltable engagement with the rear lower portion (3') of the seat mounting (3), and at an area between the forward and rear portion of the bar in abutment with the first tilt shaft (6).

2. An arrangement as stated in claim 1, **characterised in that** the neck rest holder (9) is spring loaded and tiltable about a pivotal joint (10) in a neck rest mechanism (11), and that the neck rest holder (9) has at least one tilt arm (14) which is pivotally connected to the single back rod (13).

3. An arrangement as stated in claim 1 or 2, **characterised in that** alternatives a) and c) are related to fixed, maximum tilting angles for the neck rest holder (9) in relation to the chair back (7).

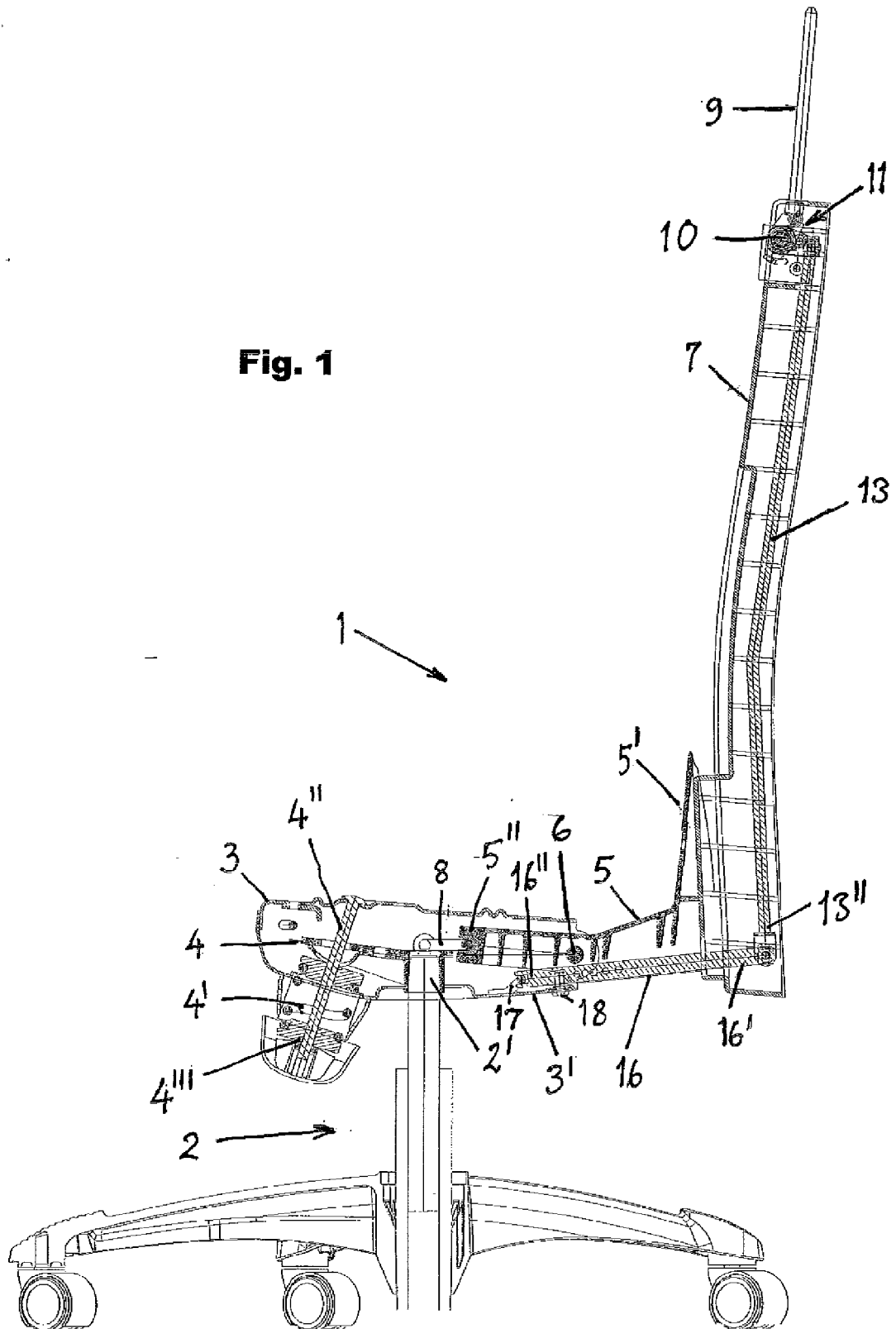
4. An arrangement as stated in claim 1 or 2, **characterised in that** in alternative b) the point (16''') where the second tilt shaft (19) cooperates with the bar (16) between its forward (16'') and rear (16') portion is determining for the tilting angle of the neck rest holder (9) in relation to the chair back (7).

5. An arrangement as stated in claim 4, **characterised in that** the tilting angle of the neck rest holder (9) in relation to the chair back (7) is made to be increasing with increasing distance from said point (16''') to an articulation (21) between the said rod (13) and bar (16).

6. An arrangement as stated in claim 1, 2, 3, 4, or 5, **characterised in that** the rod (13) extends from the neck rest mechanism (11) and down to said bar (16) in a guide (7') in the rear of the back.

7. An arrangement as stated in claim 1, 2, 3, 4, 5, or 6, **characterised in that** the neck rest mechanism (11) has at least one lug (14') assigned to the motion of the tilt arm (14), where the lug (14') is equipped with a pin (14'') which is movable in a groove (15) in the neck rest mechanism (11) to limit the angle of motion of the neck rest holder (9) forwards and backwards in relation to the chair back.

Fig. 1



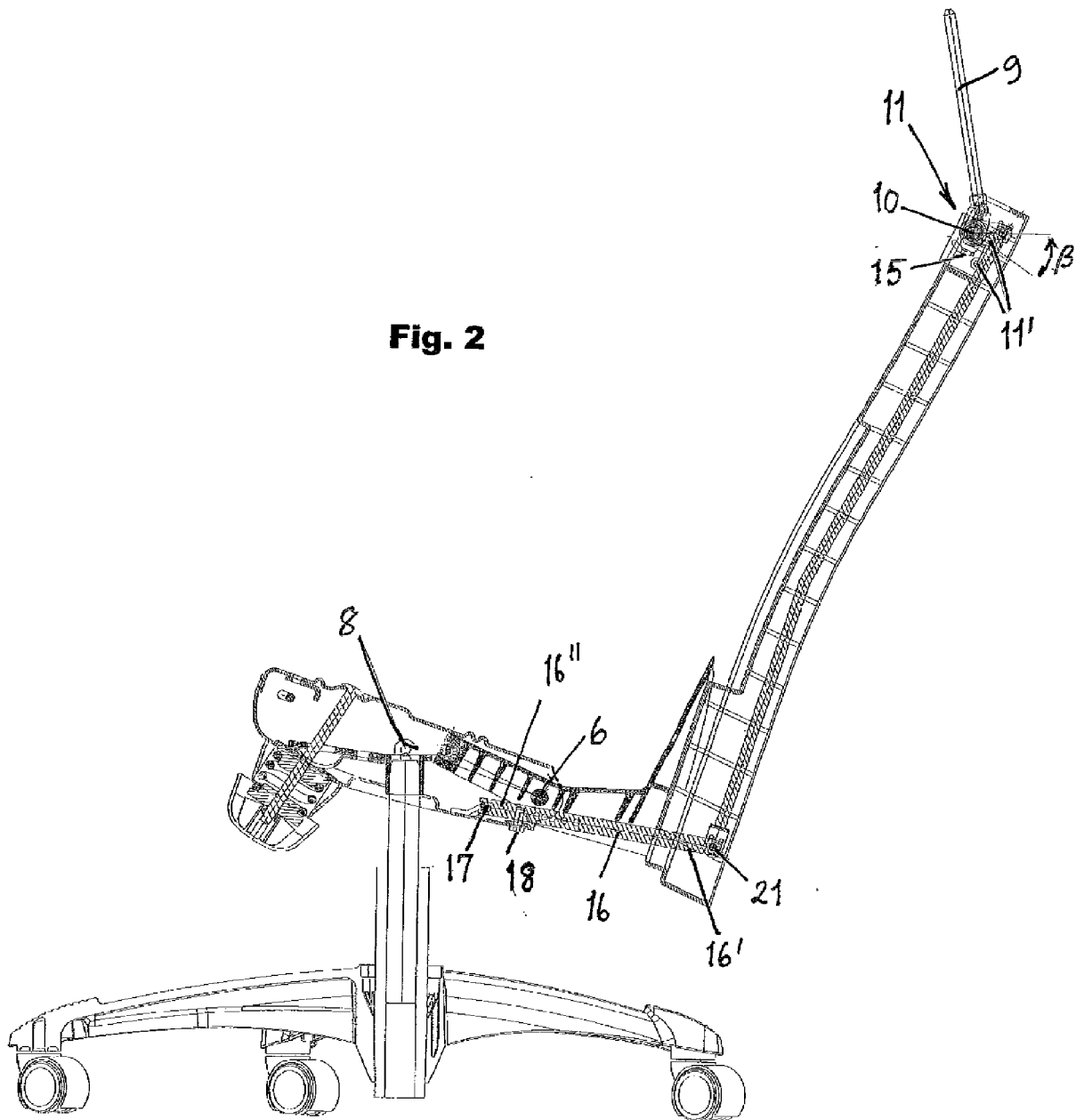
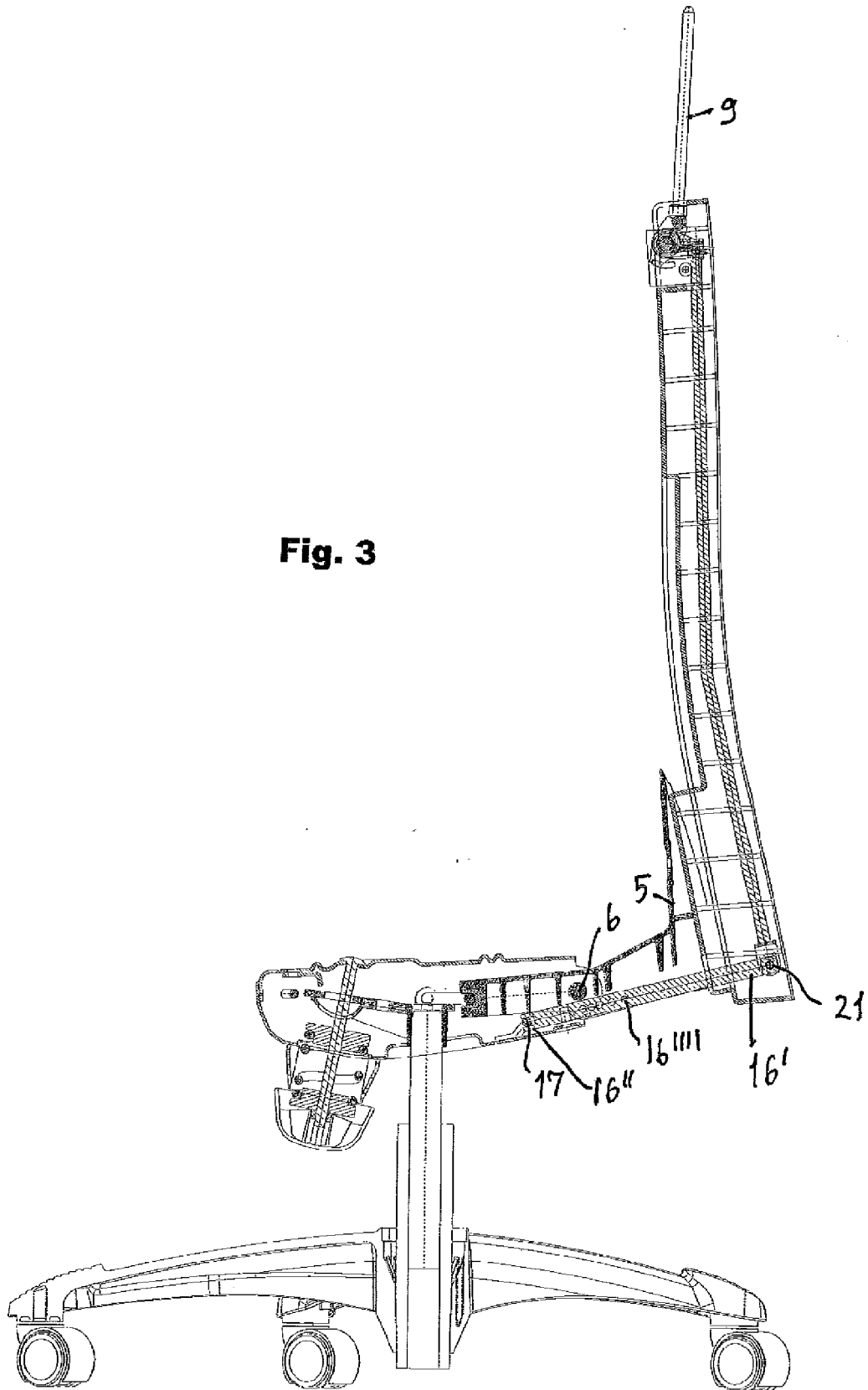


Fig. 3



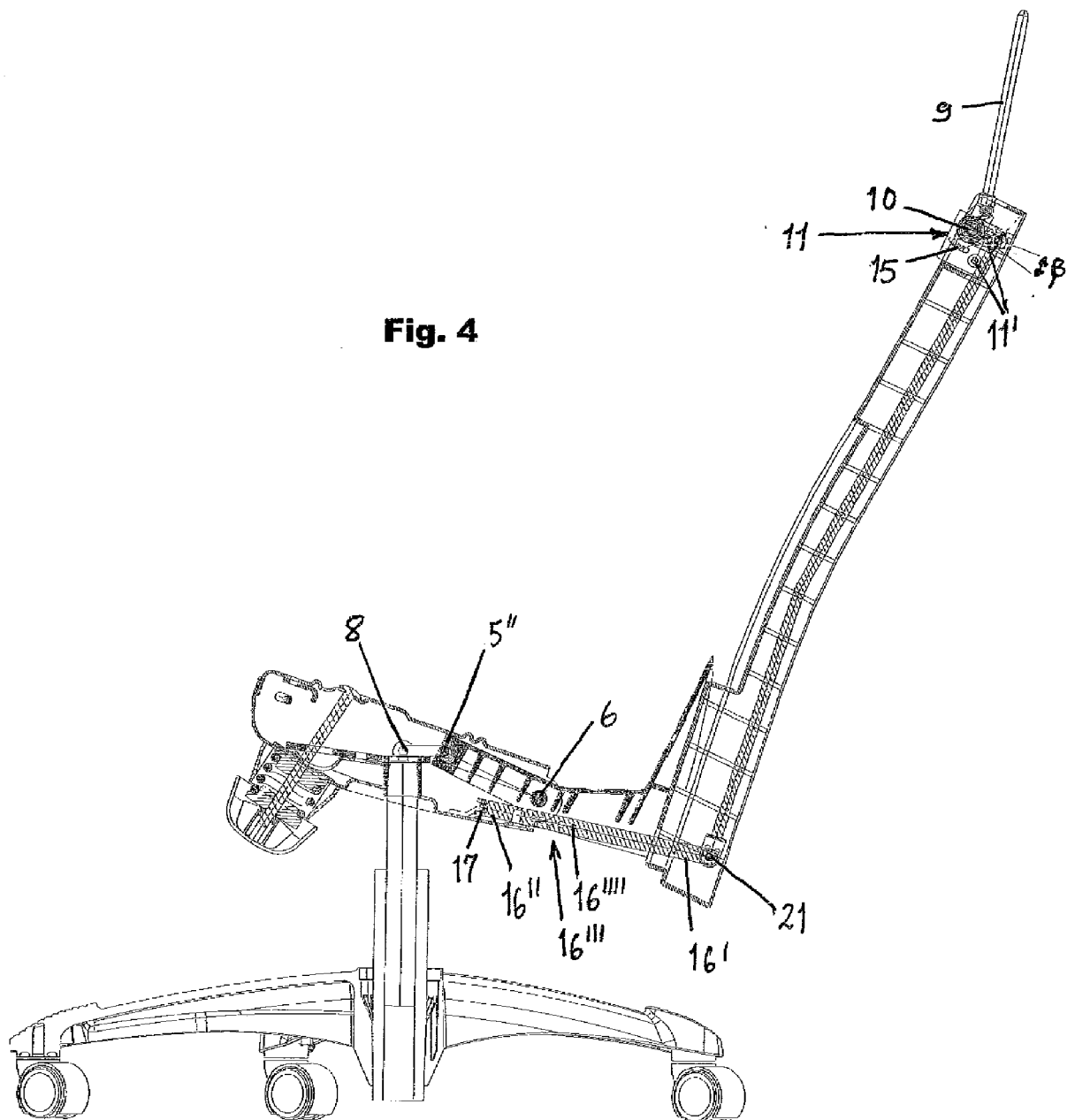


Fig. 5

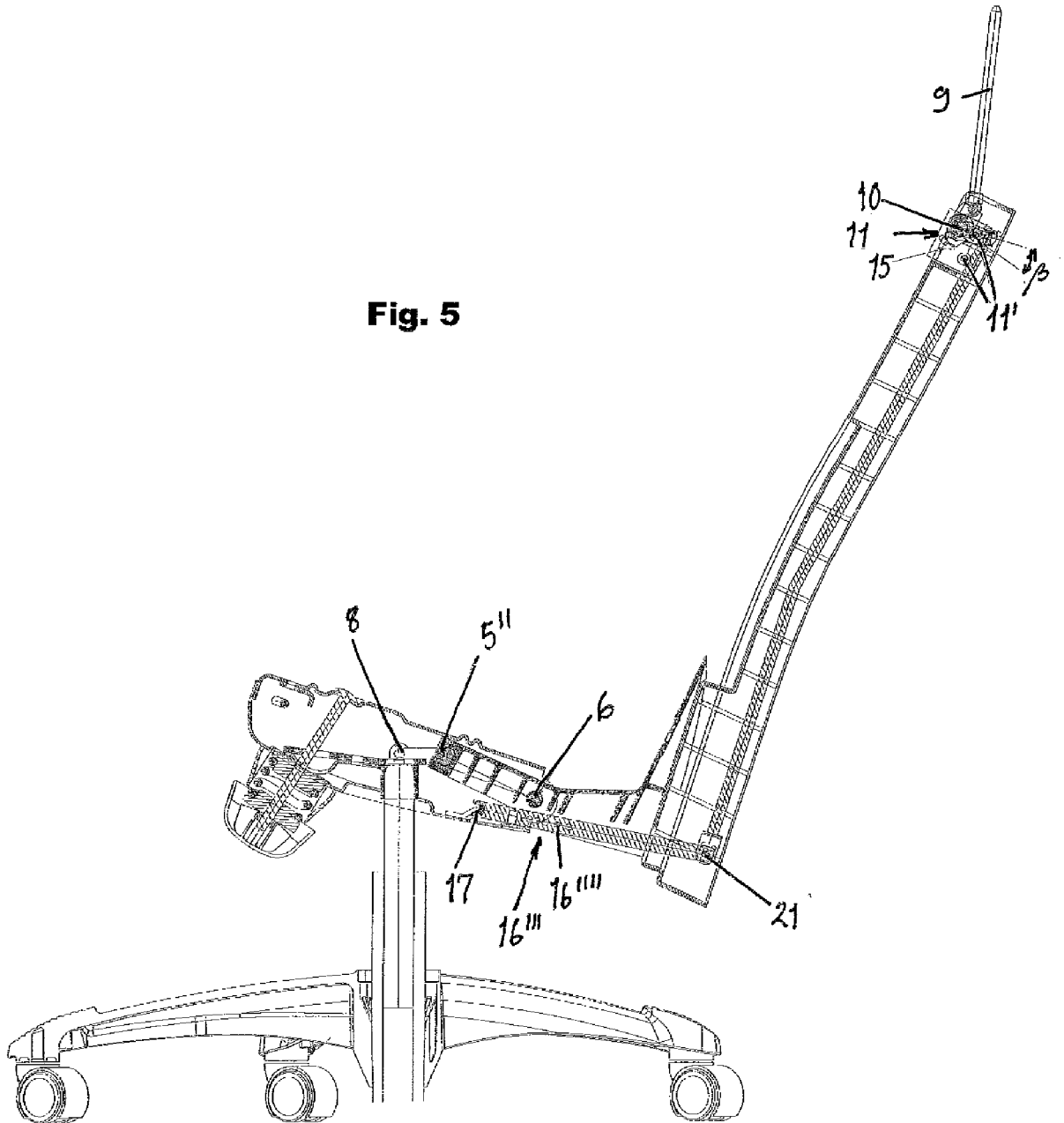
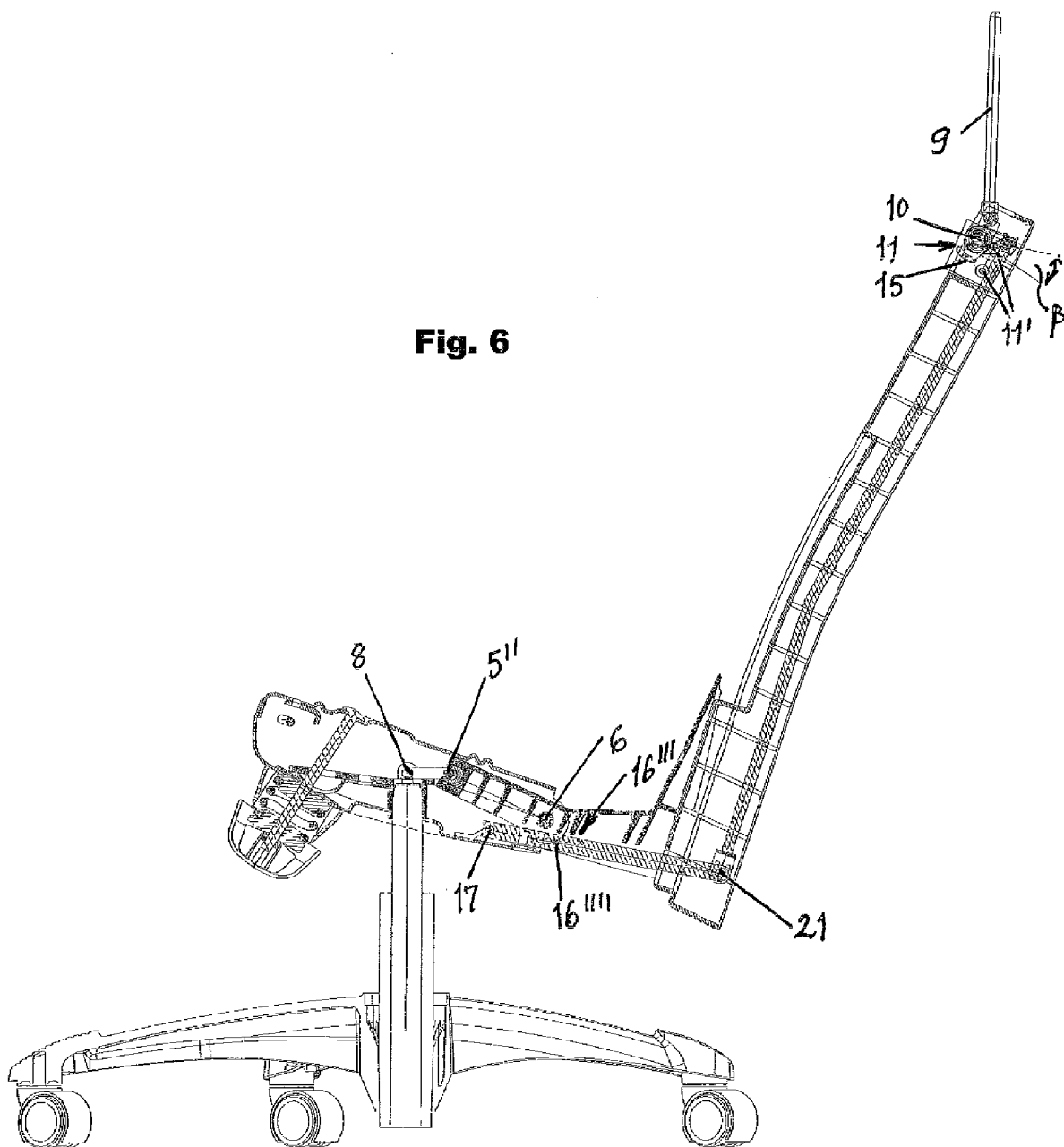
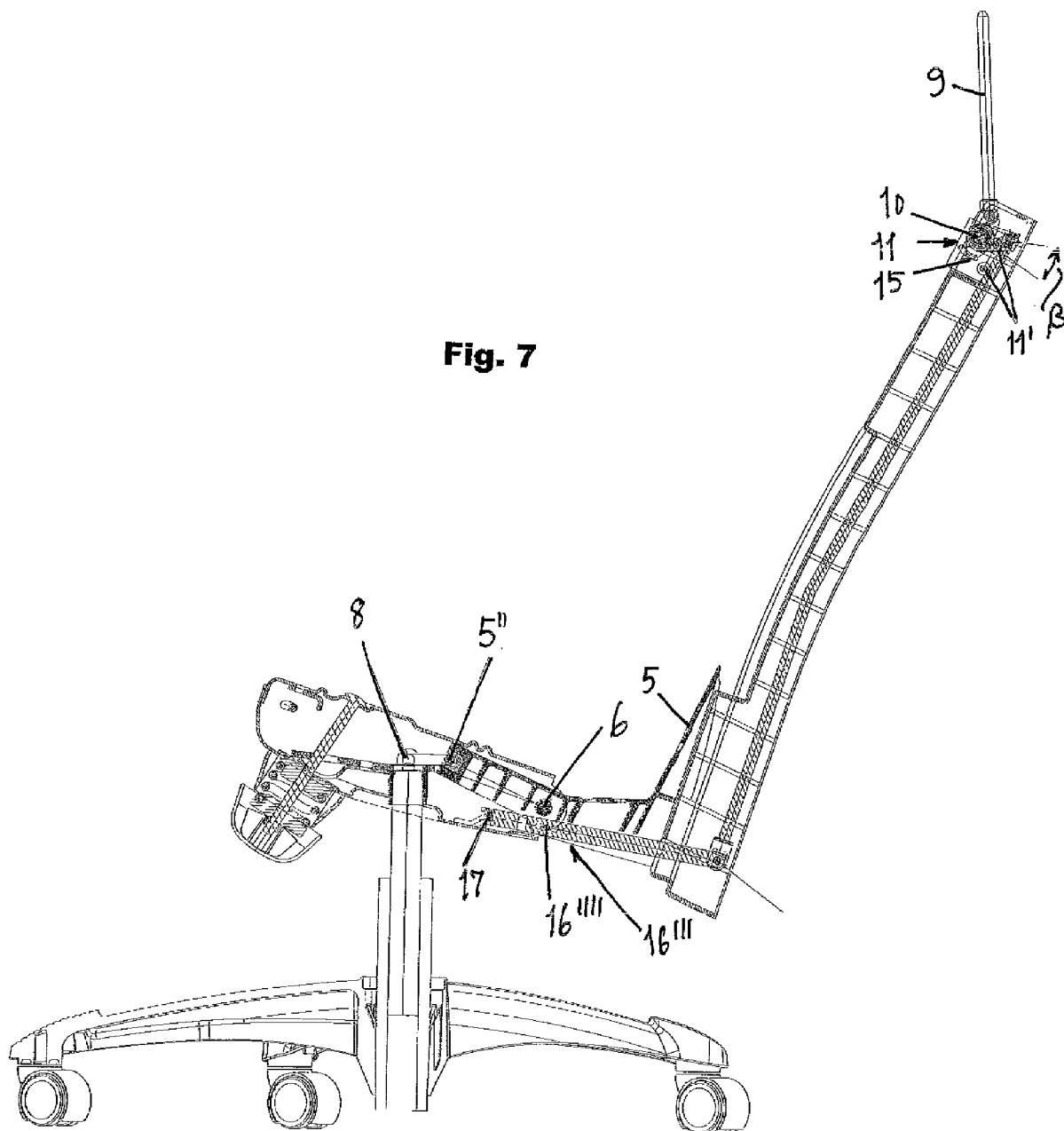


Fig. 6





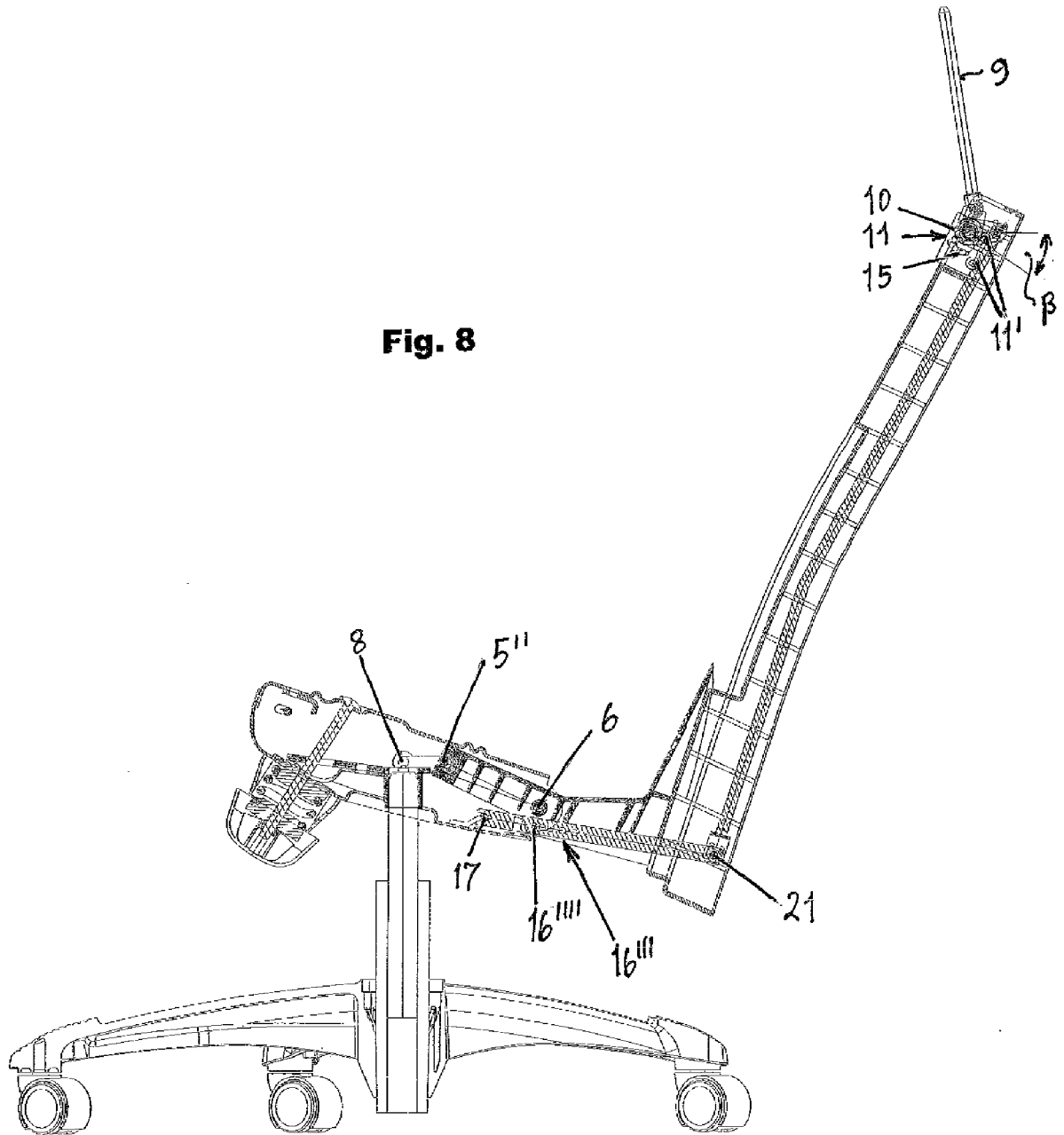
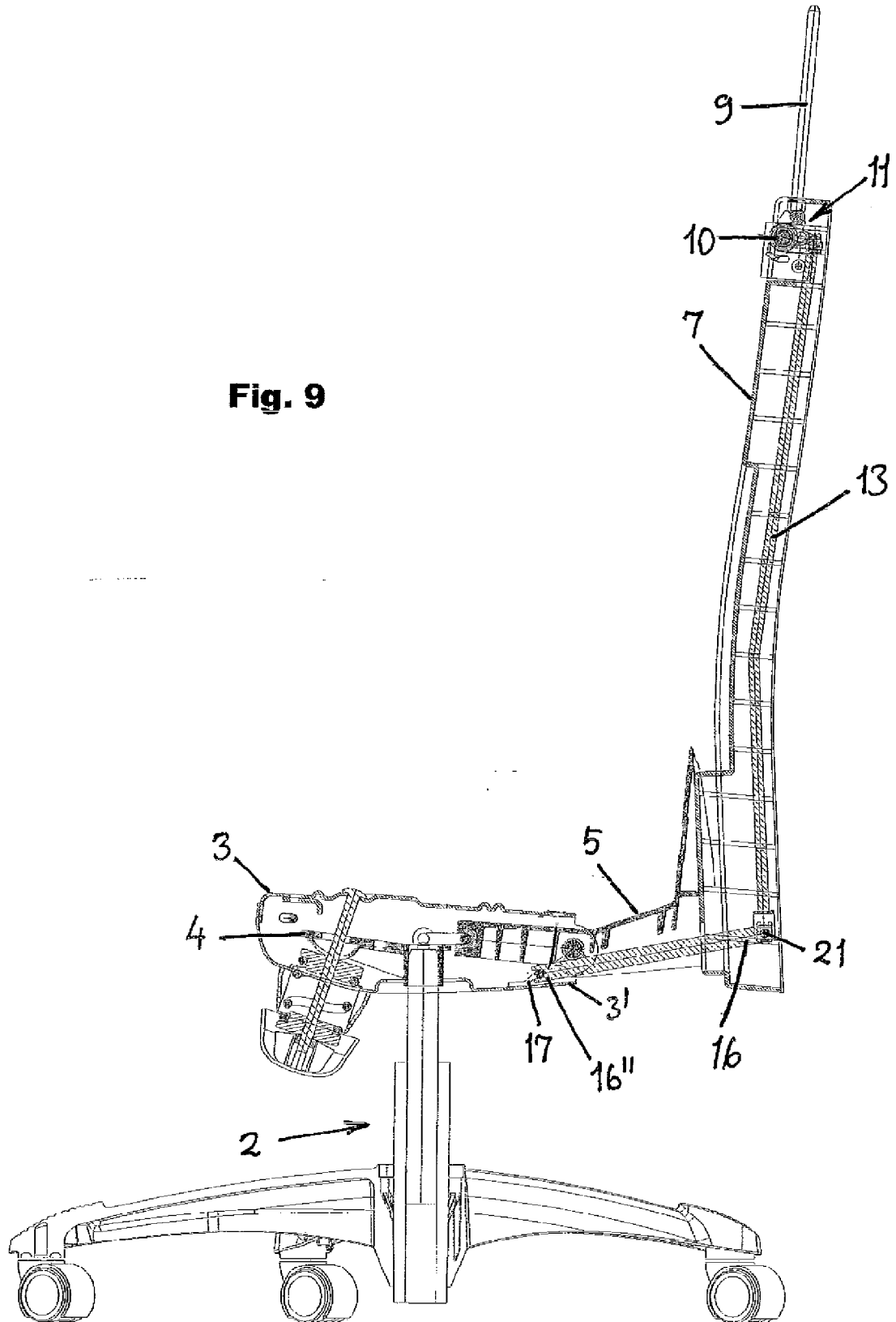
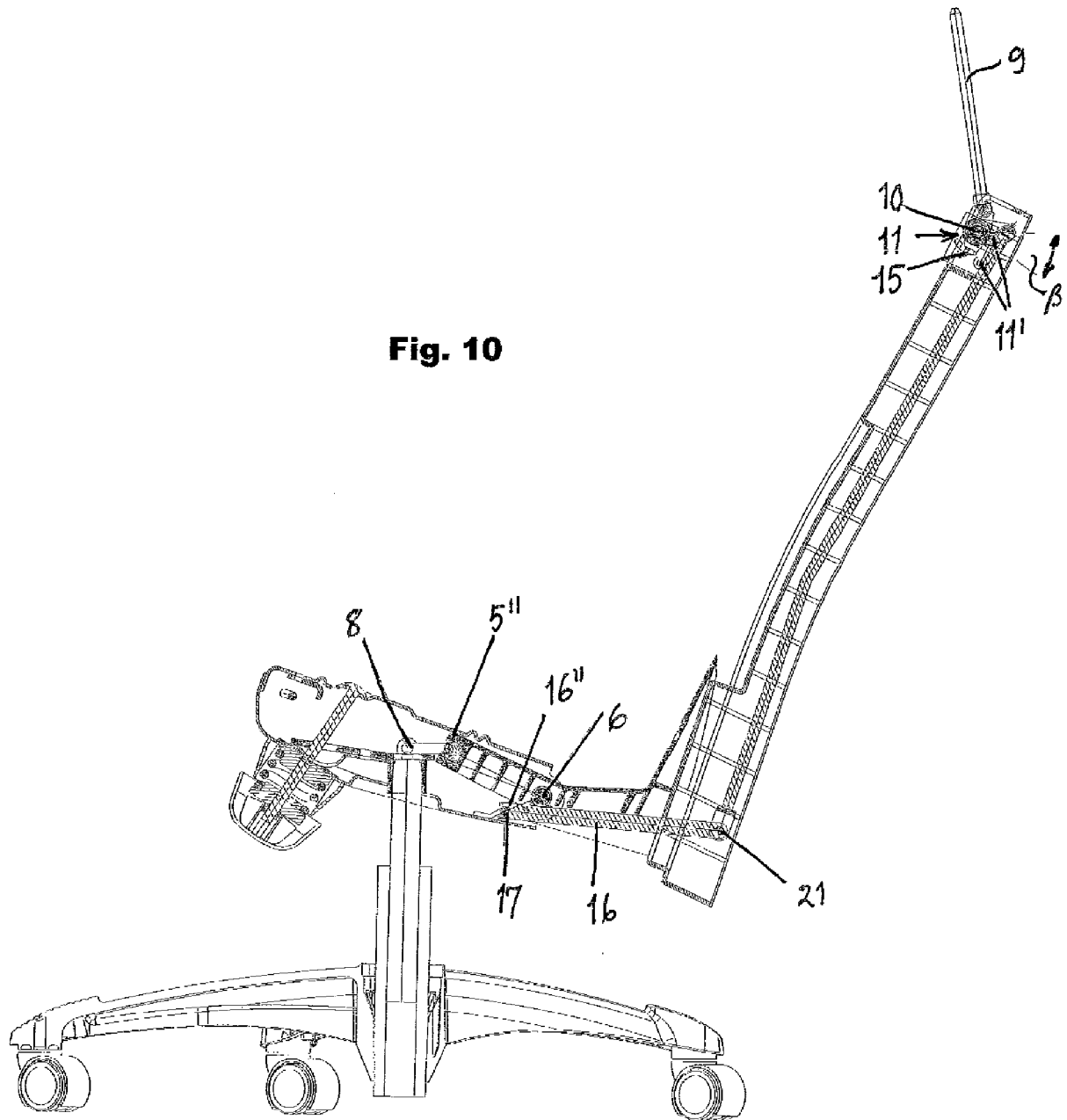


Fig. 9





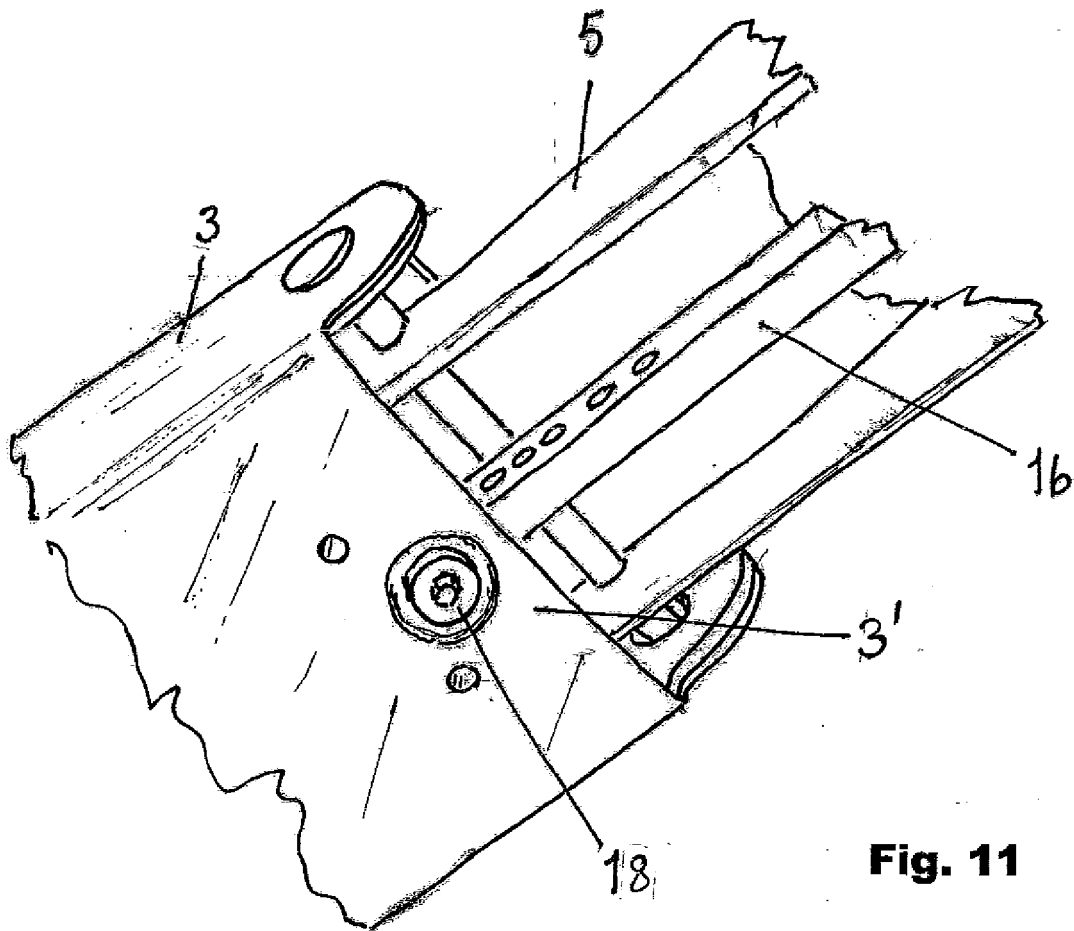
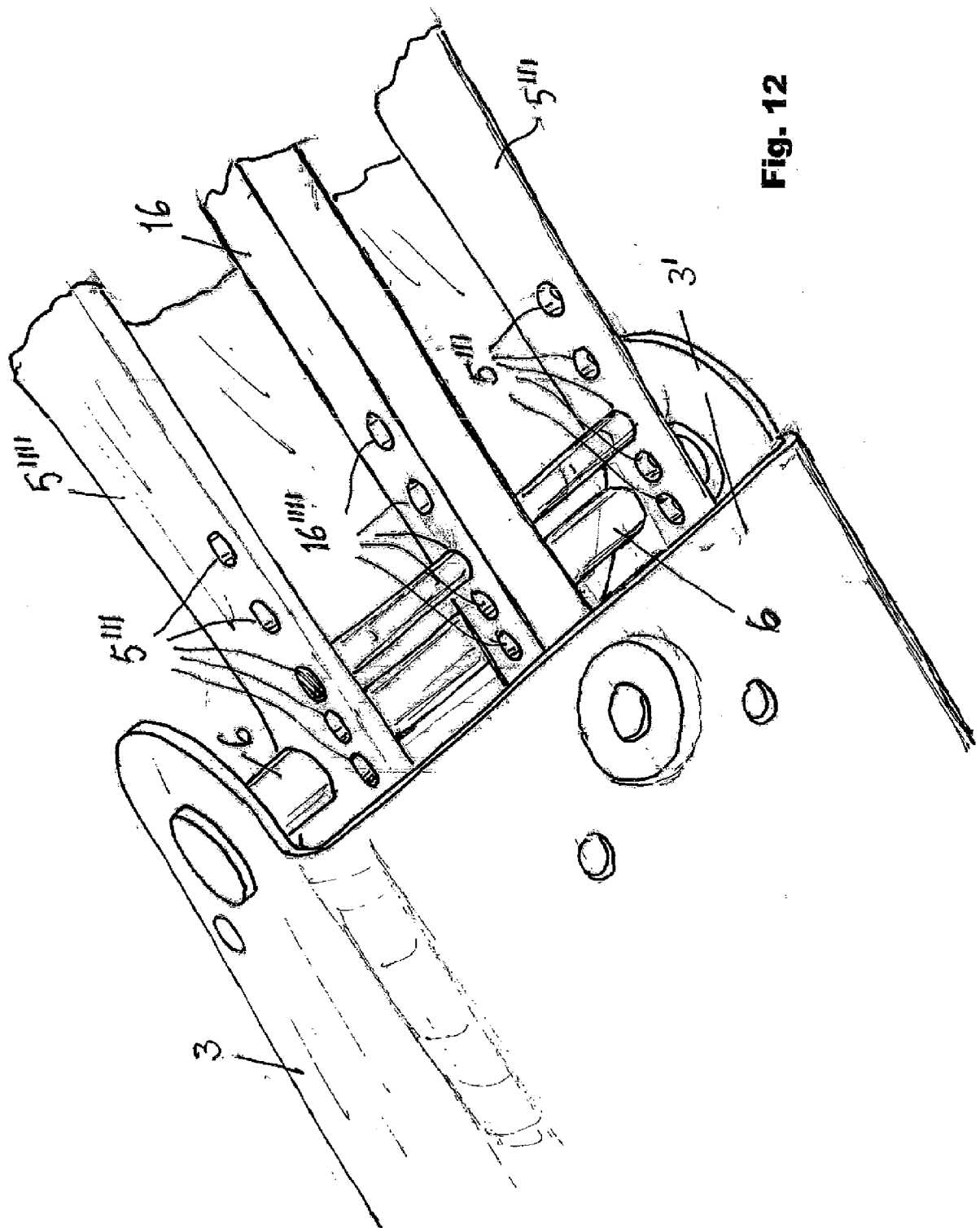
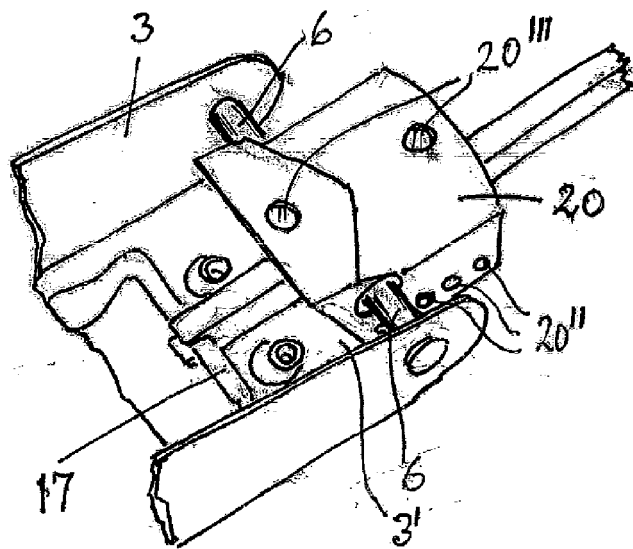
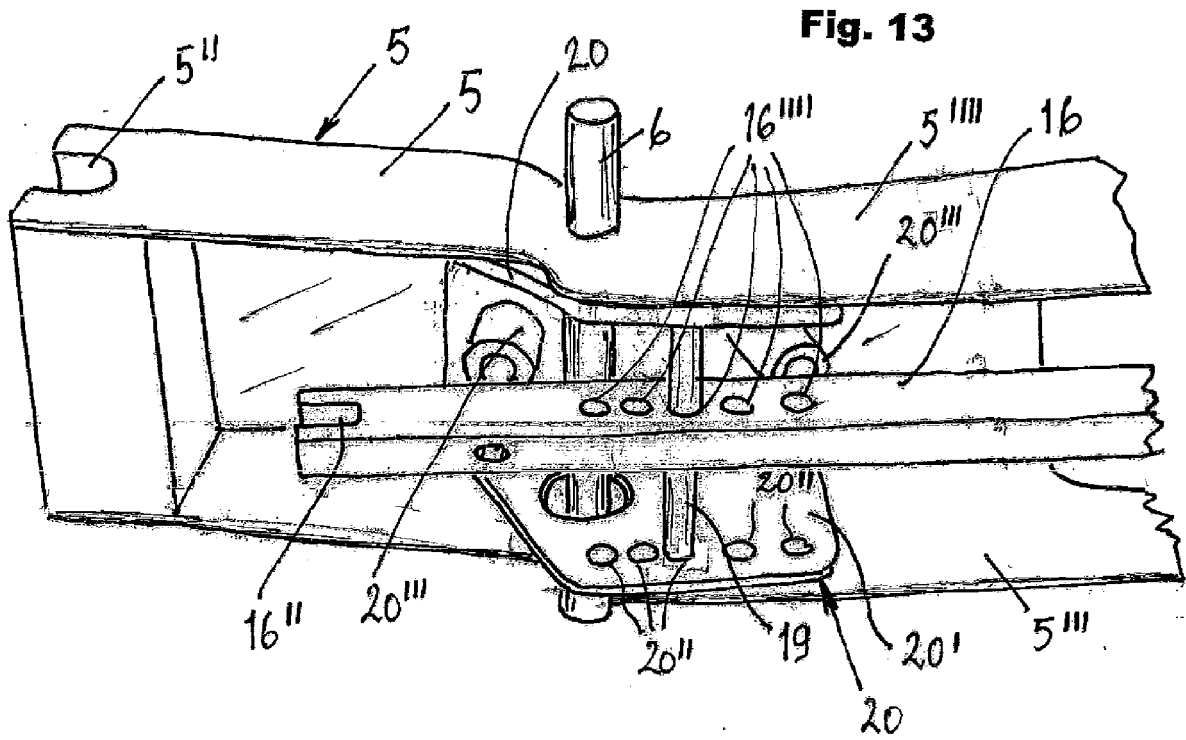
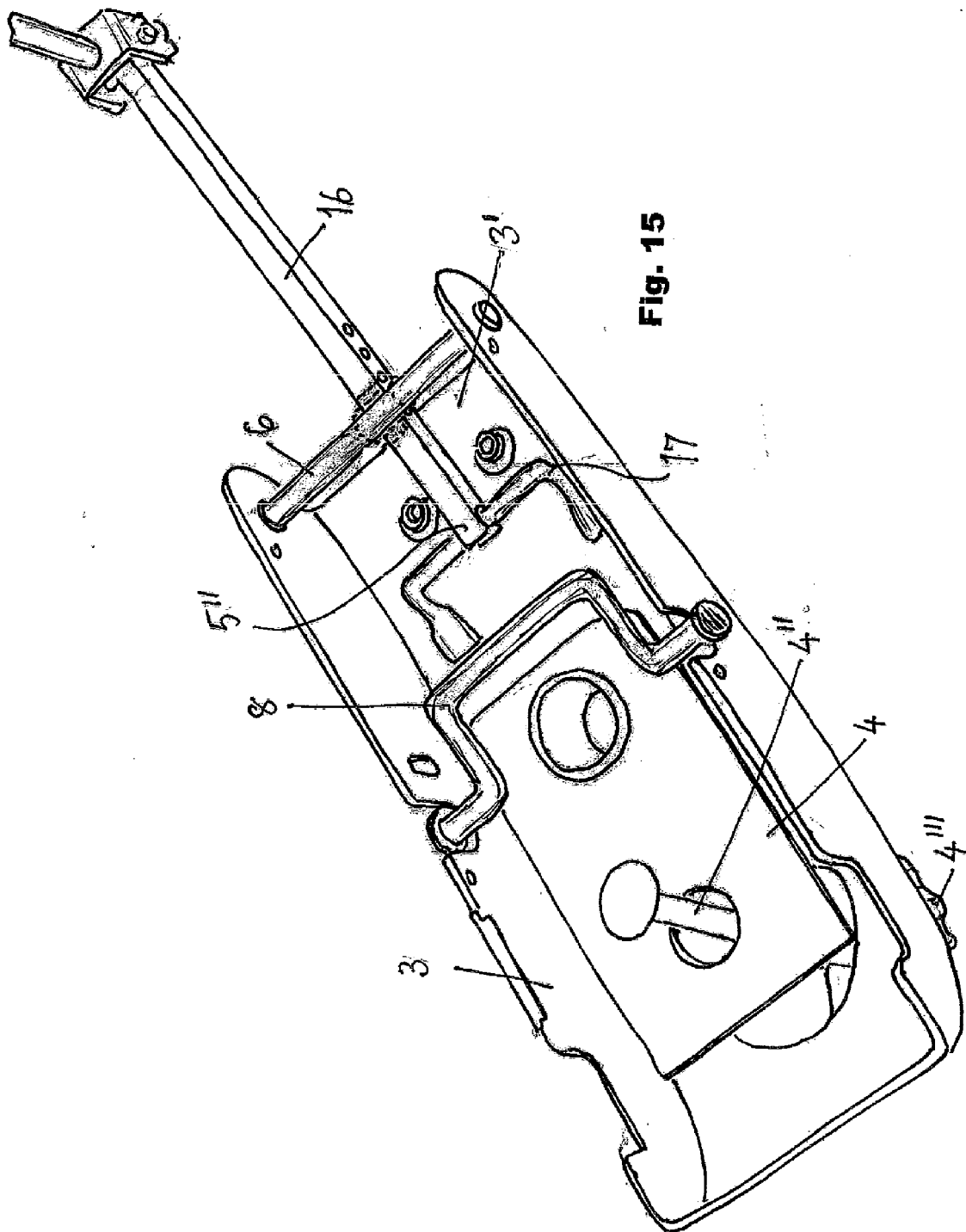


Fig. 11







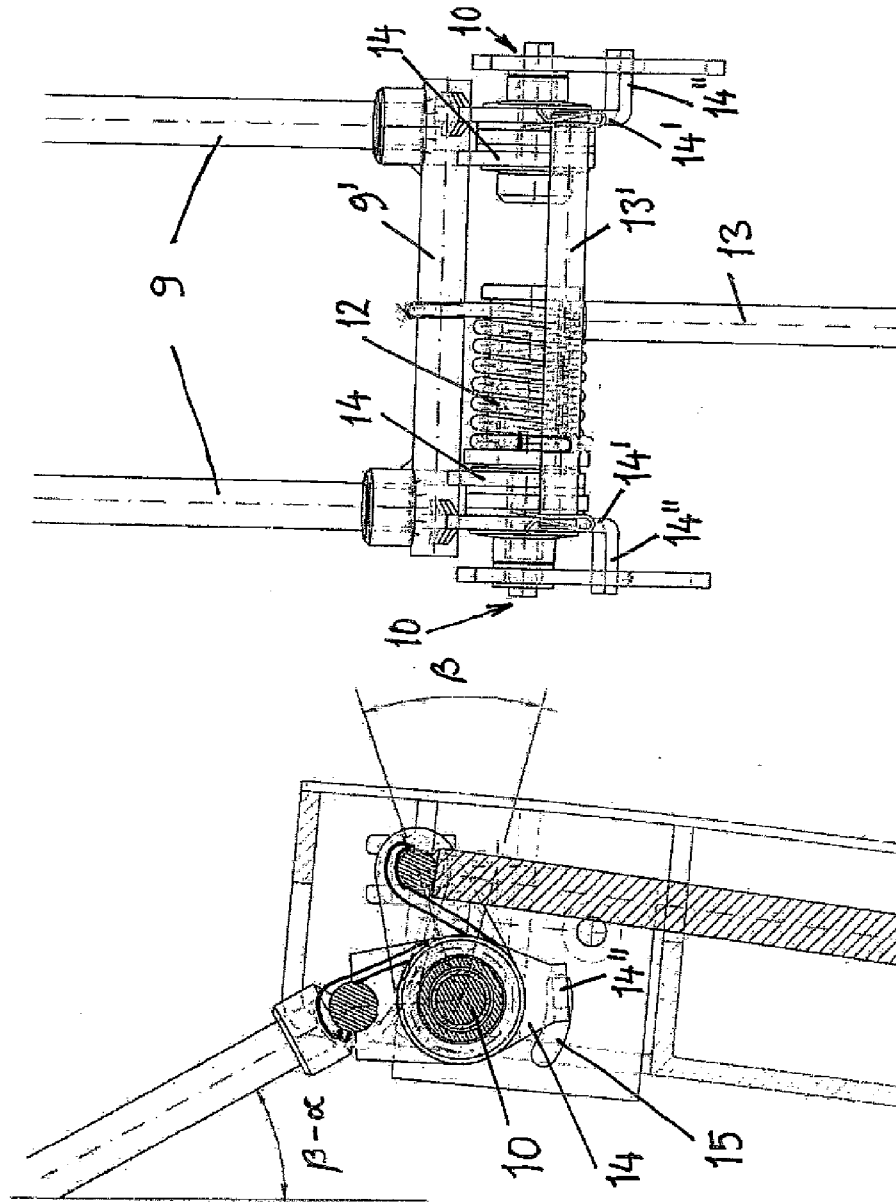


Fig. 17

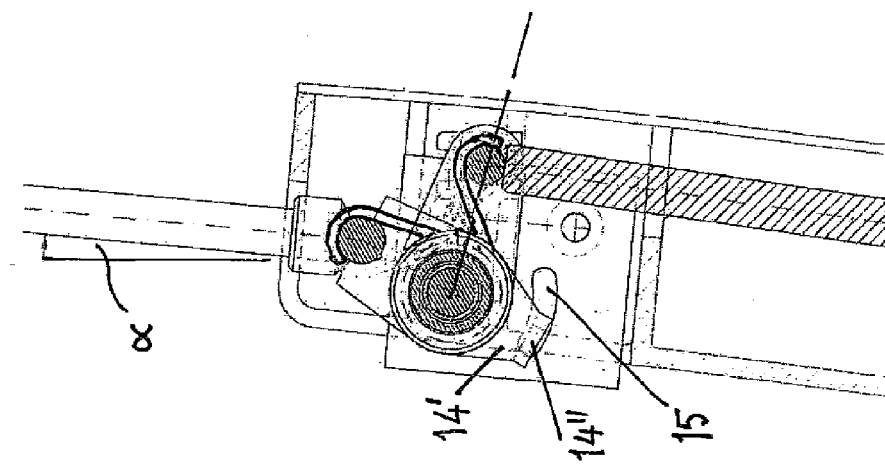


Fig. 16

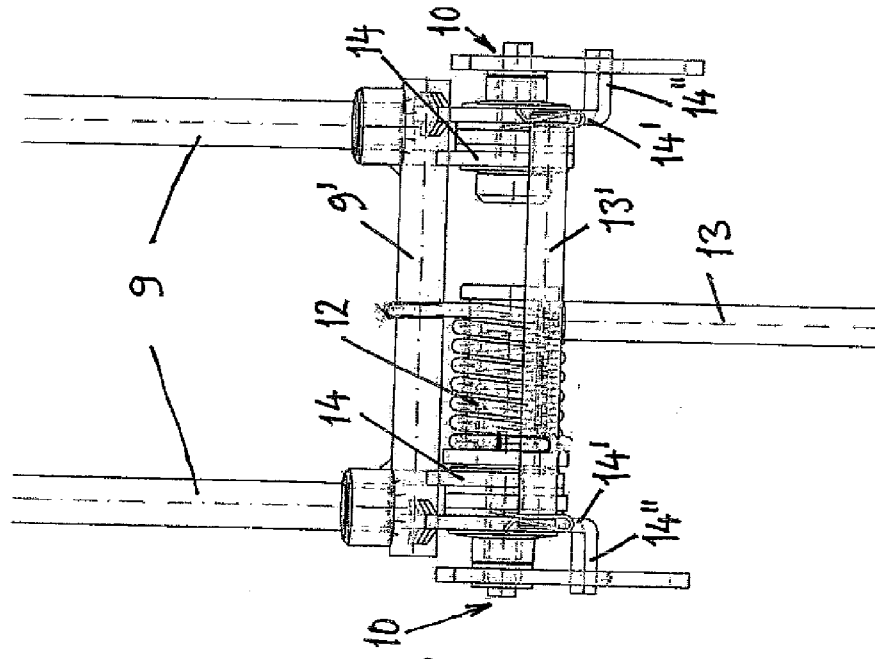


Fig. 18

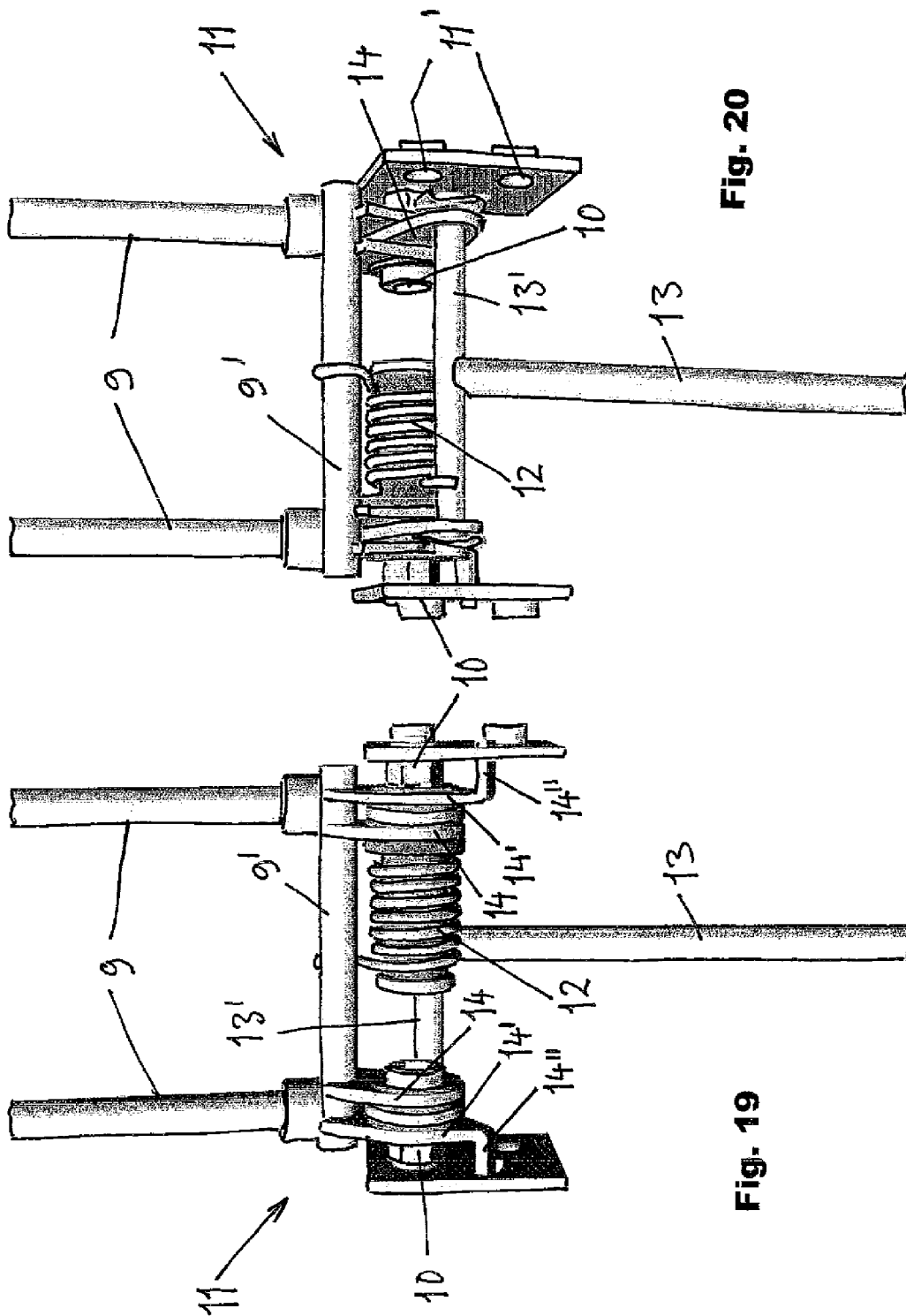


Fig. 20

Fig. 19

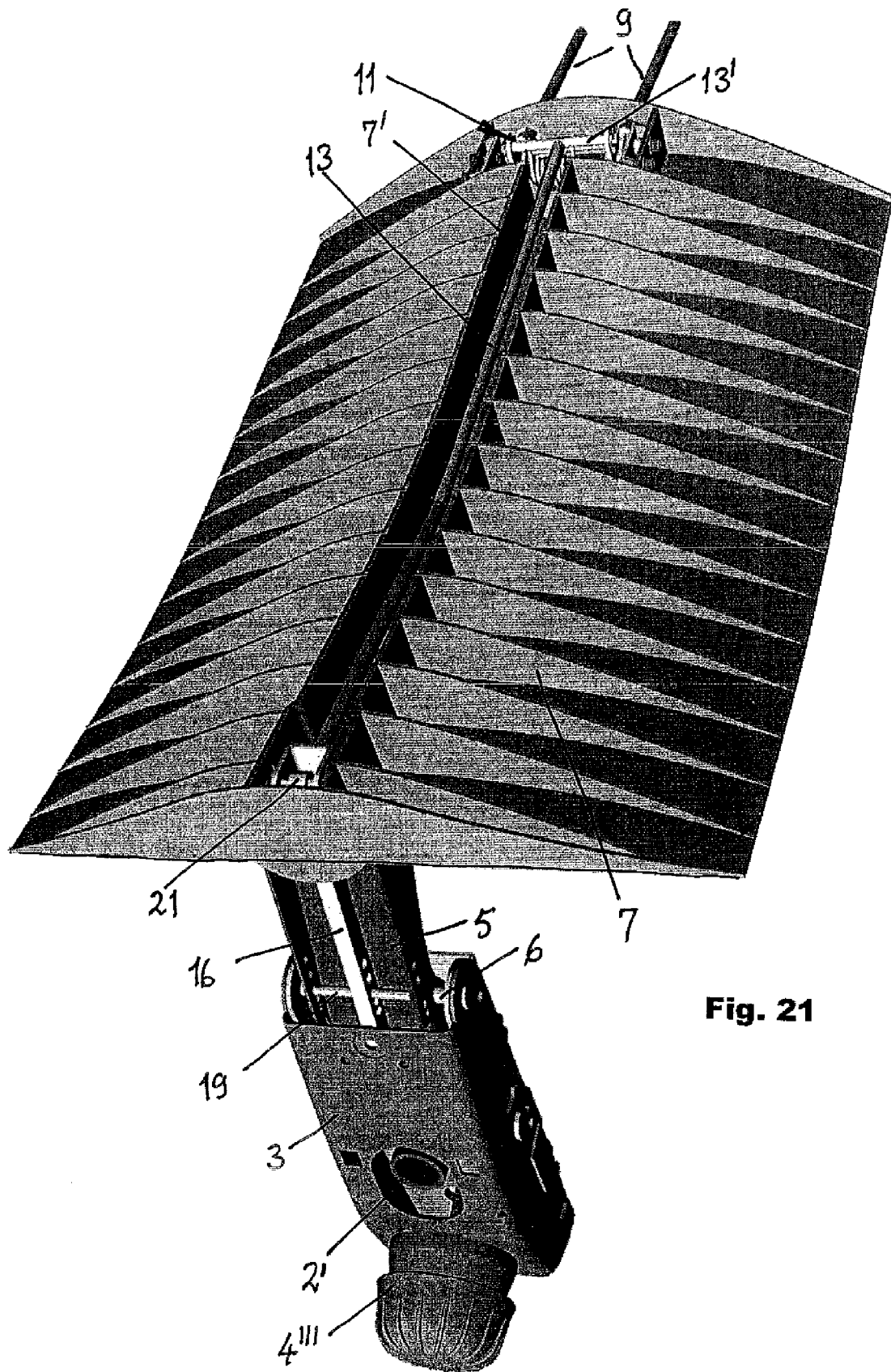


Fig. 21



EUROPEAN SEARCH REPORT

Application Number
EP 12 16 7975

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	NL 7 612 421 A (HIMOLLA HIERL GMBH C) 21 July 1977 (1977-07-21) * figures *	1	INV. A47C1/036
A	----- WO 2008/111848 A1 (SAPDESIGN AS) 18 September 2008 (2008-09-18) * figures *	1	
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			A47C
Place of search		Date of completion of the search	Examiner
The Hague		15 August 2012	Kis, Pál
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 (03.02) (P04C01)

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

EP 12 16 7975

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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15-08-2012

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