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(54) **WHEELCHAIR, IN PARTICULAR WHEELCHAIR COMPRISING A HEIGHT-ADJUSTABLE SEAT STRUCTURE**

(57) There is described a wheelchair (1) comprising a seat portion (5), including a seat structure (50), a foot portion (6), a pair of wheels (3) and a wheelchair frame (2) extending between the seat portion (5) and the foot portion (6). The wheelchair frame (2) comprises a cross-member (27/28) having first and second ends coupled to the wheels (3), first and second side frame members (21, 22) extending on each side of the wheelchair frame (2) from the first end, respectively second end, of the cross-member (27/28) to the foot portion (6), and a central support structure (25/250/500) located on a middle portion of the cross-member (27/28), which central support structure (25/250/500) supports the seat structure (50). The wheelchair frame (2) further comprises a linking structure (23/24) extending from the middle portion of the cross-member (27/28) to each one the first and second side frame members (21, 22), at the foot portion (6). Also described is a wheelchair (1) comprising a height-adjustable seat structure (50).

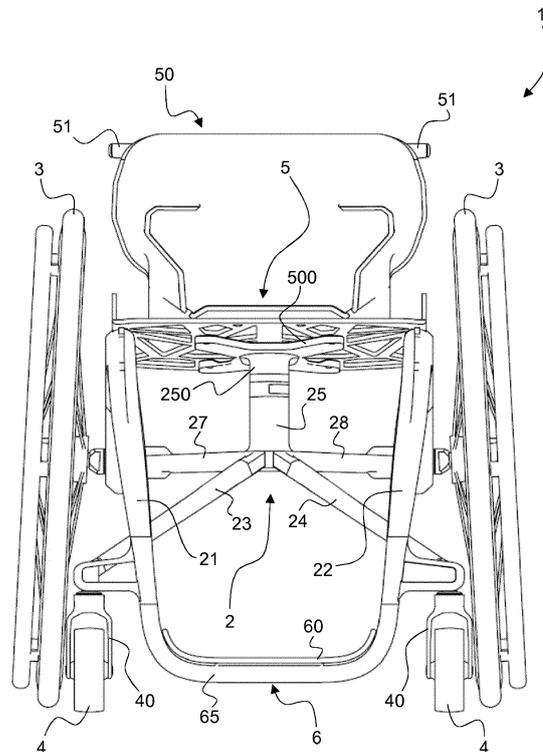


Fig. 1C

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DescriptionTECHNICAL FIELD

[0001] The present invention generally relates to wheelchairs, and in particular to wheelchairs of the type comprising a central support structure supporting a seat structure.

BACKGROUND OF THE INVENTION

[0002] German Utility Model Publication No. DE 297 05 494 U1 discloses a wheelchair comprising a seat portion, including a seat structure, a foot portion, a pair of rear wheels, and a wheelchair frame extending between the seat portion and the foot portion. The wheelchair frame of this known wheelchair basically consists of a cross-member, the two ends of which are coupled to the rear wheels, a pair of side frame members extending on each side of the wheelchair frame from the two ends of the cross-member to the foot portion, and a central support structure located on a middle portion of the cross-member, which central support structure supports the seat structure. More specifically, the central support structure comprises a cylindrical seat post that is secured to the cross-member and a hollow cylindrical seat tube that is secured to an underside of the seat structure and mounted onto the seat post. A pair of bolts running through mounting holes formed in the seat post and the seat tube is further provided to secure the seat tube onto the seat post at a given position among a plurality of predefined seating height positions.

[0003] A fundamental drawback and weakness of this wheelchair configuration resides in the fact that the entirety of the load exerted onto the seat structure is borne by the aforementioned seat tube/seat post arrangement, with the pair of bolts carrying most of the load, quickly leading to mechanical failures due to the inherent shearing forces applied on the bolts. Furthermore, with this wheelchair configuration, the load is transferred from the central support structure to the cross-member alone, which may lead to potential weaknesses in terms of frame robustness.

[0004] International PCT Publication No. WO 2008/047261 A2 discloses another wheelchair of the type comprising a central support structure supporting a seat structure. In contrast to the wheelchair configuration of German Utility Model Publication No. DE 297 05 494 U1, the central support structure only bears part of the load exerted onto the seat structure, the seat structure being further supported at a front-end onto the wheelchair frame, namely onto a section of two side frame members that extend from the central support structure to the foot portion of the wheelchair. This therefore leads to the necessity to shape the side frame members to provide the relevant support at the front-end of the seat structure as well as the provision of two additional support elements for connecting the seat structure to the side frame mem-

bers.

[0005] There is therefore a need for an improved solution.

5 SUMMARY OF THE INVENTION

[0006] A general aim of the invention is to provide such a wheelchair of the type comprising a central support structure supporting a seat structure that is adapted to optimally cope with the load exerted onto the seat structure.

[0007] Yet another aim of the invention is to provide a wheelchair of the aforementioned type that is of robust construction.

10 **[0008]** A further aim of the invention is to provide a wheelchair of the aforementioned type that ensures proper and adequate load transfer from the seat structure, to the central support structure, and to the wheelchair frame.

20 **[0009]** Still another aim of the invention is to provide a wheelchair of the aforementioned type where a seating height of the seat structure can be adjusted, without compromising load transfer or robustness of the central support structure.

25 **[0010]** These aims are achieved thanks to the solutions defined in the claims.

[0011] In accordance with a first aspect of the invention, there is provided a wheelchair according to claim 1, namely a wheelchair comprising a seat portion, including a seat structure, a foot portion, a pair of wheels, and a wheelchair frame extending between the seat portion and the foot portion. The wheelchair frame comprises a cross-member having first and second ends coupled to the wheels, first and second side frame members extending on each side of the wheelchair frame from the first end, respectively second end, of the cross-member to the foot portion, and a central support structure located on a middle portion of the cross-member, which central support structure supports the seat structure. According to this first aspect of the invention, the wheelchair frame further comprises a linking structure extending from the middle portion of the cross-member to each one of the first and second side frame members, at the foot portion.

40 **[0012]** In accordance with a particularly preferred embodiment, the linking structure includes a first arm extending from the middle portion of the cross-member to an end of the first side frame member and a second arm extending from the middle portion of the cross-member to an end of the second side frame member.

50 **[0013]** Preferably, each one of the first and second side frame members exhibits an L-shaped profile with a rearward section extending mainly horizontally from the first end, respectively second end, of the cross-member and a forward section extending mainly vertically from the foot portion, and the linking structure extends obliquely from the middle portion of the cross-member to the foot portion.

[0014] The linking structure may advantageously fur-

ther bear a pair of caster wheels located in a vicinity of the foot portion.

[0015] By way of preference, the cross-member and linking structure together form an X-shaped frame assembly.

[0016] The central support structure may in particular comprise a central support member secured to the middle portion of the cross-member, and preferably forming an integral part with the cross-member, and a seat post secured to the seat structure and mounted onto the central support member. In this context, the seat post can especially include a shoulder portion providing support for load transfer to the central support member.

[0017] In accordance with another aspect of the invention, there is provided a wheelchair according to claim 8, namely a wheelchair comprising a seat portion, including a seat structure, a pair of wheels, and a wheelchair frame. The wheelchair frame comprises a cross-member having first and second ends coupled to the wheels, and a central support structure located on a middle portion of the cross-member, which central support structure supports the seat structure. According to this other aspect of the invention, the central support structure comprises a central support member secured to the middle portion of the cross-member and a seat post secured to the seat structure and mounted onto the central support member, the seat post including a shoulder portion providing support for load transfer to the central support member.

[0018] By way of preference, the aforementioned central support structure includes a clamping mechanism designed to selectively clamp the seat post onto the central support member, and a spacer interposed between the central support member and the seat post. The provision of the spacer allows adjustment of a seating height of the seat structure if need be.

[0019] With respect to the provision of the aforementioned clamping mechanism, the central support member may in particular comprise a mounting hole dimensioned to receive an engaging section of the seat post. By way of preference, the clamping mechanism includes a clamping collar encircling a portion of an upper section of the central support member and a corresponding portion of the engaging section received inside the mounting hole. The upper section of the central support member may advantageously comprise at least one radial slit allowing elastic deformation of the upper section under the action of the clamping collar. The spacer may furthermore be located around the upper section of the central support member and comes in abutment against the shoulder portion of the seat post.

[0020] In accordance with a further embodiment of the invention, the central support structure further comprises a seat base secured to an upper portion of the seat post and to an underside of a seat of the seat structure.

[0021] According to yet another embodiment of the invention, the wheelchair frame is made, at least in part, of composite materials, especially composite materials containing graphene.

[0022] Further advantageous embodiments of the invention are discussed below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] Other features and advantages of the present invention will appear more clearly from reading the following detailed description of embodiments of the invention which are presented solely by way of non-restrictive examples and illustrated by the attached drawings in which:

Figures 1A to 1G are multiple views taken from different perspectives of a first embodiment of a wheelchair in accordance with a first aspect of the invention ;

Figures 2A to 2F are multiple views taken from different perspectives of the wheelchair frame of the wheelchair of Figures 1A to 1G ;

Figures 3A to 3F are multiple views of an X-shaped frame assembly forming part of the wheelchair frame of Figures 2A to 2F ;

Figures 4A to 4E are partial cutaway views of a central support structure of the wheelchair of Figures 1A to 1G ;

Figure 5 is a cutaway view of a seat post forming part of the central support structure of Figures 4A to 4E ;

Figures 6A to 6F are multiple views taken from different perspectives of a wheelchair seat structure in accordance with another embodiment of the invention ;

Figure 7 is a perspective view of a second embodiment of a wheelchair in accordance with another aspect of the invention ; and

Figure 8 is a perspective view of the wheelchair of Figure 7, with the seat structure removed.

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0024] The present invention will be described in relation to various illustrative embodiments. It shall be understood that the scope of the invention encompasses all combinations and sub-combinations of the features of the embodiments disclosed herein.

[0025] As described herein, when two or more parts or components are described as being connected, secured or coupled to one another, they can be so connected, secured or coupled directly to each other or through one or more intermediary parts.

[0026] The invention will be described in relation to various embodiments of a wheelchair frame as depicted in Figures 1 to 8.

[0027] Figures 1A to 1G are multiple views taken from different perspectives of a first embodiment of a wheelchair, designated globally by reference numeral 1, in accordance with a first aspect of the invention. The wheel-

chair 1 essentially comprises a seat portion 5, including a seat structure 50, a foot portion 6, a pair of rear wheels 3, and a wheelchair frame 2 extending between the seat portion 5 and the foot portion 6. In the illustrated embodiment, the wheelchair 1 further comprises a pair of front caster wheels 4 that are each supported onto the wheelchair frame 2 by a fork element 40. The foot portion 6 includes in this example a U-shaped foot rest member 65 coupled to a front-end of the wheelchair frame 2, which foot rest member 65 carries a foot rest 60 that extends rearward from the foot rest member 65. Other foot rest configurations could however be contemplated.

[0028] The seat structure 50 is preferably made of one lightweight piece integrating a backrest and seat, as well as clothing guards as shown, it being understood that the seat portion 5 would typically further include seat and backrest cushions or padding (not shown in Figures 1A-G) to improve comfort for the wheelchair user (see e.g. the other embodiment shown in Figure 7). The seat structure could in essence include further elements and/or exhibit a more complex shape, as for instance illustrated in Figures 6A-6F which show another example of an integral seat structure 50* including not only a backrest 50a and a seat 50b, but also clothing and mud guards 50c shaped to cover an upper portion of the rear wheels 3 (see also Figure 7). For the sake of convenience, a pair of push handles 51 are further provided on a rear portion of the seat structure 50, resp. 50*.

[0029] The particular configuration of the wheelchair frame 2 will now be described in relation to the illustrations of Figures 1A-G, 2A-F and 3A-F. Figures 2A to 2F are multiple views taken from different perspectives of the wheelchair frame 2 of the wheelchair 1 of Figures 1A-G, while Figures 3A to 3F are multiple views of an X-shaped frame assembly forming a distinctive part of the wheelchair frame 2.

[0030] In Figures 2A-F, the rear wheels 3, front caster wheels 4 and associated fork elements 40, as well as the seat structure have been omitted to reveal the overall structure of the wheelchair frame 2 in accordance with this first embodiment. The wheelchair frame 2 comprises, as shown, a cross-member 27/28 having first and second ends coupled to the rear wheels 3, first and second side frame members 21, 22 extending on each side of the wheelchair frame 2 from the first end, respectively second end, of the cross-member 27/28 to the foot portion 6, and a central support structure 25/250/500 located on a middle portion of the cross-member 27/28, which central support structure 25/250/500 supports the seat structure 50. In accordance with this first aspect of the invention, the wheelchair frame 2 further comprises a linking structure 23/24 extending from the middle portion of the cross-member 27/28 to each one the first and second side frame members 21, 22, at the foot portion 6.

[0031] As shown in Figures 1A-G, 2A-F and 3A-F, the cross-member 27/28 and the linking structure 23/24 together form an X-shaped frame assembly, which constitutes a visually-striking and very distinctive feature of the

wheelchair 1 of this first embodiment. The overall structure and configuration of this X-shaped frame assembly is more clearly apparent from the illustrations of Figures 3A to 3F.

[0032] In the illustrated embodiment, the cross-member 27/28 comprises first and second cross-member elements 27, 28 that extend rearward from the central support structure 25/250/500 to connect to the rear wheels 3. An outer end of each cross-member element 27, 28 is designed to form a wheel hub for connection to the rear wheels. Preferably, the cross-member elements 27, 28 form an integral part with a central support member 25 of the central support structure 25/250/500, which central support member 25 extends upwards from the middle portion of the cross-member 27/28.

[0033] The linking structure 23/24 preferably includes, as shown, a first arm 23 extending from the middle portion of the cross-member 27/28 to an end 21a of the first side frame member 21 and a second arm 24 extending from the middle portion of the cross-member 27/28 to an end 22a of the second side frame member 22. In the illustrated embodiment, end sections 23a, 24a of the first and second arms 23, 24 are further designed to act as supports for the front caster wheel assemblies 4/40. Furthermore, the aforementioned foot rest member 65 carrying the foot rest 60 is also connected to a lower portion of the end sections 23a, 24a.

[0034] In accordance with the first embodiment shown in Figures 1A-G, 2A-F and 3A-F, one may appreciate that each one of the first and second side frame members 21, 22 exhibits an L-shaped profile (when seen from the side) with a rearward section extending mainly horizontally from the first end, respectively second end, of the cross-member 27/28 and a forward section extending mainly vertically from the foot portion 6. Furthermore, the linking structure 23/24 extends obliquely from the middle portion of the cross-member 27/28 to the foot portion 6. This leads to a structurally very robust wheelchair frame configuration, the linking structure 23/24 ensuring proper distribution and transfer of the load.

[0035] Turning to the central support structure 25/250/500, which constitutes another aspect of the invention, this structure comprises the aforementioned central support member 25 that is secured to the middle portion of the cross-member 27/28 (and that preferably forms an integral part with the cross-member 27/28), and a seat post 250 secured to the seat structure 50 and mounted onto the central support member 25. The central support structure 25/250/500 preferably further comprises a seat base 500 that is secured to an upper portion of the seat post 250 and to an underside of the seat of the seat structure 50 (see also Figures 6B-F where the seat base 500 is shown located on the underside of the seat 50b of the seat structure 50*). As this will become apparent from reading further the following description, the seat post 250 advantageously includes a shoulder portion 250b providing support for load transfer to the central support member 25 (see especially Figures 4C,

4D and 5)

[0036] In accordance with a particularly preferred embodiment of the invention, which will be described with reference to Figures 3A-F, 4A-E and 5, the central support structure 25/250/500 includes a clamping mechanism 510 designed to selectively clamp the seat post 250 onto the central support member 25, and a spacer 520 interposed between the central support member 25 and the seat post 250. The spacer 520 may in particular be disposed so as to come in abutment against the aforementioned shoulder portion 250b of the seat post 250.

[0037] Figures 4A to 4E are partial cutaway views of the central support structure 25/250/500 of the wheelchair of Figures 1A-G, and Figure 5 is a cutaway view of the seat post 250 forming part of the central support structure 25/250/500. The seat post 250 is shown in Figures 4A-E and 5 with a portion thereof removed for the purpose of illustration. It should however be understood that the seat post 250 actually exhibits a circularly-closed configuration.

[0038] As shown in greater detail in Figures 4A to 4E, the central support member 25 preferably comprises a mounting hole 25A (see also Figures 3A-E) dimensioned to receive an engaging section 250a of the seat post 250 (see also Figure 5). In the context of this embodiment, the clamping mechanism 510 includes a clamping collar 515 encircling a portion of an upper section 25a of the central support member 25 and a corresponding portion of the engaging section 250a received inside the mounting hole 25A. Furthermore, and with a view to allow elastic deformation of the upper section 25a under the action of the clamping collar 515, the upper section 25a of the central support member 25 is provided with at least one, here two radial slits 25B (see Figures 3A-C and 3E). Moreover, the spacer 520 is here advantageously located around the upper section 25a of the central support member 25 and comes in abutment against the shoulder portion 250b of the seat post 250. In the illustrated example, the spacer 520 further bears against another shoulder portion formed by the clamping collar 515 itself, which in turn transfers the load to a corresponding shoulder portion of the central support member 25.

[0039] By way of preference, the wheelchair frame of the invention is made, at least in part, of composite materials, especially composite materials containing graphene. This being said, other materials could be contemplated, especially lightweight material like aluminium, magnesium, titanium, or alloys thereof.

[0040] Various modifications and/or improvements may be made to the above-described embodiments without departing from the scope of the invention as defined by the annexed claims. For instance, while the aforementioned central support structure configuration was disclosed in the context of a wheelchair as shown in Figures 1A-G, this configuration could be applied to other wheelchair configurations, including but not limited to a wheelchair configuration as shown for instance in Figures 7 and 8 where no linking structure is provided. Indeed, Fig-

ures 7 and 8 show another possible embodiment of a wheelchair 1* in accordance with the second aspect of the invention, which wheelchair 1* essentially comprises a seat portion 5*, including a seat structure 50* (as for instance shown in Figures 6A-F), a foot portion 6* with a foot rest 60, a pair of rear wheels 3, a wheelchair frame 2* extending between the seat portion 5* and the foot portion 6*, and a pair of front caster wheels 4 that are each supported onto the wheelchair frame 2*. In contrast to the embodiment shown in Figures 1A-G, the wheelchair frame 2* essentially consists of a cross-member 27*/28* and two side frame members 21*, 22* similar to the cross-member 27/28 and side frame members 21, 22, except that no linking structure 23/24 is provided. In this other embodiment, the two side frame members 21*, 22* are joined at the foot portion 6*, and could be made of a single piece. Other than that, the cross-member 27*/28* may likewise support a central support structure 25/250/500 as discussed above to support the seat structure 50*.

[0041] In addition, while the central support structure 25/250/500 discussed above includes a central support member 25 comprising a mounting hole 25A dimensioned to receive an engaging section 250a of the seat post 250, the structure could be reversed, with the seat post comprising a mounting hole dimensioned to receive an engaging section rising up from the central support member.

LIST OF REFERENCE NUMERALS AND SIGNS USED THEREIN

[0042]

35	1	wheelchair (first embodiment)
	1*	wheelchair (second embodiment)
	2	wheelchair frame of wheelchair 1
	2*	wheelchair frame of wheelchair 1*
	3	rear wheels of wheelchair 1, 1*
40	4	front caster wheels of wheelchair 1, 1*
	5	seat portion of wheelchair 1
	5*	seat portion of wheelchair 1*
	6	foot portion of wheelchair 1
	6*	foot portion of wheelchair 1*
45	21	(first) side frame member of wheelchair frame 2 (right-hand side)
	21a	end of side frame member 21 at foot portion 6
	21b	end of side frame member 21 coupled to outer end of cross-member element 27
50	22	(second) side frame member of wheelchair frame 2 (left-hand side)
	22a	end of side frame member 22 at foot portion 6
	22b	end of side frame member 22 coupled to outer end of cross-member element 28
55	23	(first) arm of wheelchair frame 2 (right-hand side of linking structure 23/24)
	23a	end of arm 23 coupled to end 21a of side frame member 21 (also acts as support for front caster

	wheel assembly 4/40)				
24	(second) arm of wheelchair frame 2 (left-hand side of linking structure 23/24)				- a cross-member (27/28) having first and second ends coupled to the wheels (3) ;
24a	end of arm 24 coupled to end 22a of side frame member 22 (also acts as support for front caster wheel assembly 4/40)	5			- first and second side frame members (21, 22) extending on each side of the wheelchair frame (2) from the first end, respectively second end, of the cross-member (27/28) to the foot portion (6) ; and
25	central support member (part of central support structure 25/250/500)				- a central support structure (25/250/500) located on a middle portion of the cross-member (27/28), which central support structure (25/250/500) supports the seat structure (50; 50*),
25a	upper section of central support member 25				
25A	mounting hole dimensioned to receive engaging section 250a of seat post 250	10			
25B	radial slits formed in upper section 25a of central support member 25				
27	cross-member element of wheelchair frame 2 (right-hand side of cross-member 27/28)	15			characterized in that the wheelchair frame (2) further comprises a linking structure (23/24) extending from the middle portion of the cross-member (27/28) to each one the first and second side frame members (21, 22), at the foot portion (6).
28	cross-member element of wheelchair frame 2 (left-hand side of cross-member 27/28)				
21*	(first) side frame member of wheelchair frame 2* (right-hand side)				
22*	(second) side frame member of wheelchair frame 2* (left-hand side)	20			2. The wheelchair (1) according to claim 1, wherein the linking structure (23/24) includes a first arm (23) extending from the middle portion of the cross-member (27/28) to an end (21a) of the first side frame member (21) and a second arm (24) extending from the middle portion of the cross-member (27/28) to an end (22a) of the second side frame member (22).
27*	cross-member element of wheelchair frame 2* (right-hand side of cross-member 27*/28*)				
28*	cross-member element of wheelchair frame 2* (left-hand side of cross-member 27*/28*)	25			
40	fork element carrying front caster wheel 4				
50	seat structure				
50*	seat structure				3. The wheelchair (1) according to claim 1 or 2, wherein each one of the first and second side frame members (21, 22) exhibits an L-shaped profile with a rearward section extending mainly horizontally from the first end, respectively second end, of the cross-member (27/28) and a forward section extending mainly vertically from the foot portion (6), and wherein the linking structure (23/24) extends obliquely from the middle portion of the cross-member (27/28) to the foot portion (6).
50a	backrest of seat structure 50, 50*				
50b	seat of seat structure 50, 50*	30			
50c	clothing/mud guard				
51	wheelchair push handles				
60	foot rest				
65	foot rest member				
250	seat post (part of central support structure 25/250/500)	35			
250a	engaging section of seat post 250				
250b	shoulder portion of seat post 250				
500	seat base secured to upper portion of seat post 250 and to underside of seat 50b of seat structure 50, 50*	40			4. The wheelchair (1) according to any one of the preceding claims, wherein the linking structure (23/24) further bears a pair of caster wheels (4) located in a vicinity of the foot portion (6).
510	clamping mechanism				
515	clamping collar				
520	spacer	45			5. The wheelchair (1) according to any one of the preceding claims, wherein the cross-member (27/28) and linking structure (23/24) together form an X-shaped frame assembly.

Claims

1. A wheelchair (1) comprising :

- a seat portion (5), including a seat structure (50; 50*) ;
- a foot portion (6) ;
- a pair of wheels (3); and
- a wheelchair frame (2) extending between the seat portion (5) and the foot portion (6),

wherein the wheelchair frame (2) comprises :

- 6.** The wheelchair (1) according to any one of the preceding claims, wherein the central support structure (25/250/500) comprises a central support member (25) secured to the middle portion of the cross-member (27/28), and preferably forming an integral part with the cross-member (27/28), and a seat post (250) secured to the seat structure (50; 50*) and mounted onto the central support member (25).
- 7.** The wheelchair (1) according to claim 6, wherein the

seat post (250) includes a shoulder portion (250b) providing support for load transfer to the central support member (25).

8. A wheelchair (1; 1*) comprising :

- a seat portion (5; 5*), including a seat structure (50; 50*) ;
- a pair of wheels (3); and
- a wheelchair frame (2; 2*),

wherein the wheelchair frame (2; 2*) comprises :

- a cross-member (27/28; 27*/28*) having first and second ends coupled to the wheels (3) ; and
- a central support structure (25/250/500) located on a middle portion of the cross-member (27/28; 27*/28*), which central support structure (25/250/500) supports the seat structure (50; 50*),

characterized in that the central support structure (25/250/500) comprises a central support member (25) secured to the middle portion of the cross-member (27/28; 27*/28*) and a seat post (250) secured to the seat structure (50; 50*) and mounted onto the central support member (25),

and in that the seat post (250) includes a shoulder portion (250b) providing support for load transfer to the central support member (25).

9. The wheelchair (1) according to any one of claims 6 to 8, wherein the central support structure (25/250/500) includes a clamping mechanism (510) designed to selectively clamp the seat post (250) onto the central support member (25), and a spacer (520) interposed between the central support member (25) and the seat post (250).

10. The wheelchair (1; 1*) according to claim 9, wherein the central support member (25) comprises a mounting hole (25A) dimensioned to receive an engaging section (250a) of the seat post (250).

11. The wheelchair (1; 1*) according to claim 10, wherein the clamping mechanism (510) includes a clamping collar (515) encircling a portion of an upper section (25a) of the central support member (25) and a corresponding portion of the engaging section (250a) received inside the mounting hole (25A).

12. The wheelchair (1; 1*) according to claim 11, wherein the upper section (25a) of the central support member (25) comprises at least one radial slit (25B) allowing elastic deformation of the upper section (25a) under the action of the clamping collar (515).

13. The wheelchair (1; 1*) according to claim 7 and claim

11 or 12, wherein the spacer (520) is located around the upper section (25a) of the central support member (25) and comes in abutment against the shoulder portion (250b) of the seat post (250).

14. The wheelchair (1; 1*) according to any one of claims 6 to 13, wherein the central support structure (25/250/500) further comprises a seat base (500) secured to an upper portion of the seat post (250) and to an underside of a seat (50b) of the seat structure (50; 50*).

15. The wheelchair (1; 1*) according to any one of the preceding claims, wherein the wheelchair frame (2; 2*) is made, at least in part, of composite materials, especially composite materials containing graphene.

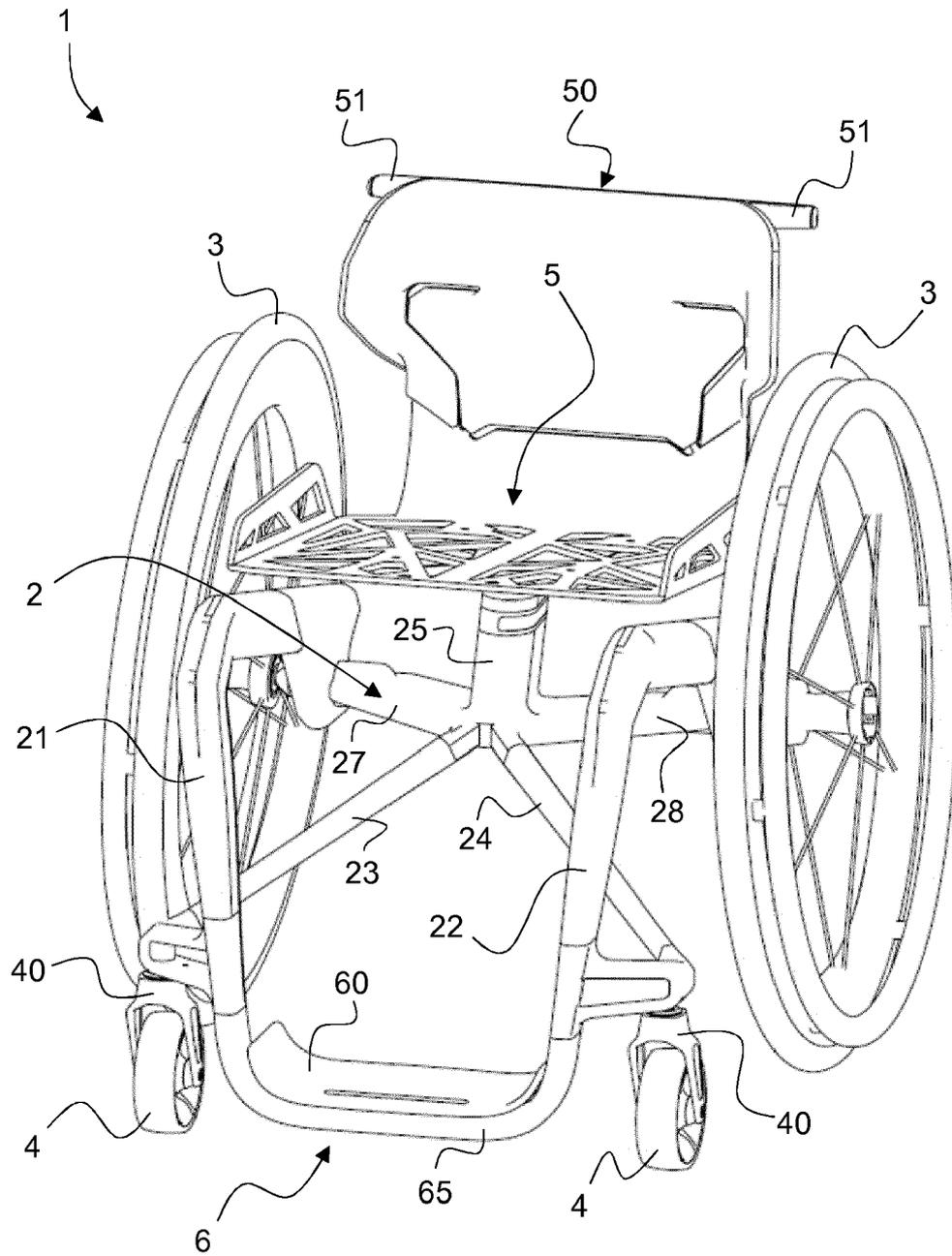


Fig. 1A

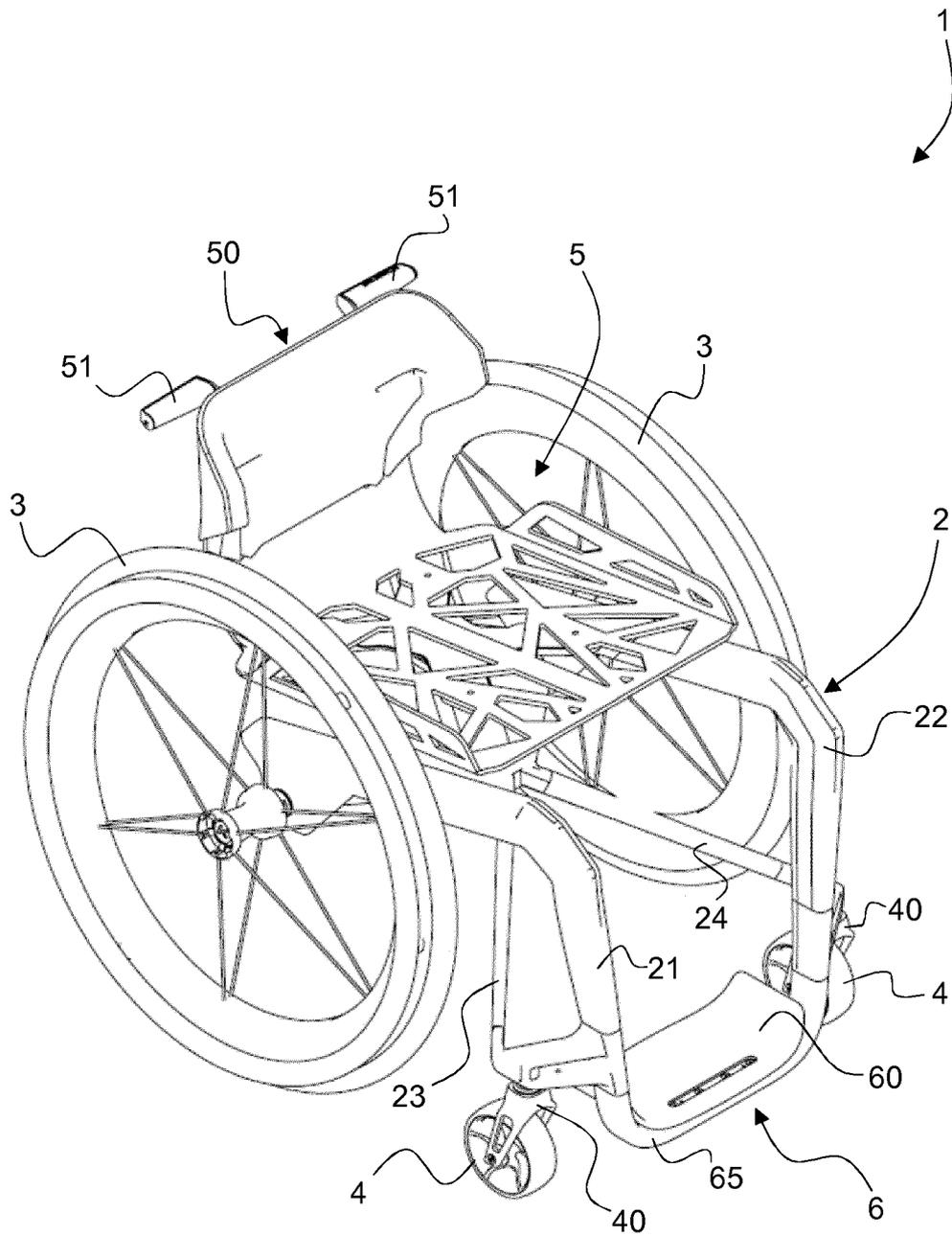


Fig. 1B

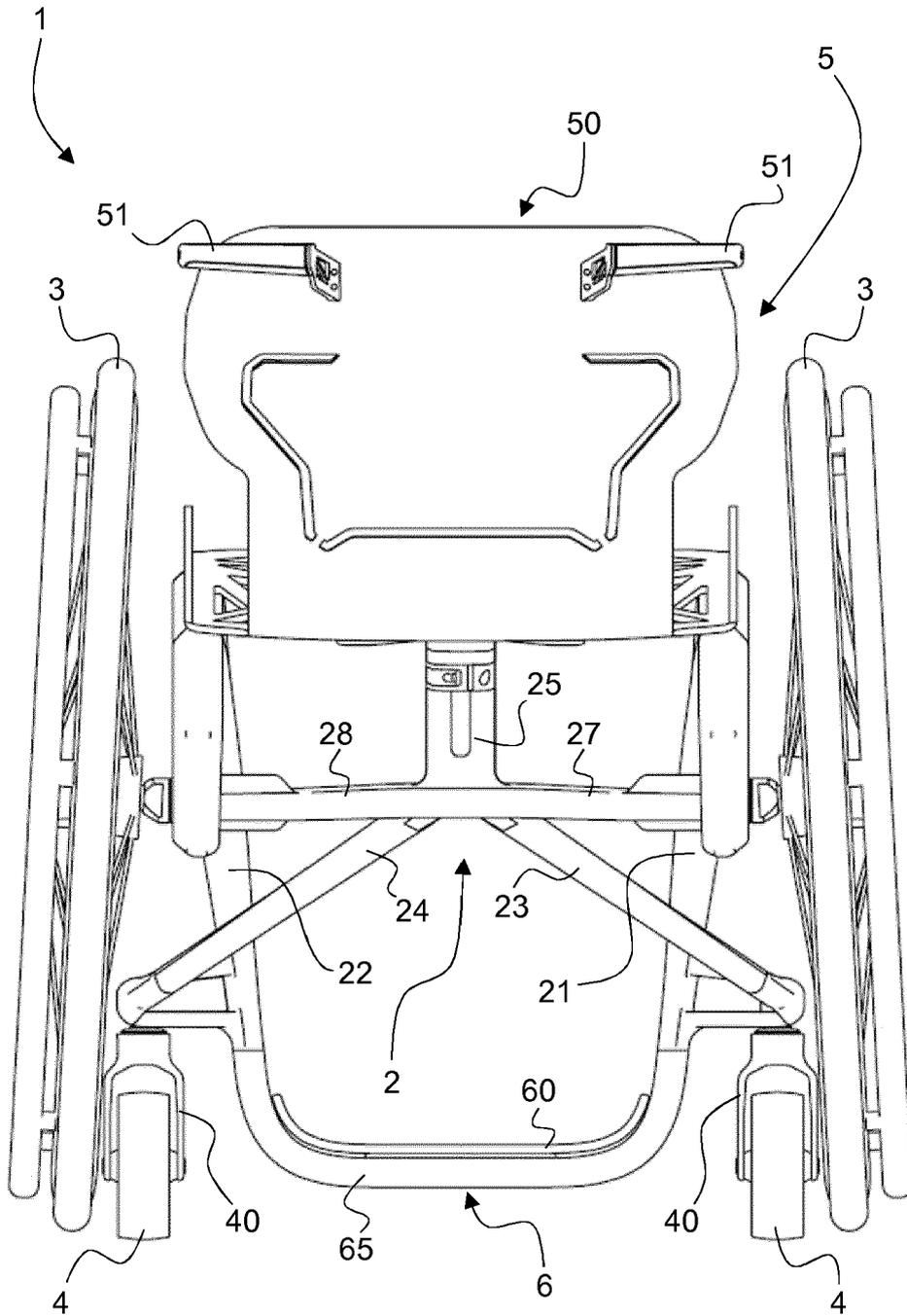


Fig. 1D

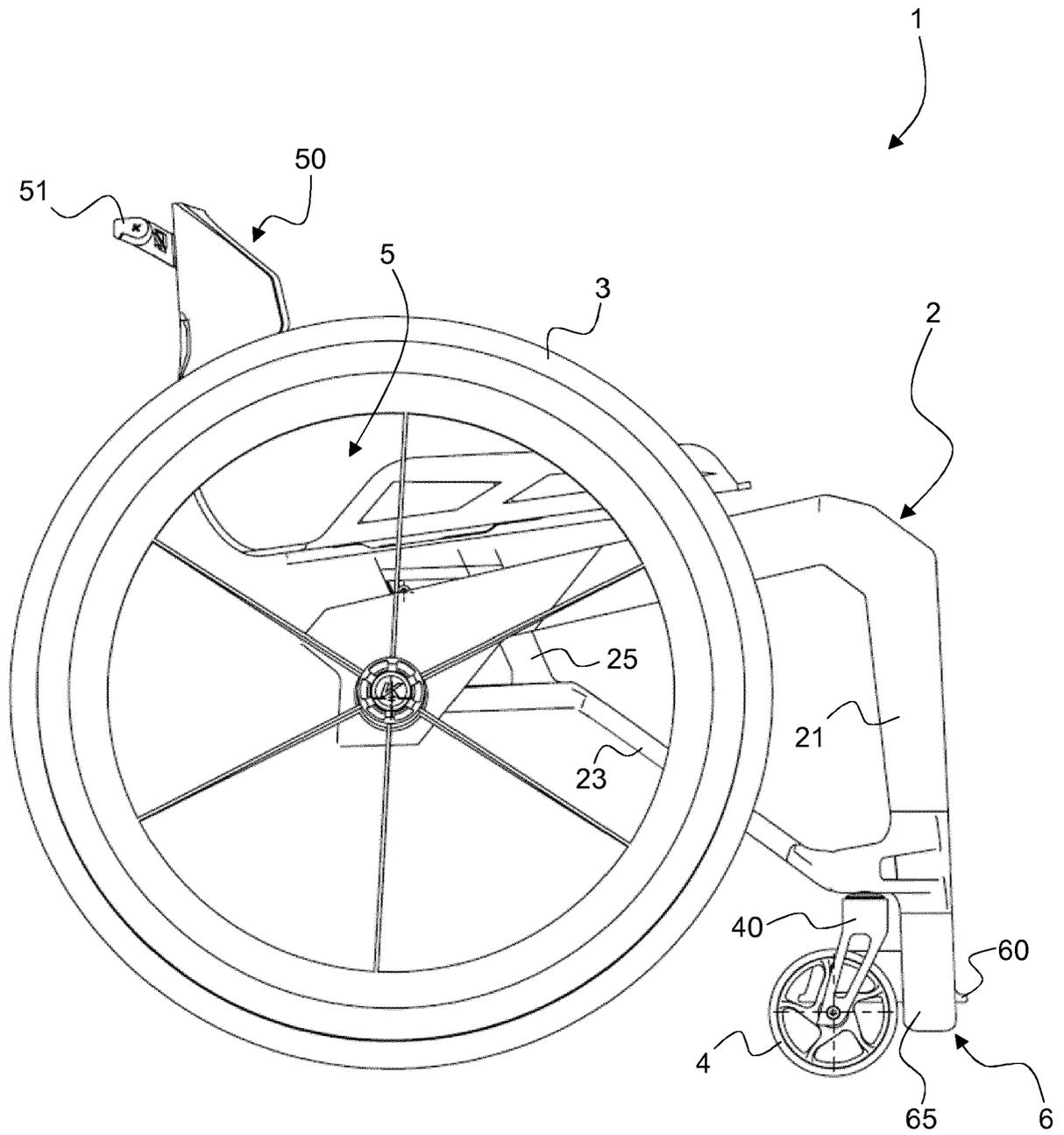
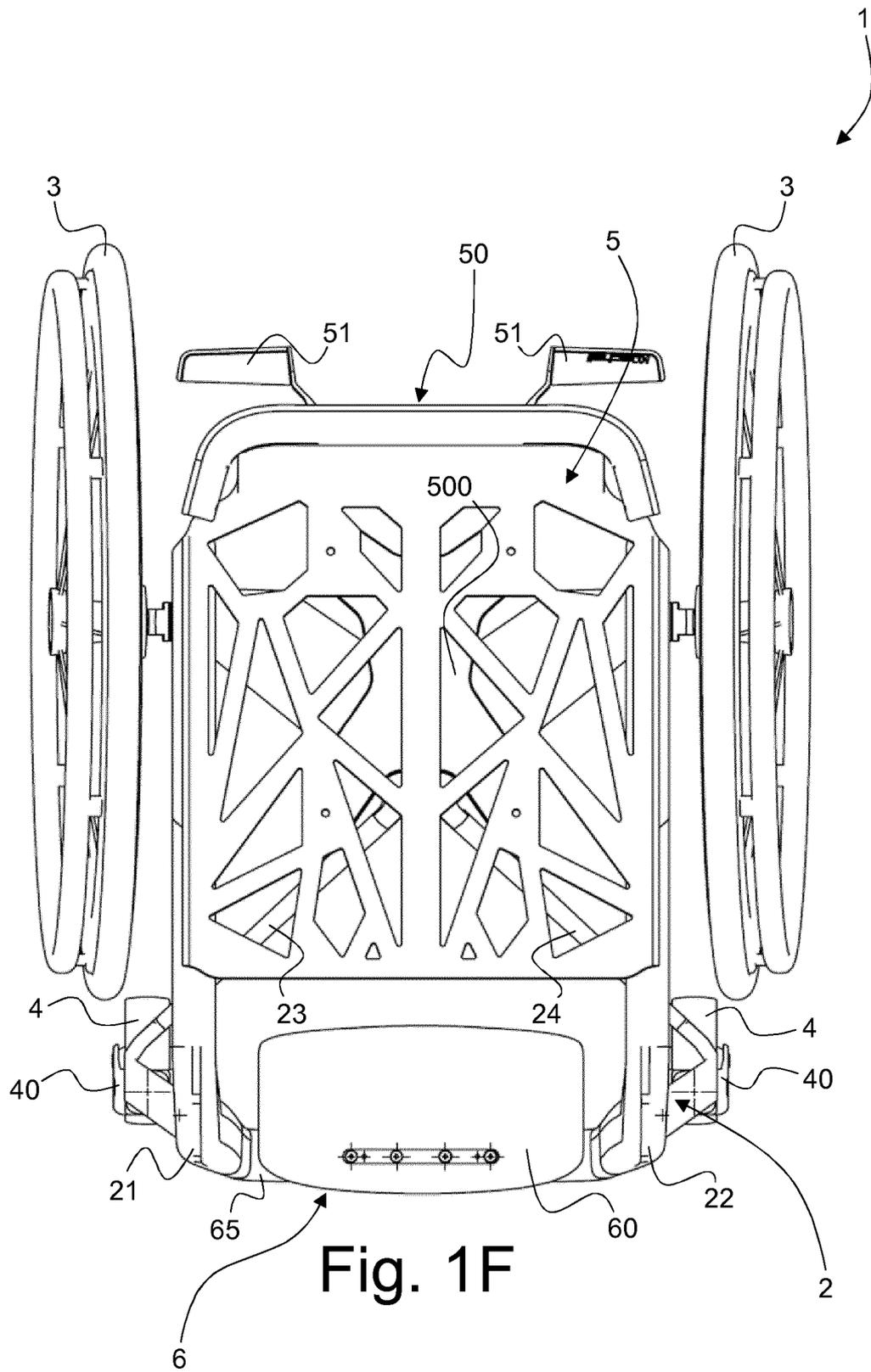


Fig. 1E



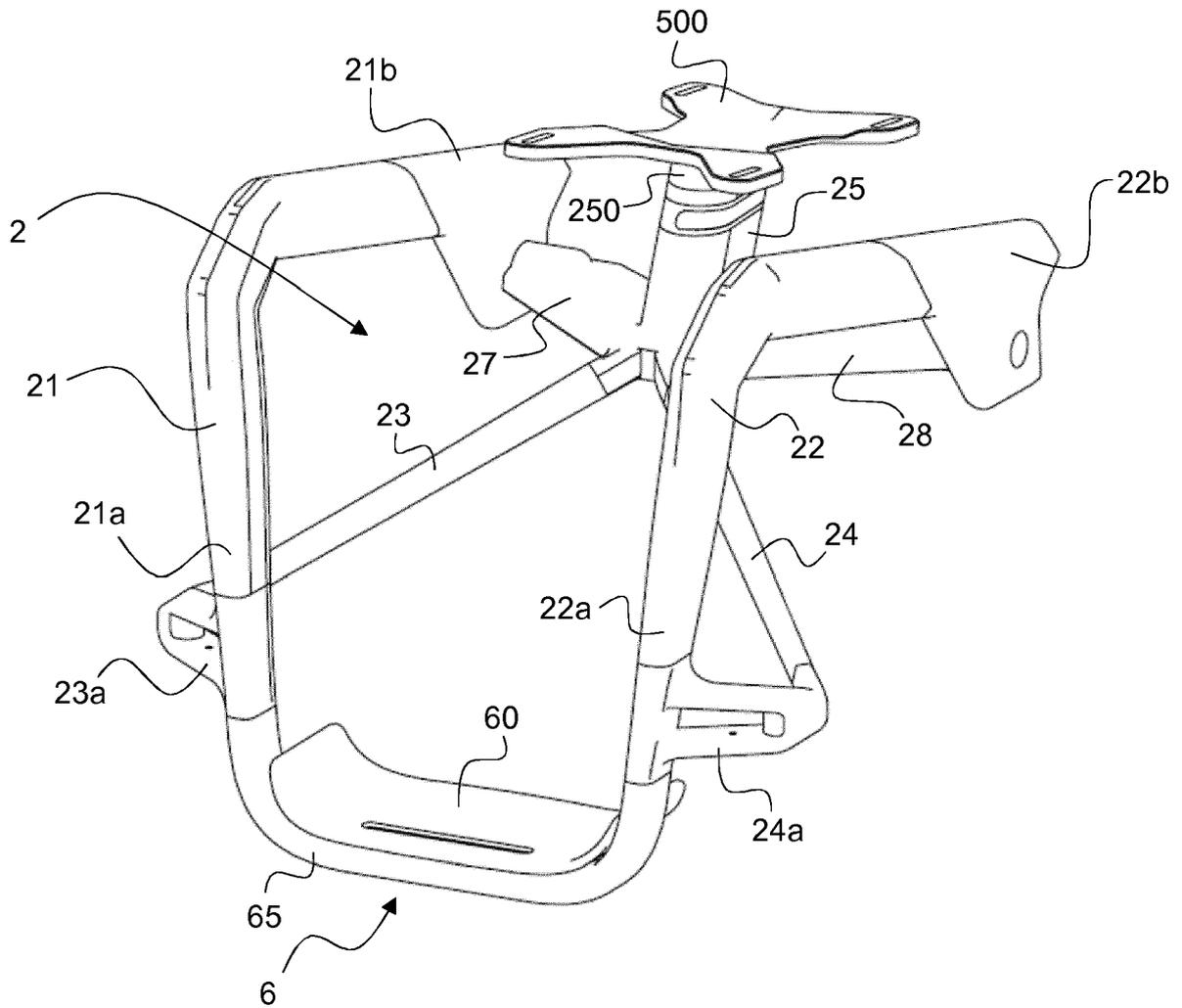


Fig. 2A

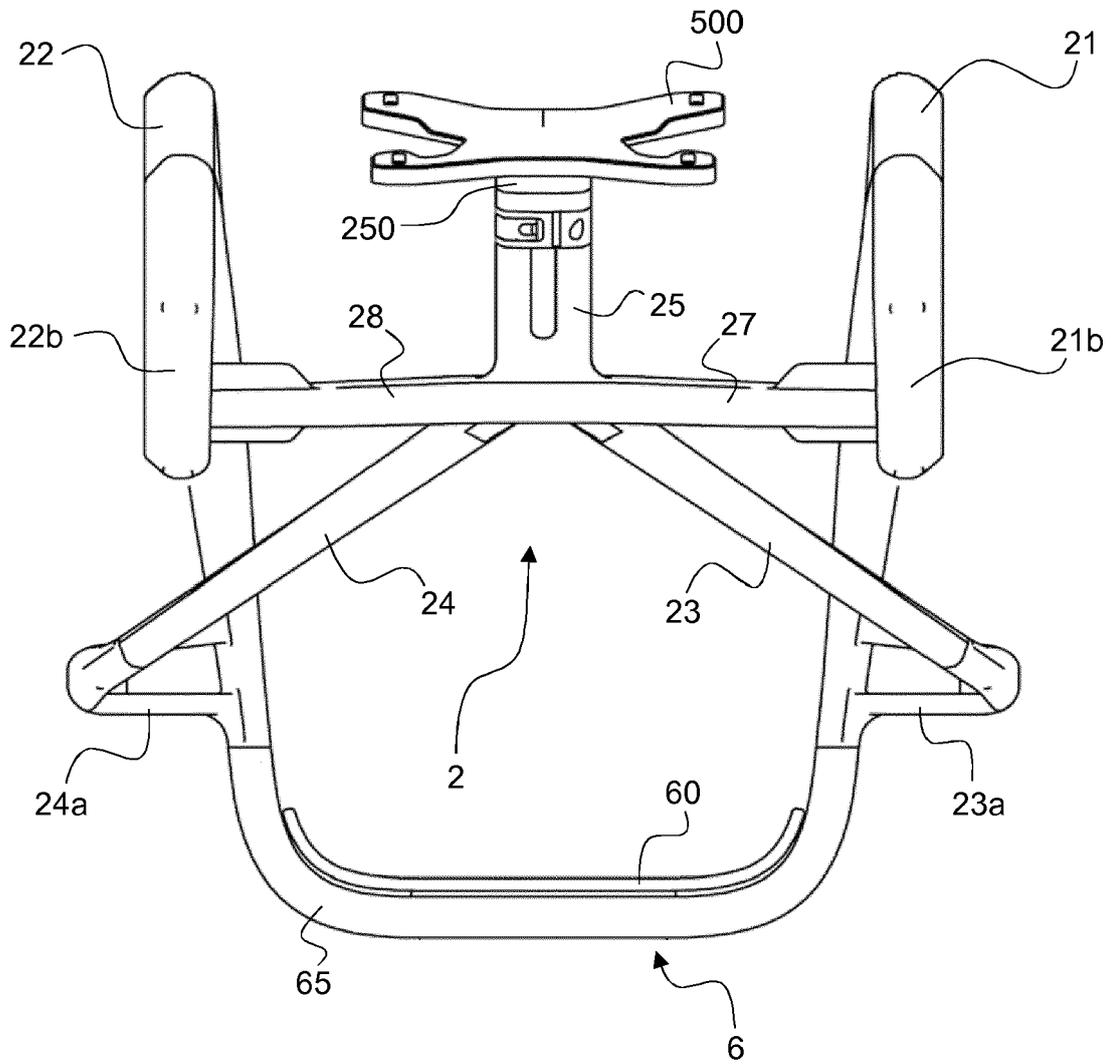


Fig. 2C

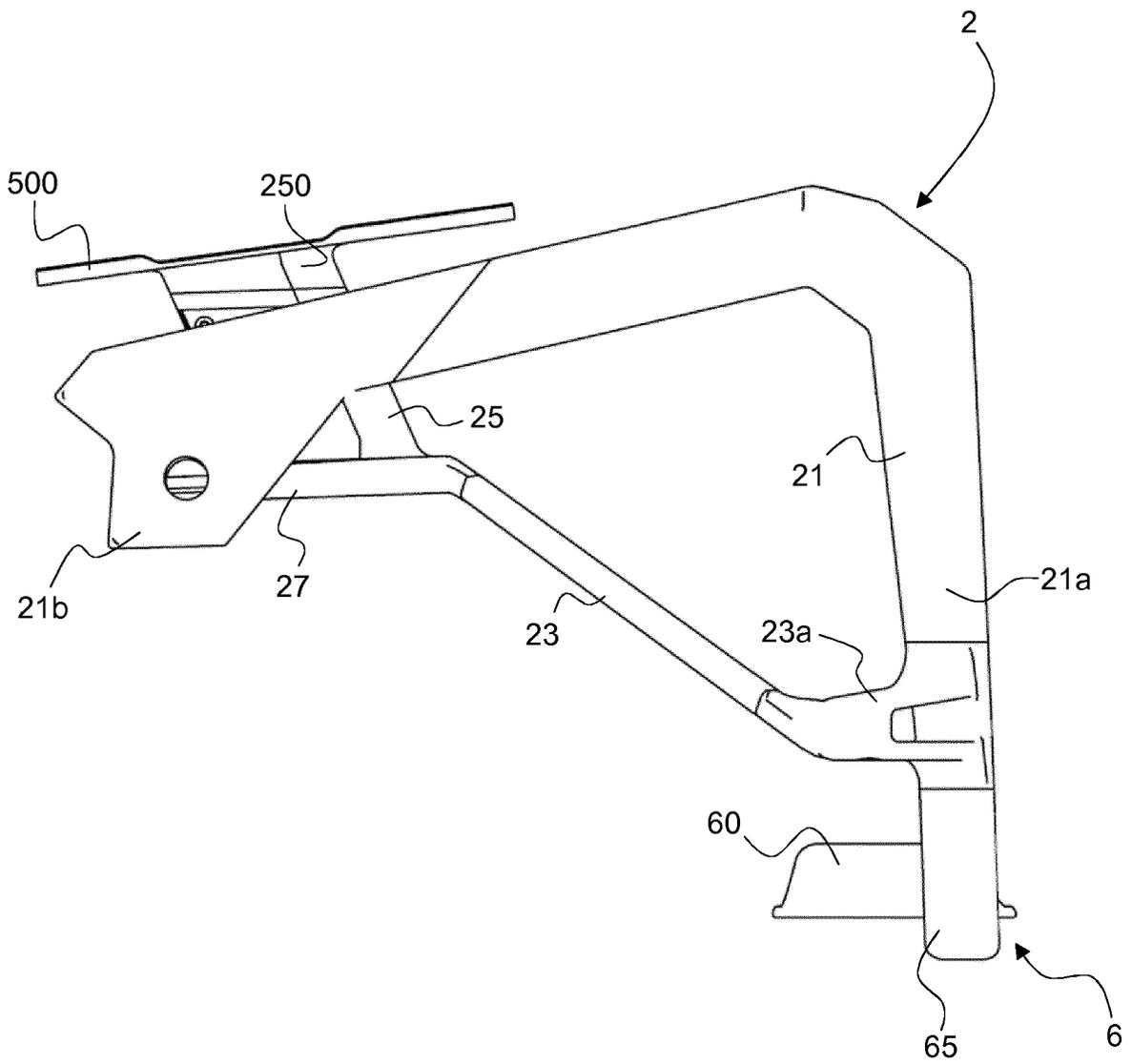
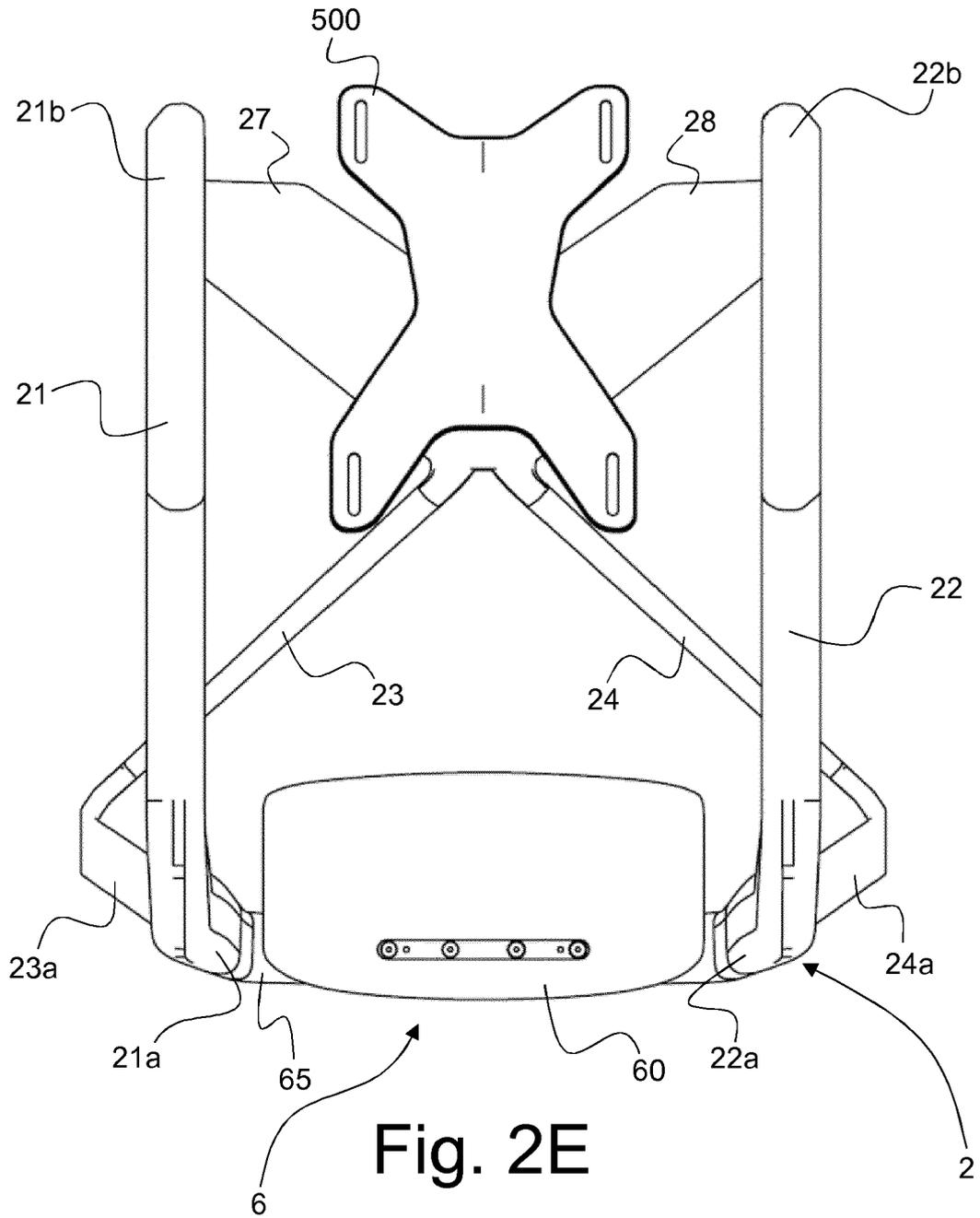
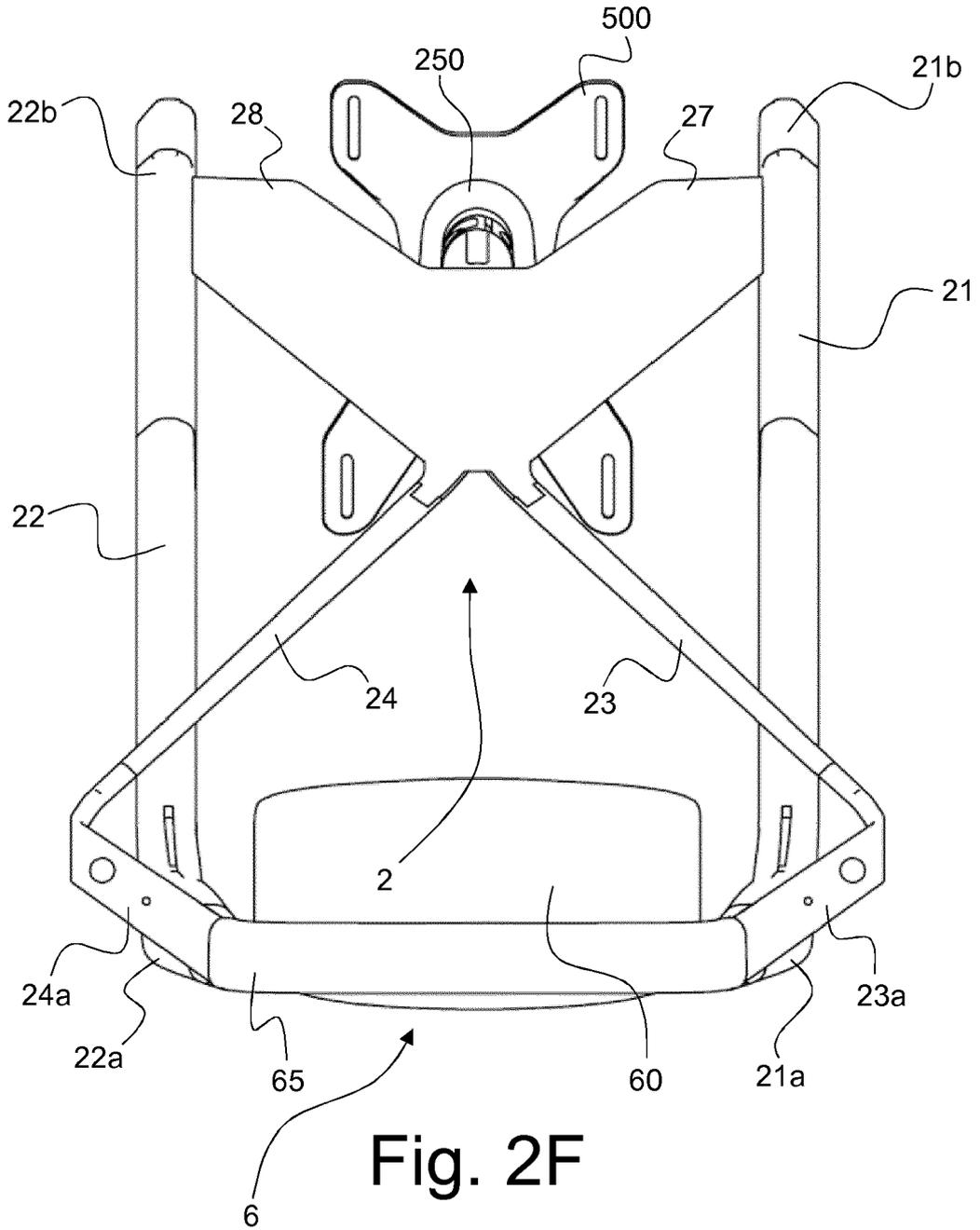


Fig. 2D





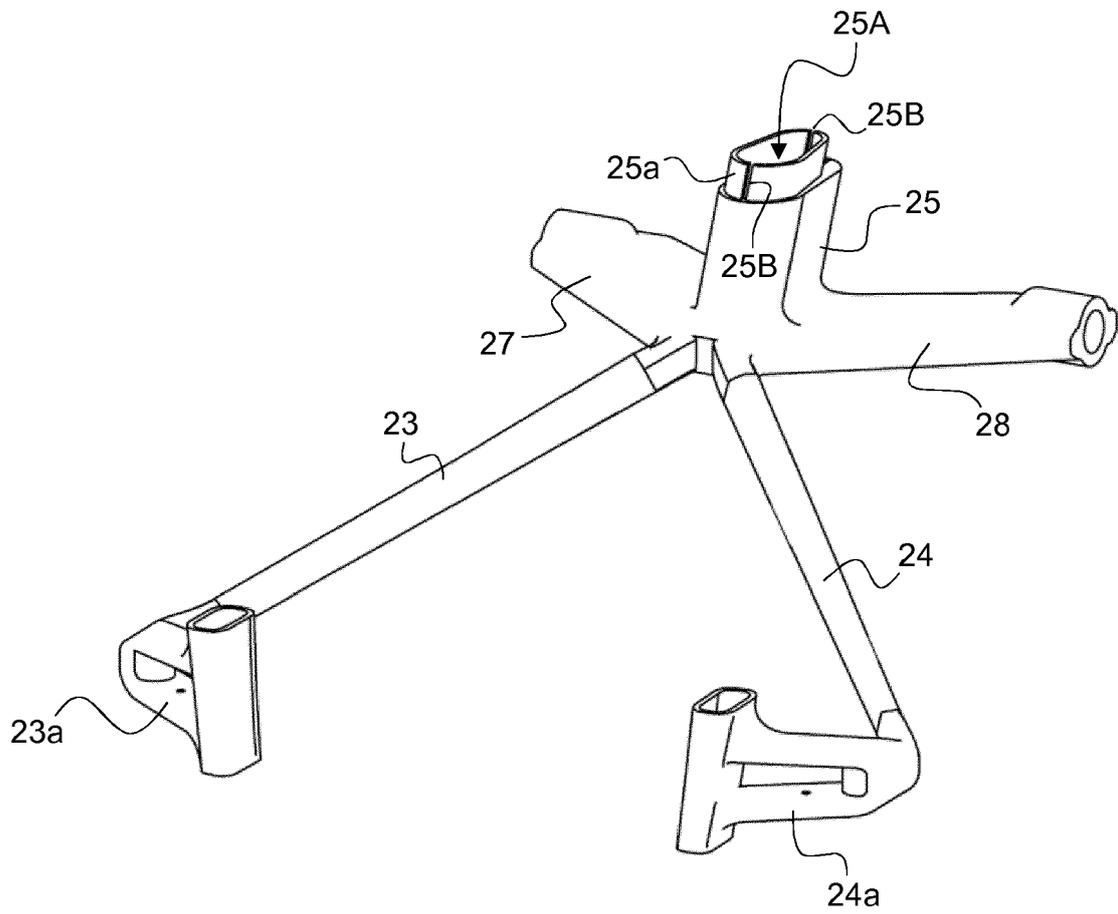


Fig. 3A

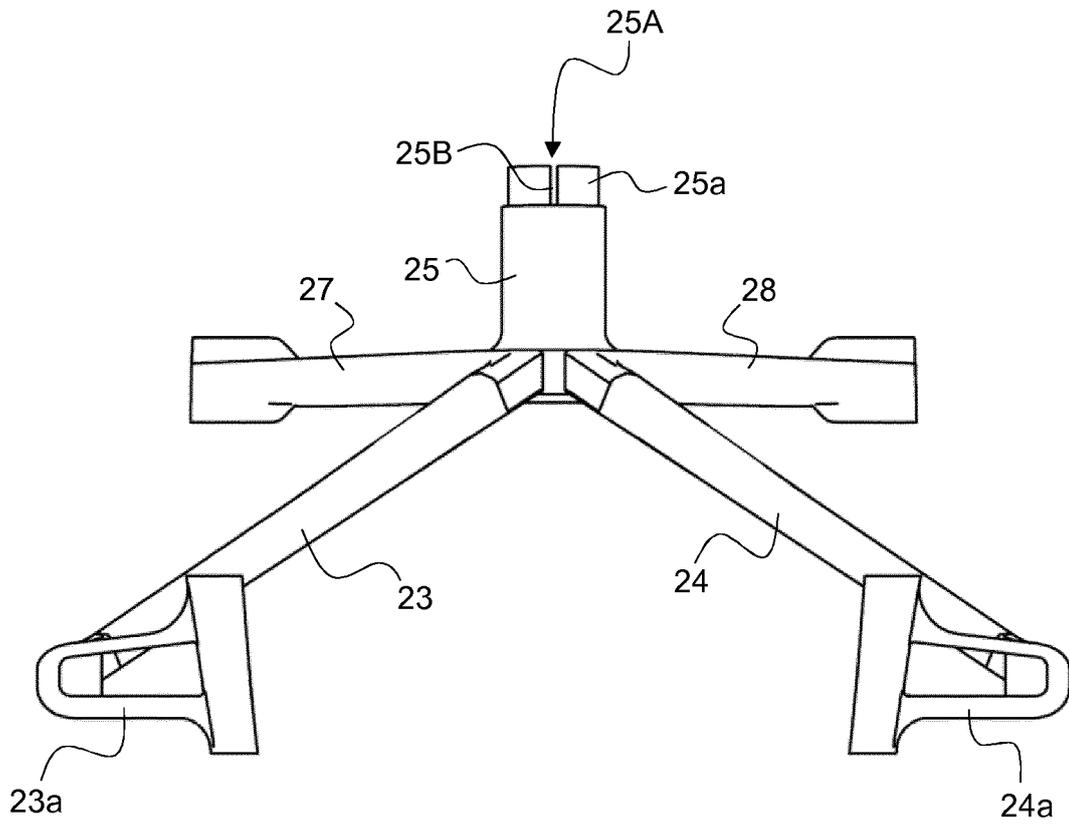


Fig. 3B

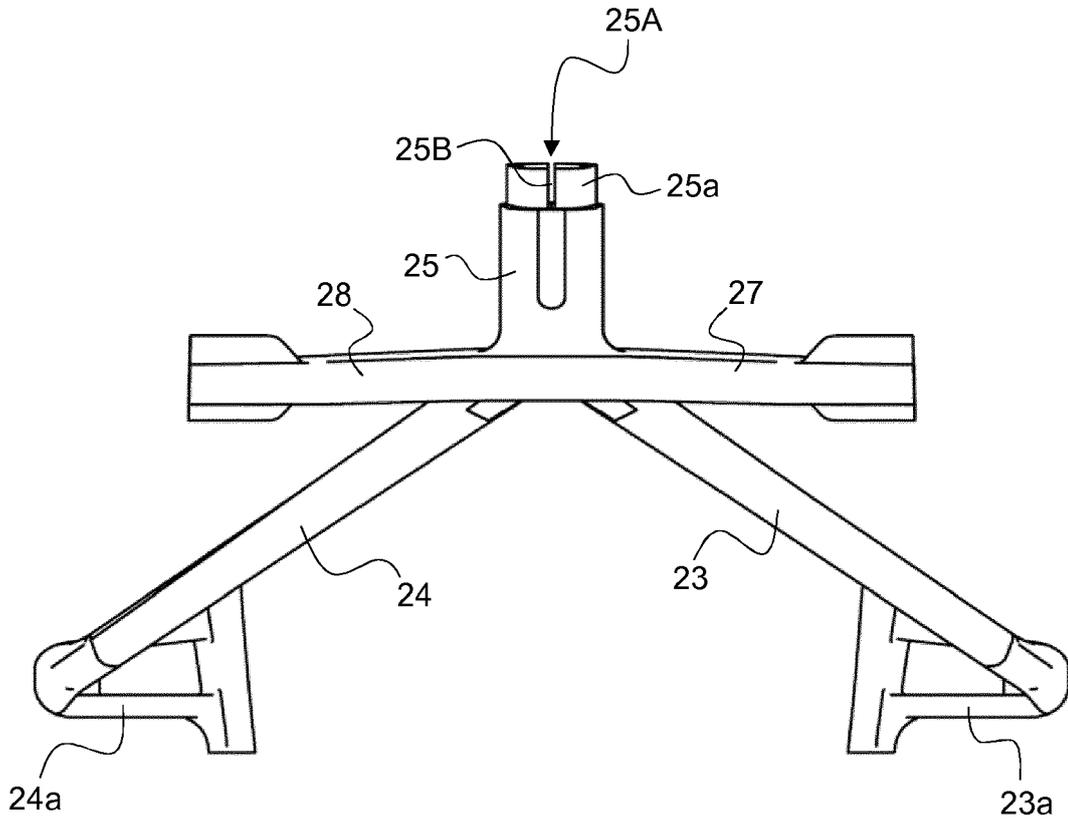


Fig. 3C

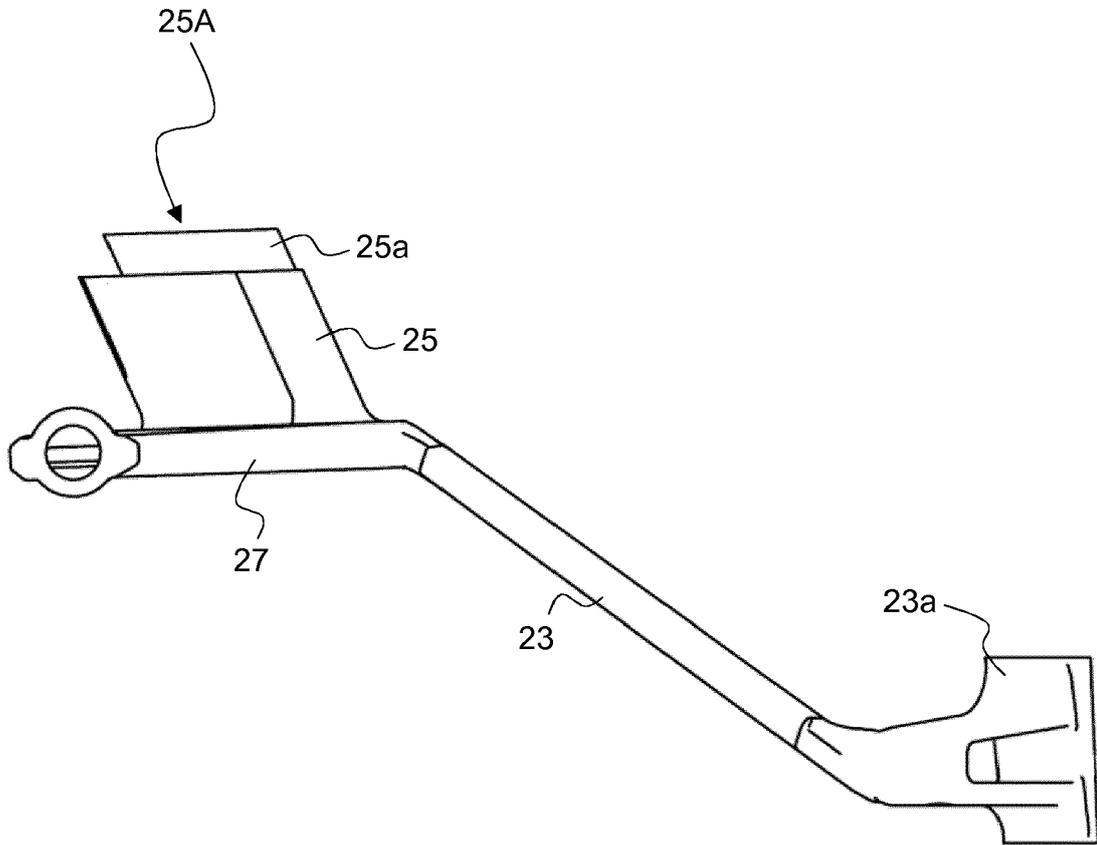


Fig. 3D

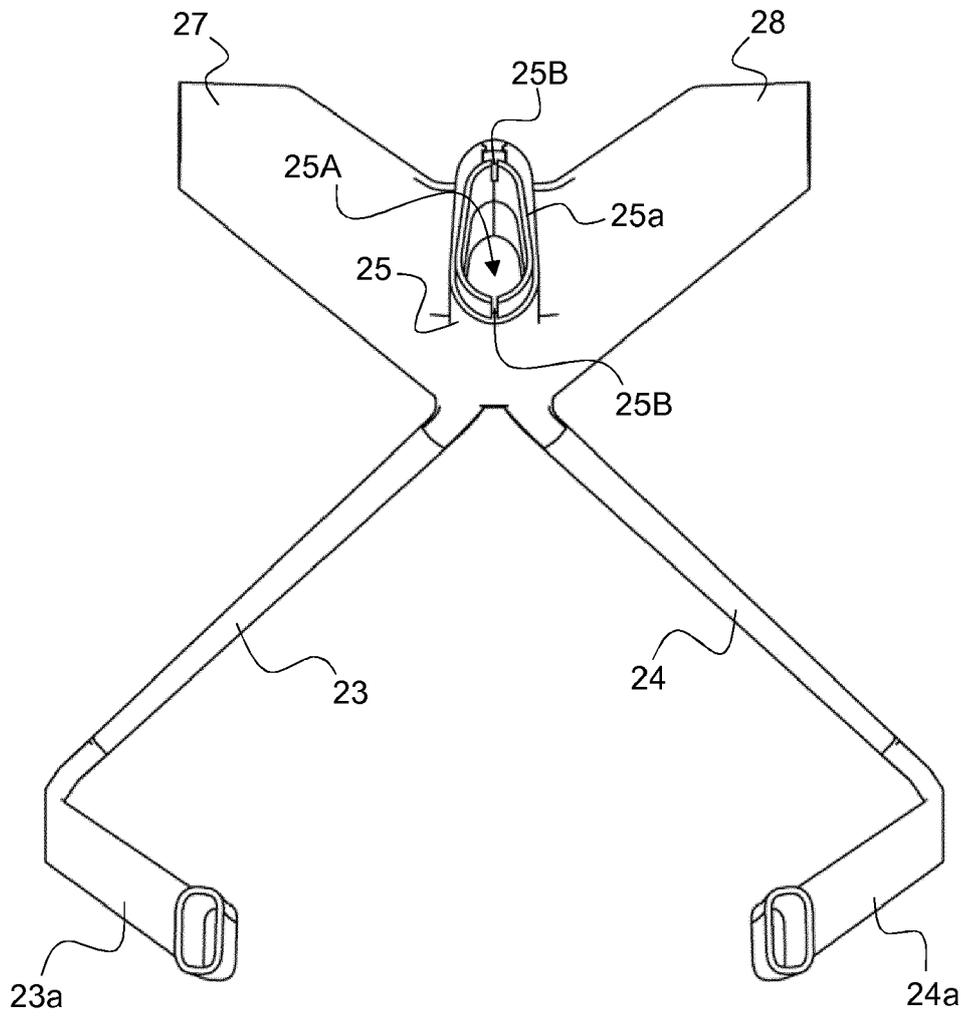


Fig. 3E

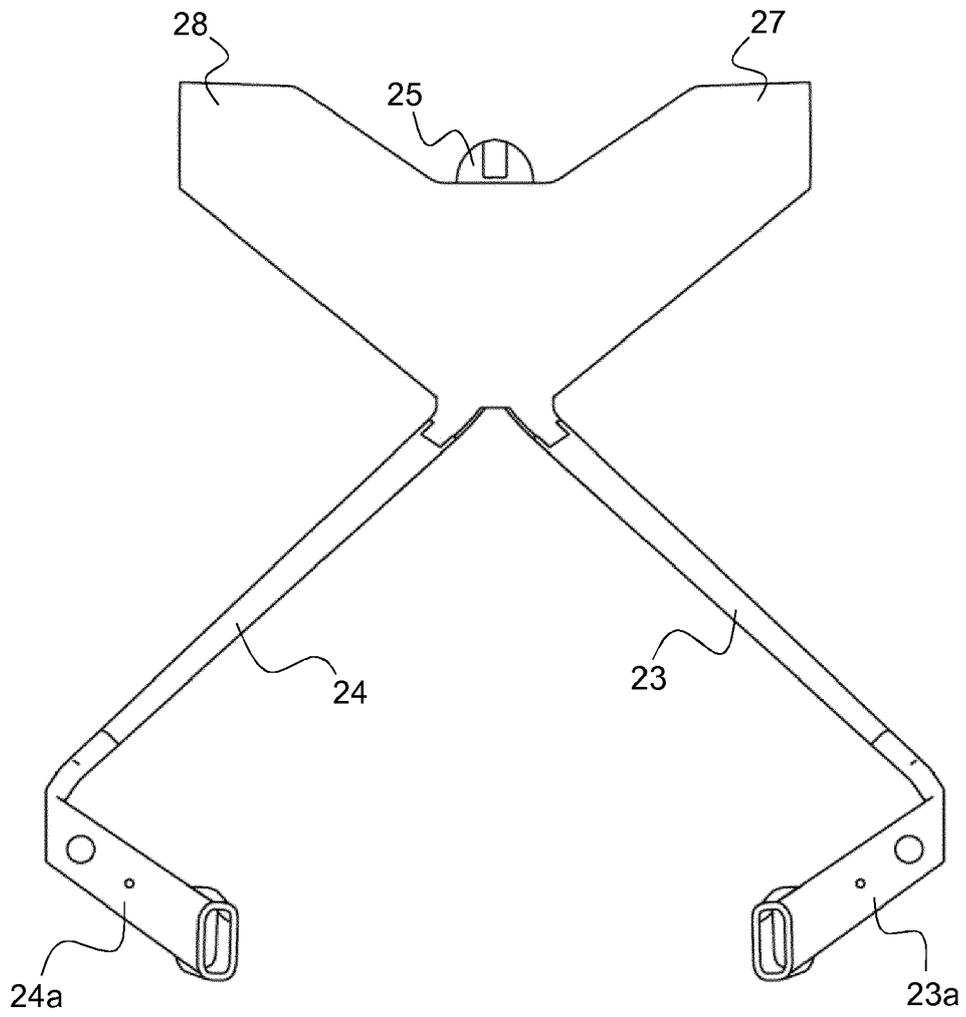


Fig. 3F

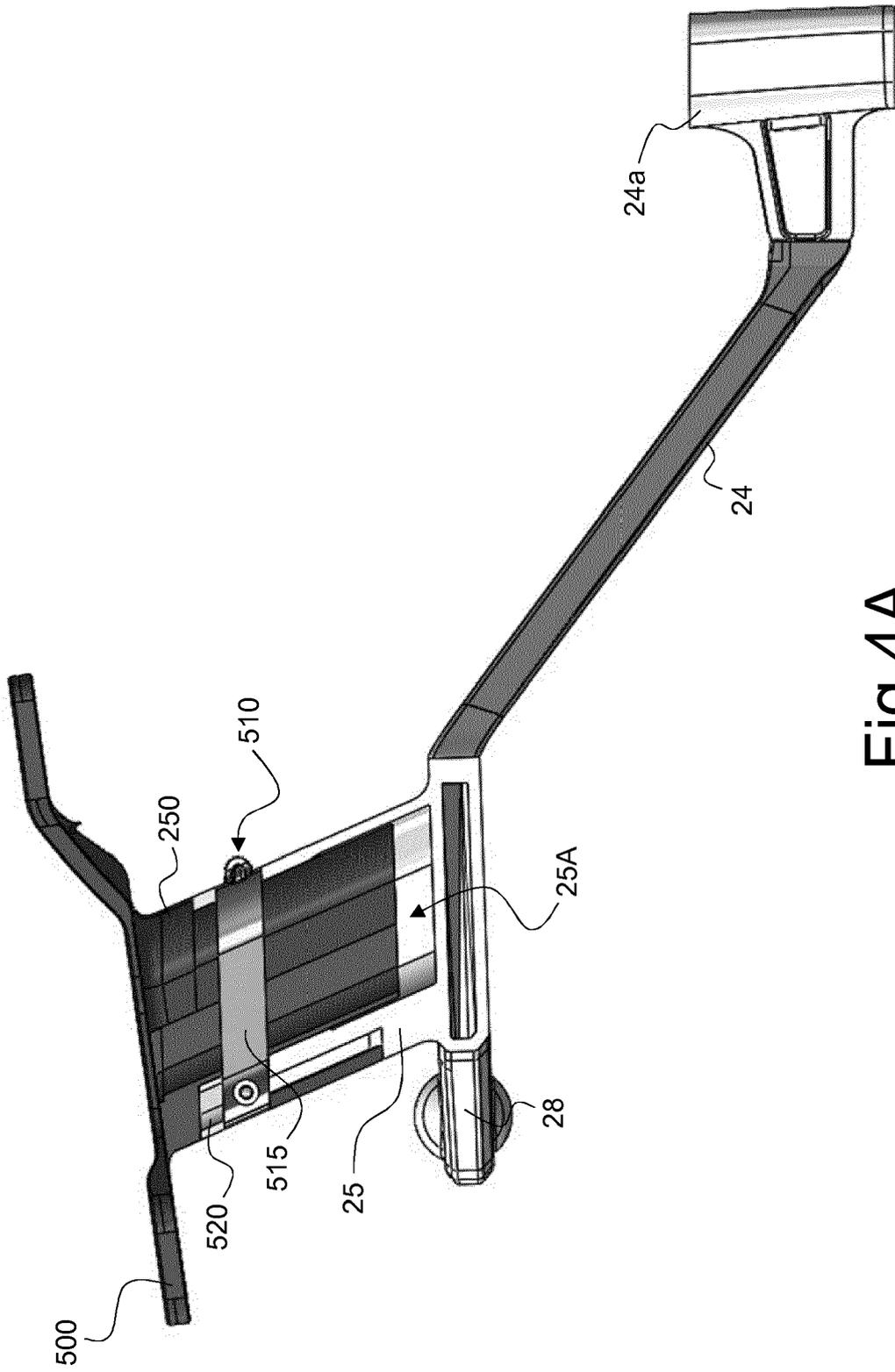


Fig.4A

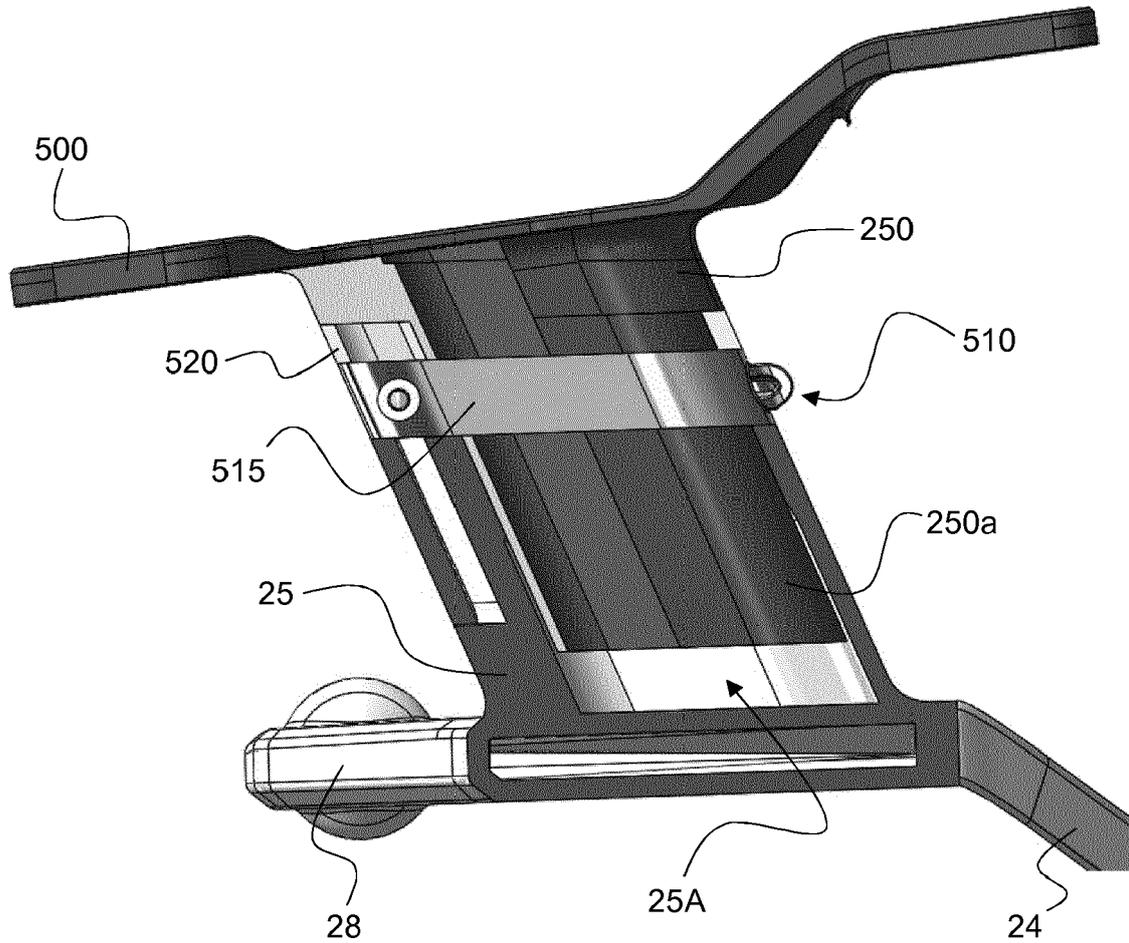


Fig. 4B

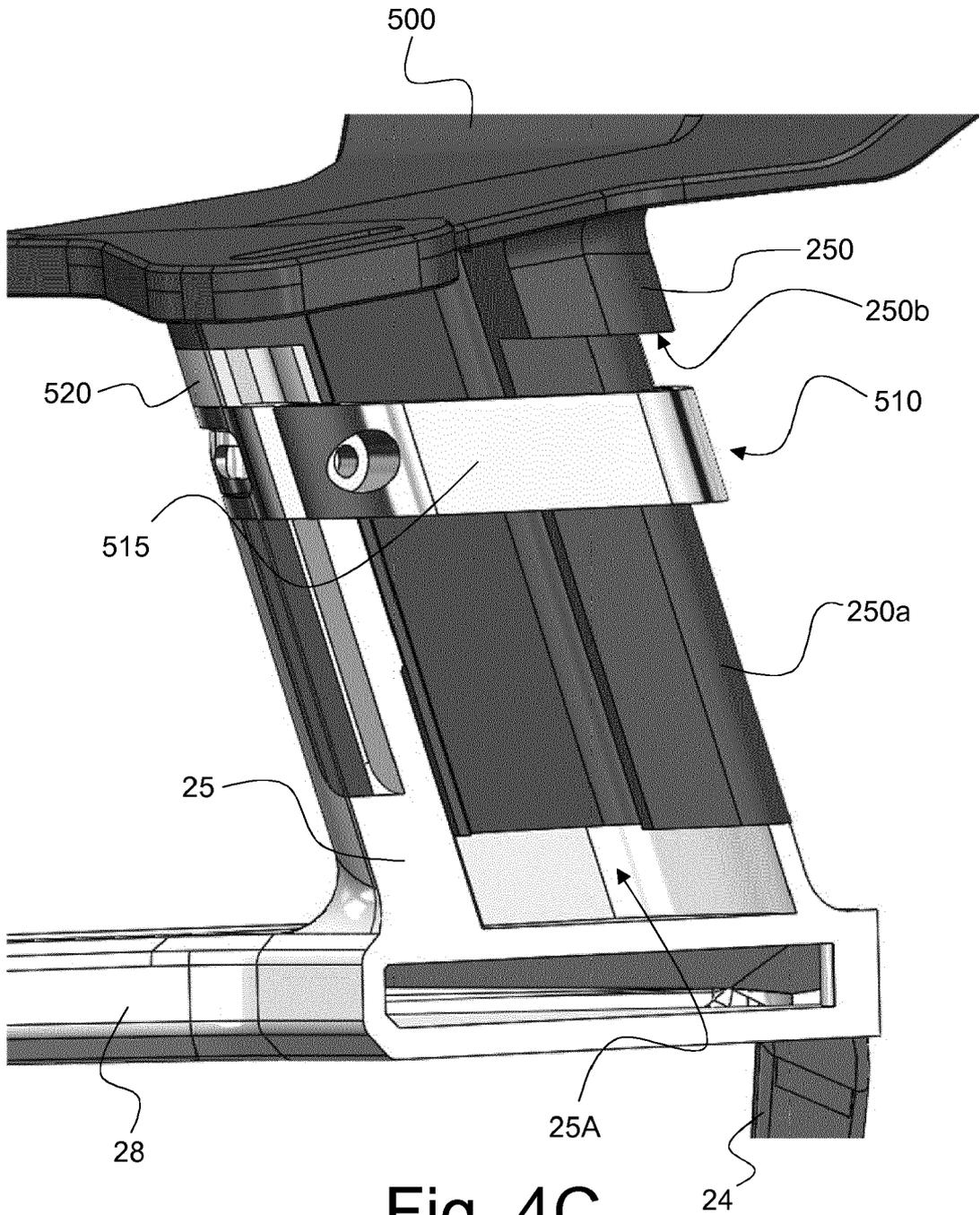


Fig. 4C

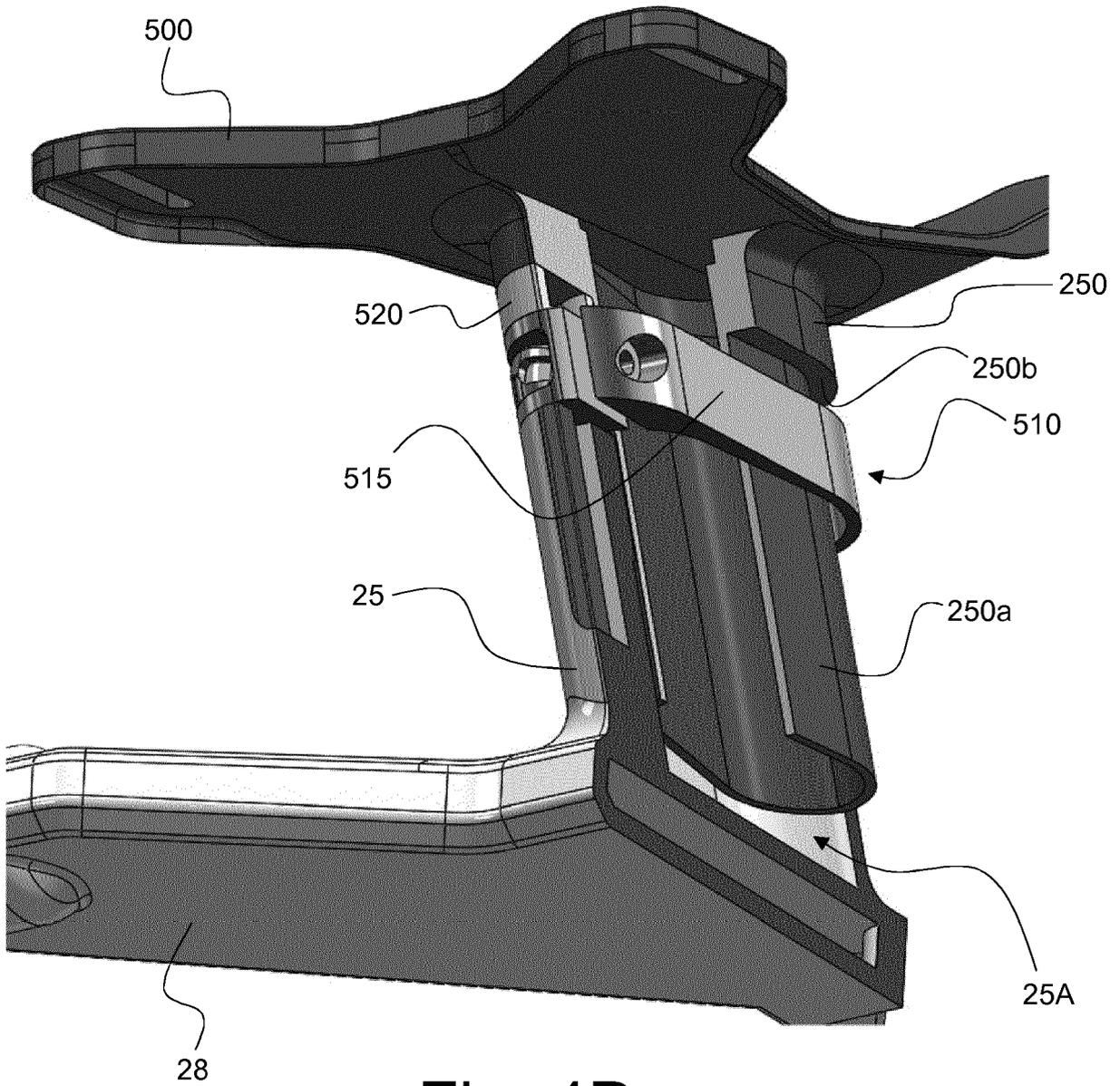


Fig. 4D

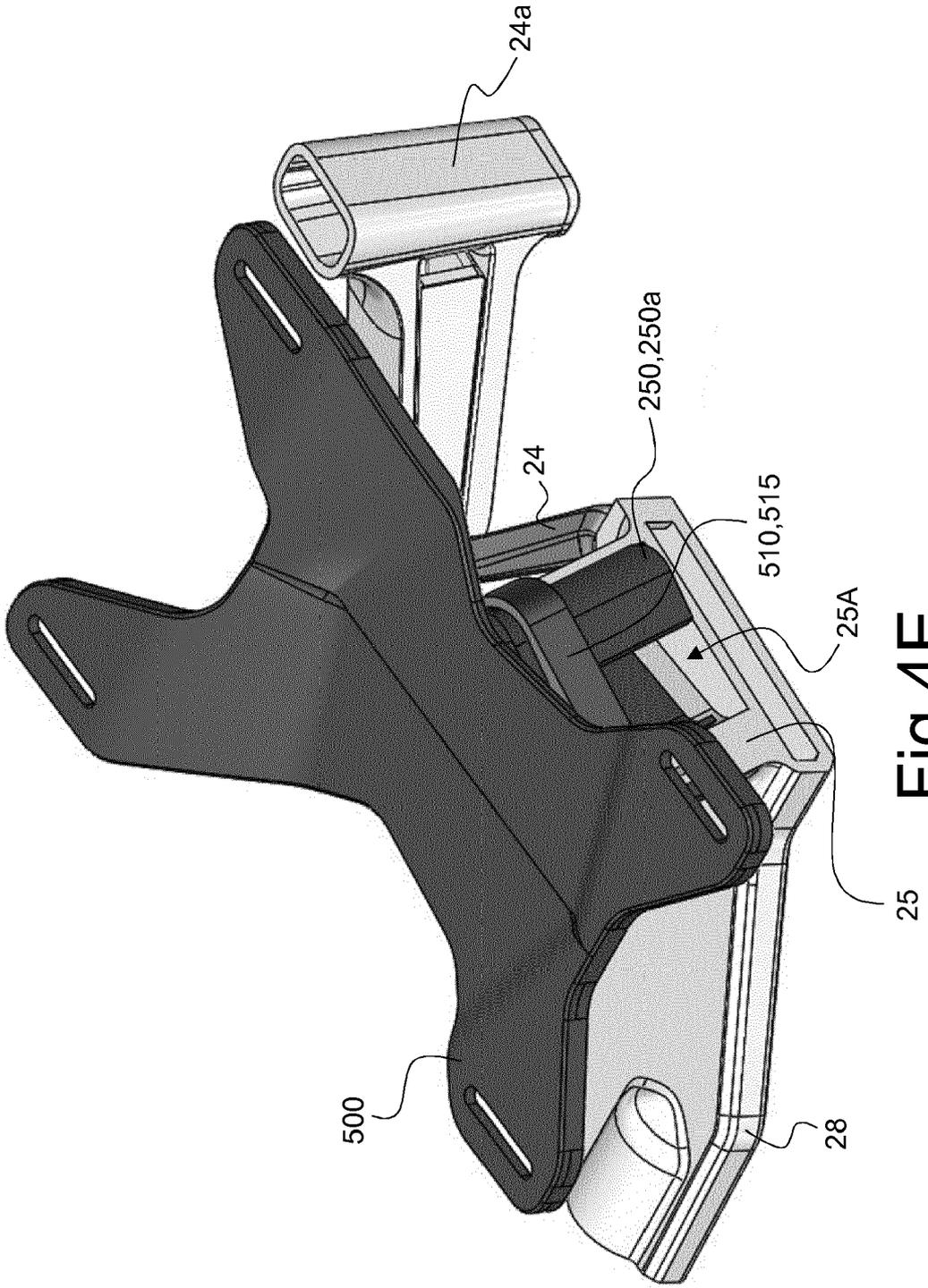


Fig. 4E

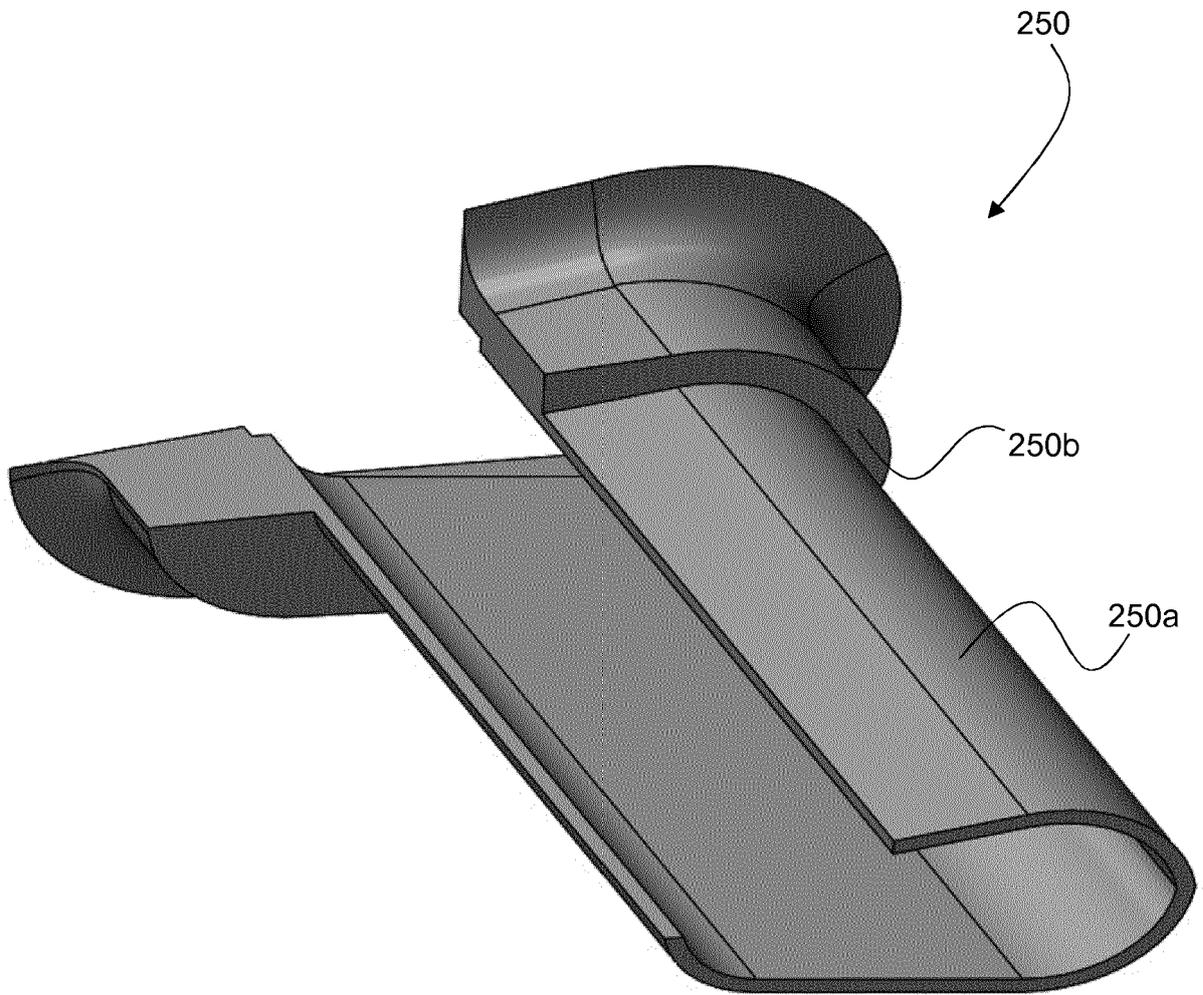


Fig. 5

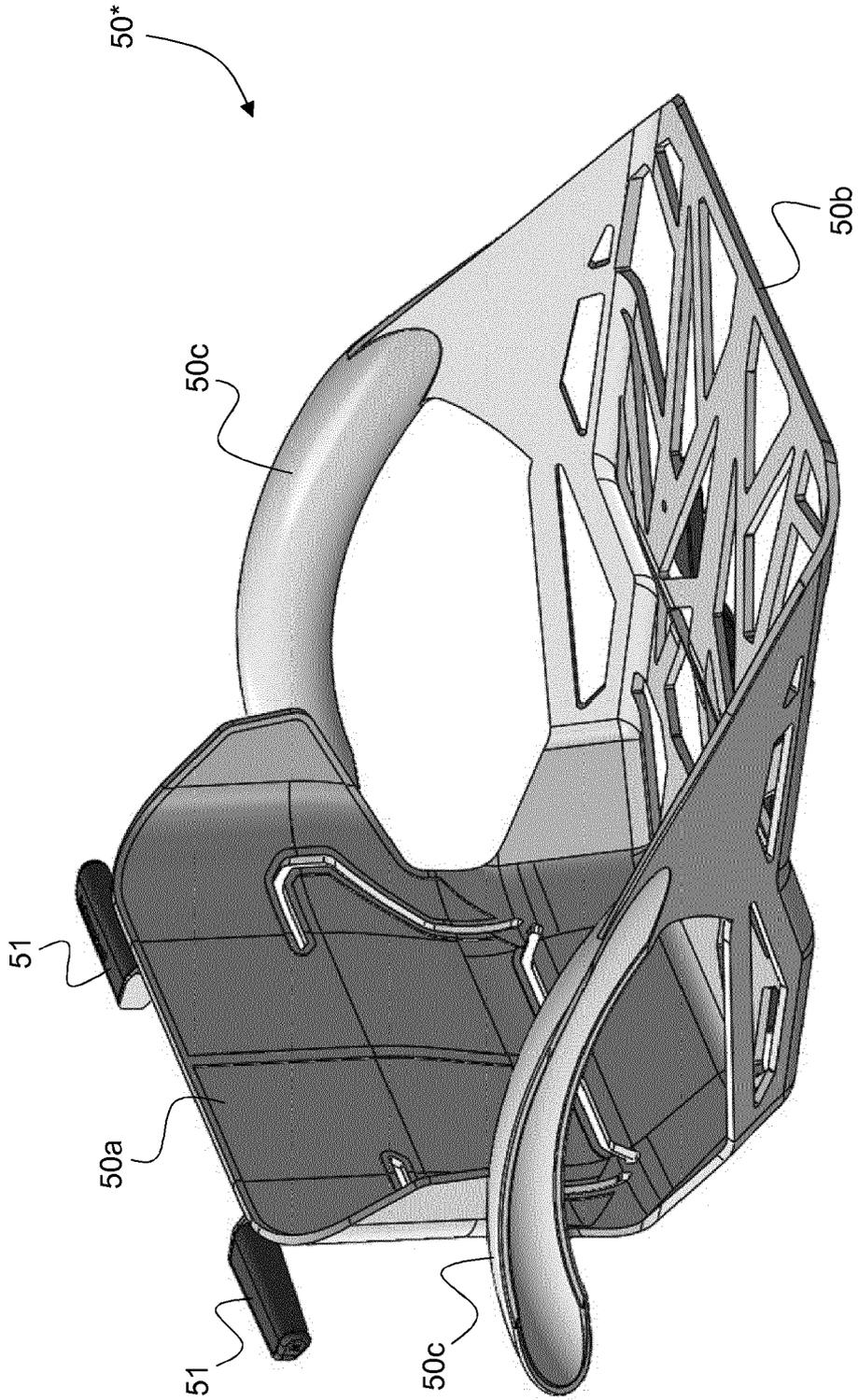


Fig. 6A

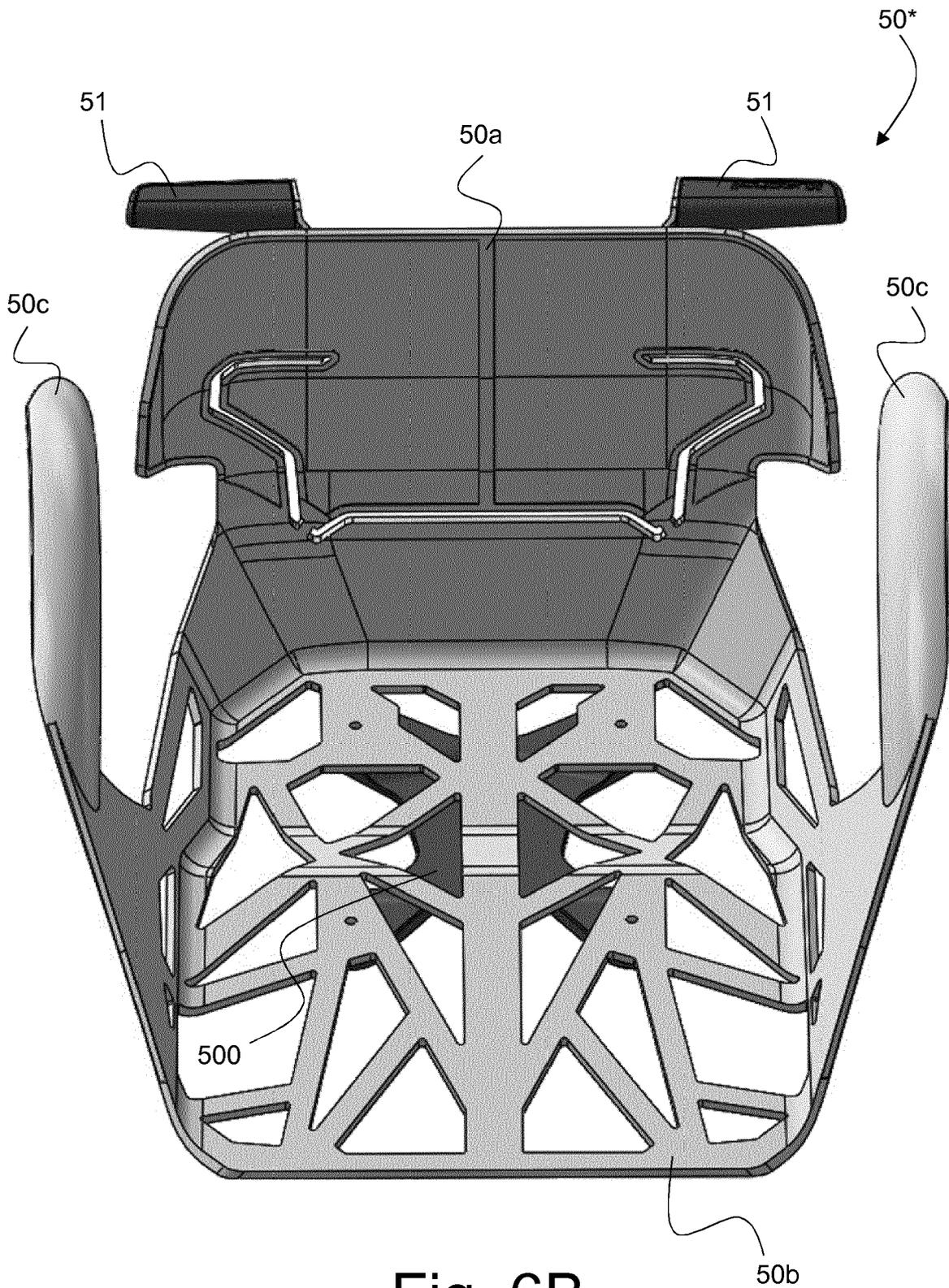


Fig. 6B

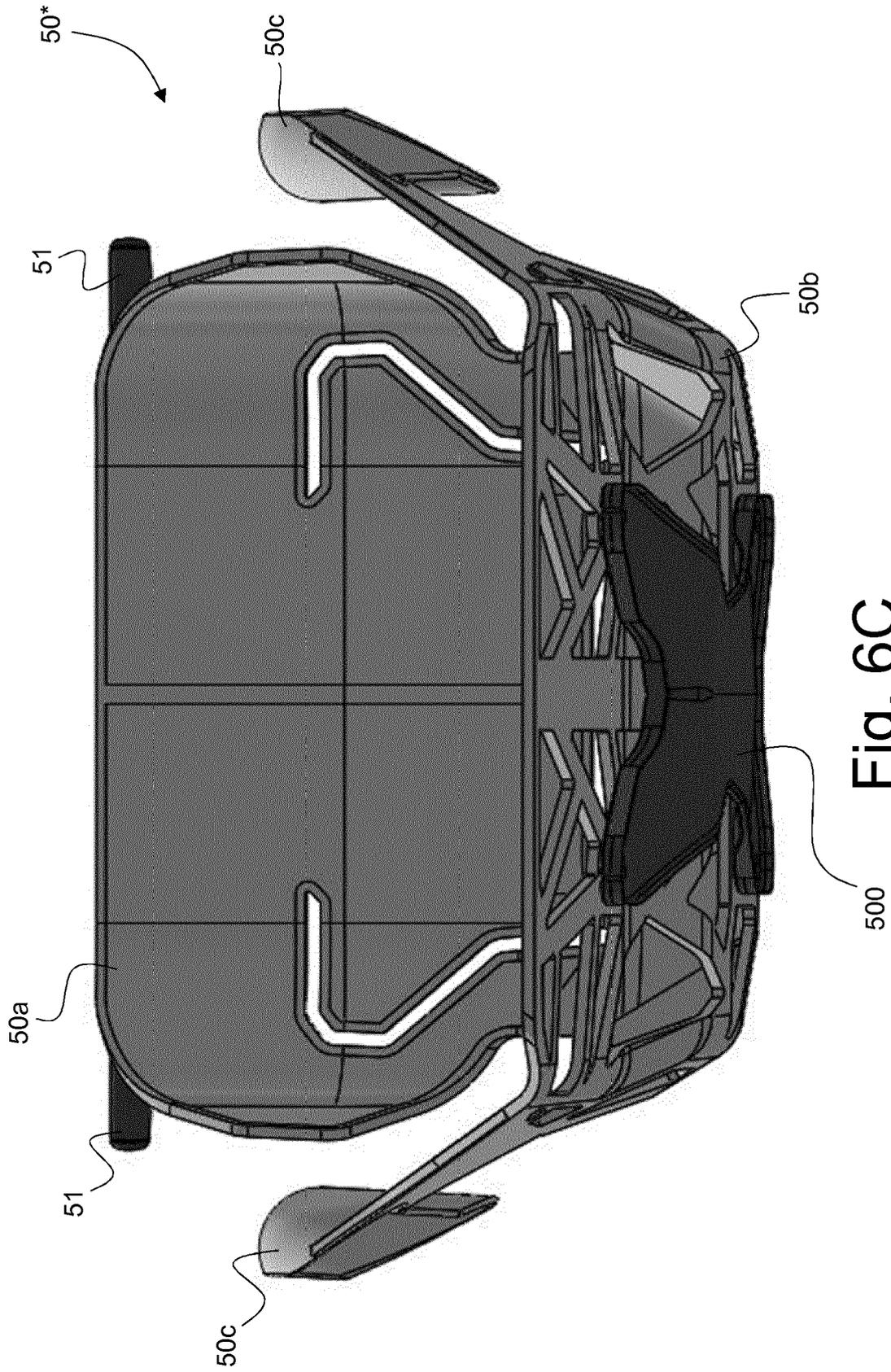


Fig. 6C

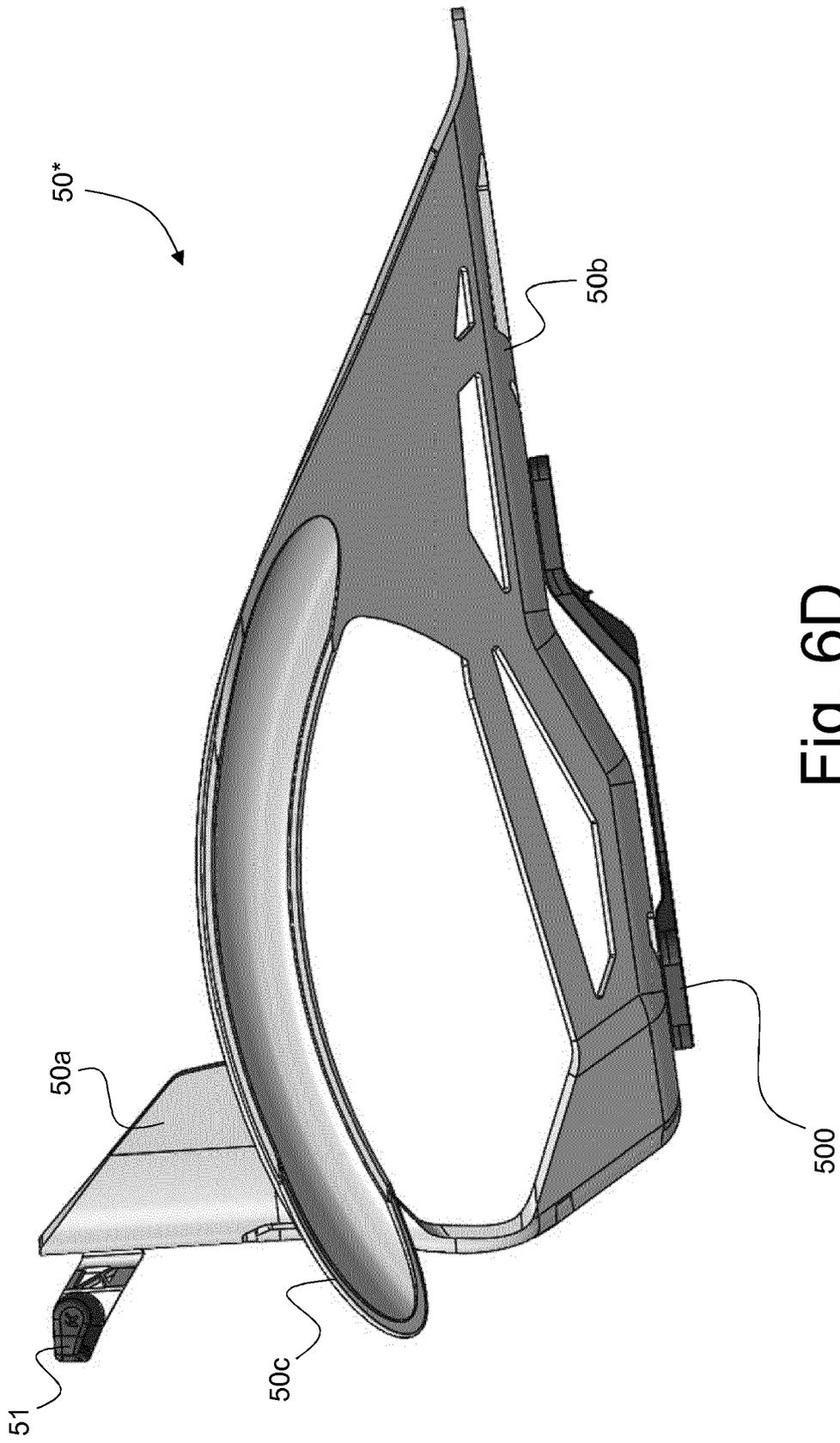


Fig. 6D

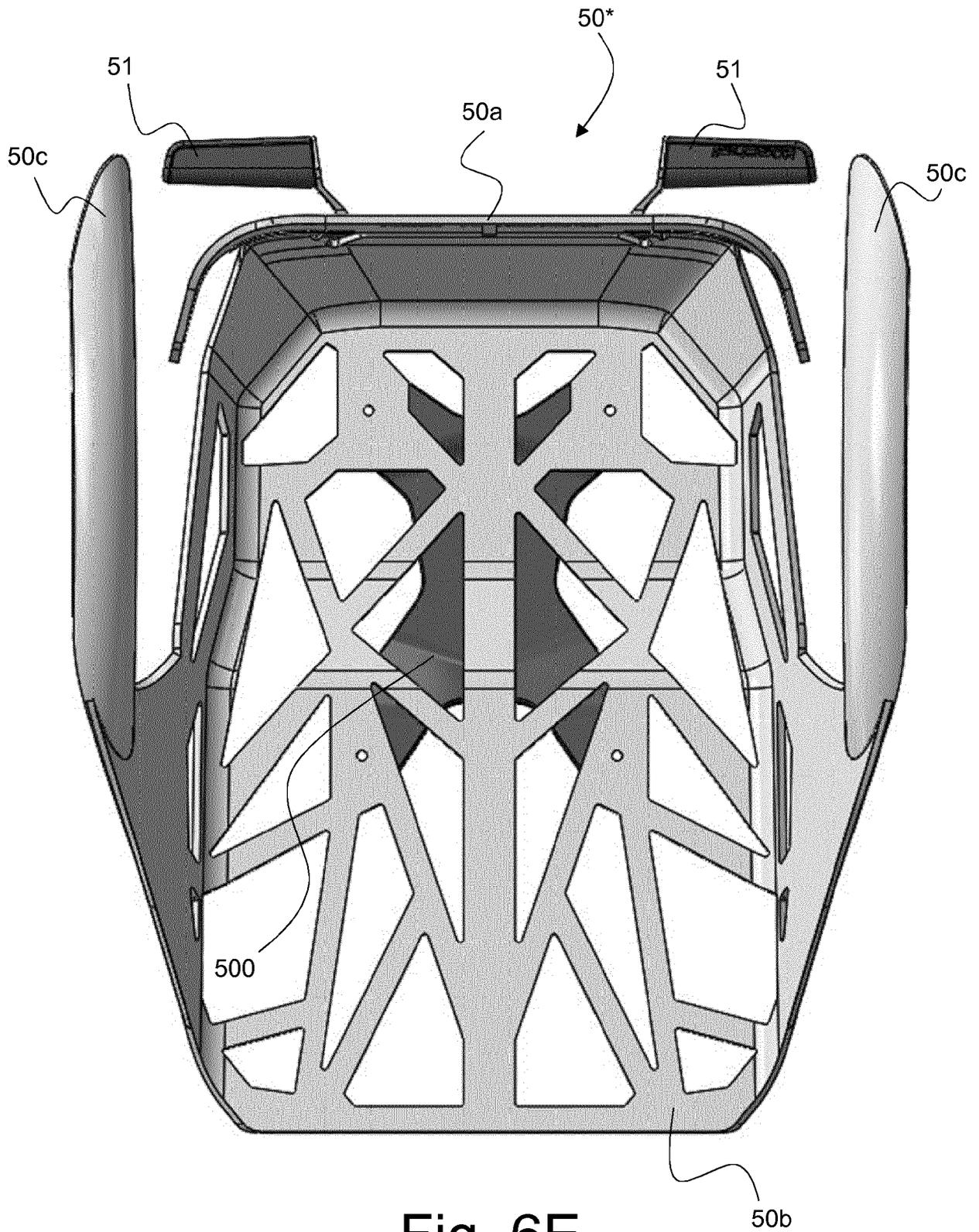


Fig. 6E

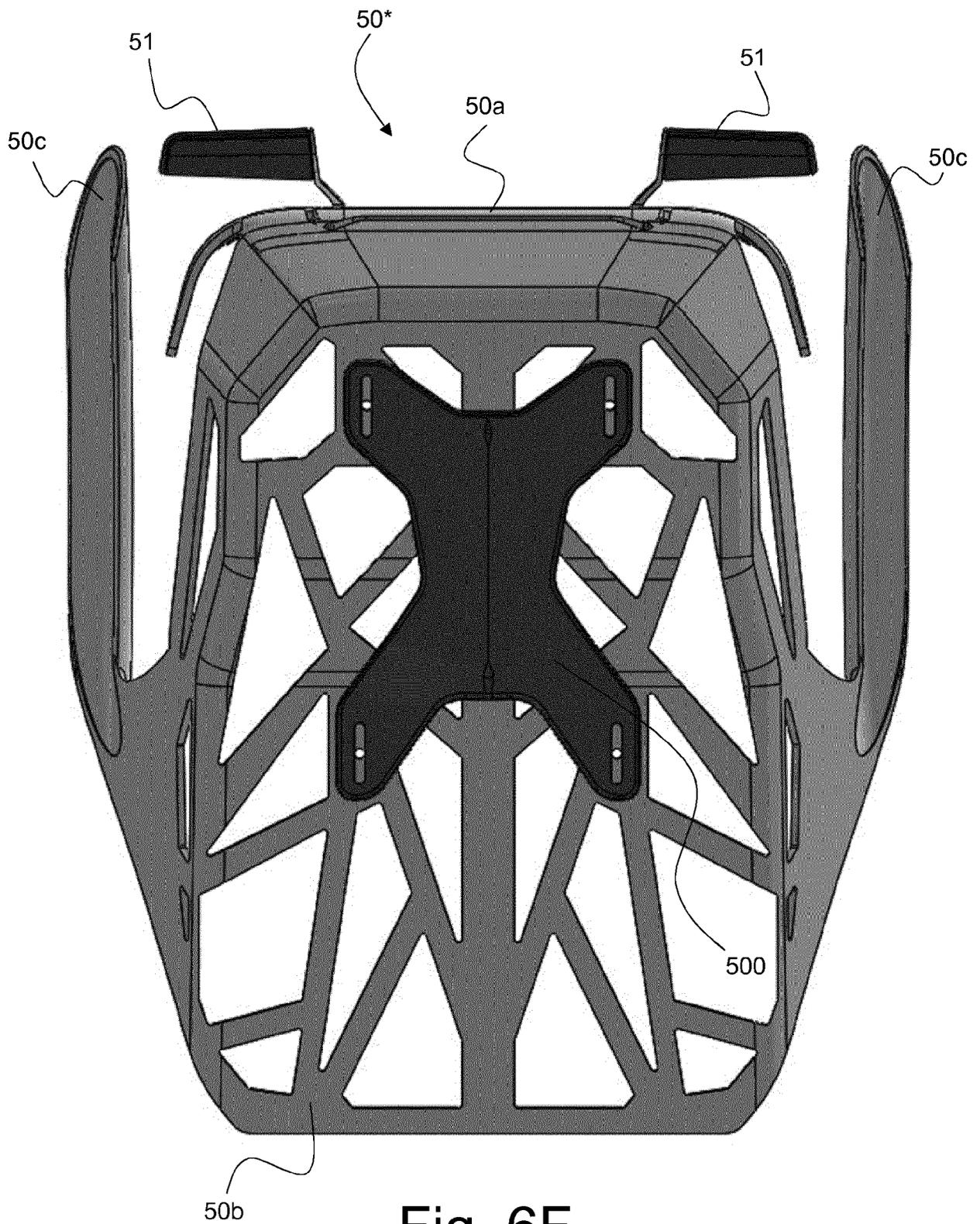


Fig. 6F

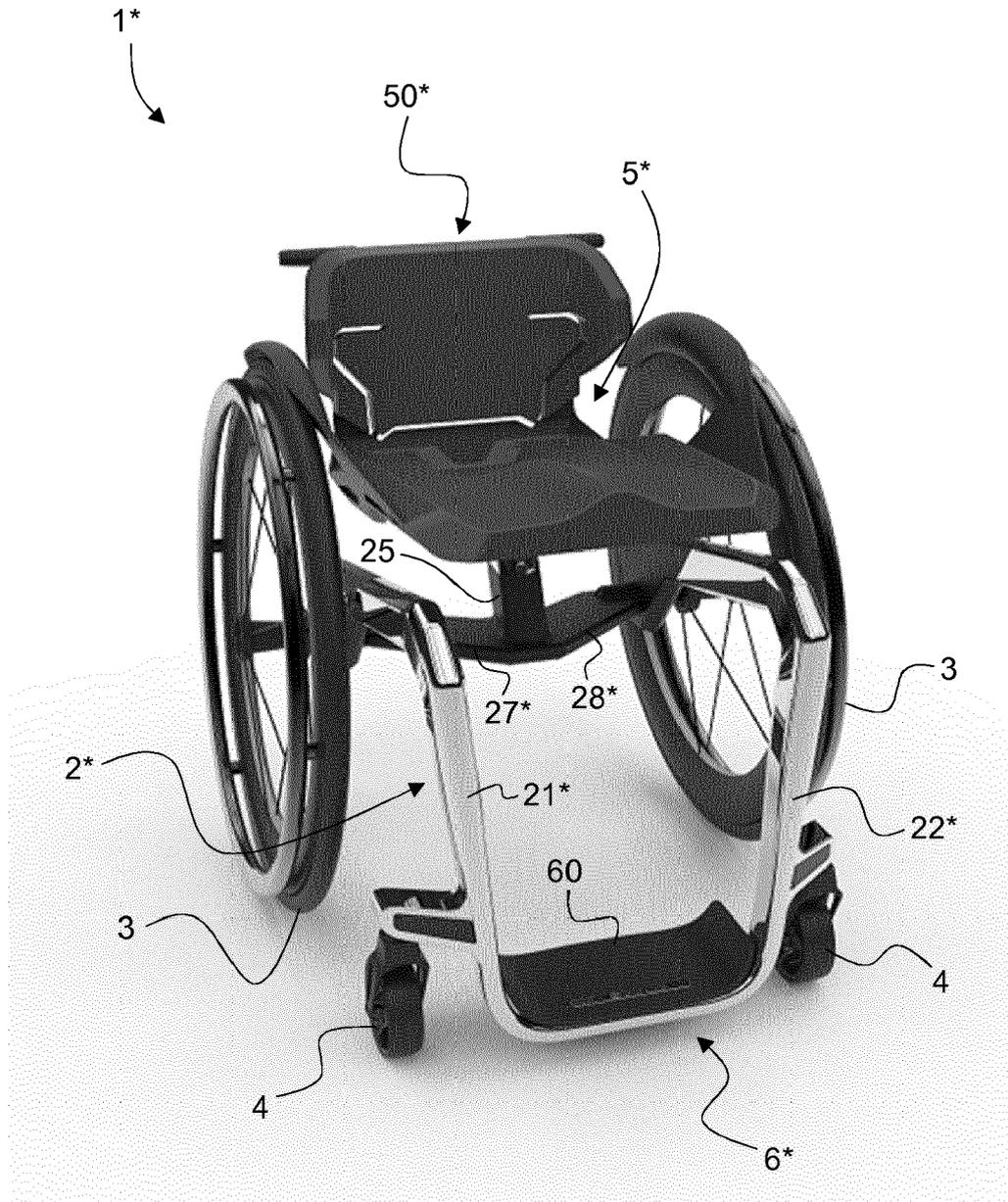


Fig. 7

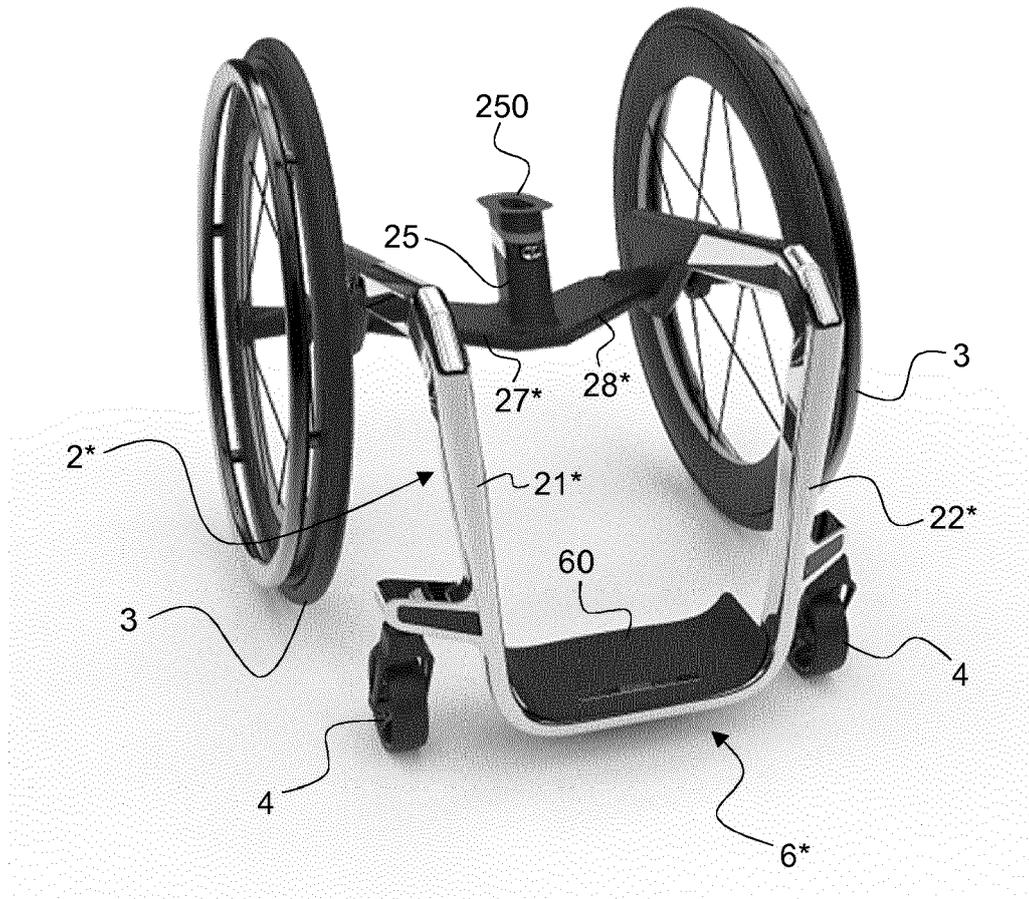


Fig. 8



EUROPEAN SEARCH REPORT

Application Number
EP 18 19 4661

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DOCUMENTS CONSIDERED TO BE RELEVANT				
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A	US 2013/300083 A1 (BORISOFF JAIMIE [CA]) 14 November 2013 (2013-11-14) * figures 1, 16 *	1		
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Y	US 2018/250179 A1 (OMER GALIN [IL] ET AL) 6 September 2018 (2018-09-06) * paragraph [0003]; figure 6 *	8		
A	GB 2 182 633 A (JAMES IND LTD) 20 May 1987 (1987-05-20) * page 2, lines 5-25; figure 2 *	1		
The present search report has been drawn up for all claims				
Place of search		Date of completion of the search	Examiner	
The Hague		19 June 2019	Petzold, Jan	
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 03/82 (P04/C01)

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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

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Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

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No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

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LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

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see sheet B

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All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

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As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

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Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

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None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

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The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

**LACK OF UNITY OF INVENTION
SHEET B**Application Number
EP 18 19 4661

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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

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1. claims: 1-7(completely); 9-15(partially)

Wheelchair with linking structure from the cross member to the footportion

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2. claims: 8(completely); 9-15(partially)

Wheelchair comprising a seat post with load supporting shoulder portion

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

EP 18 19 4661

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19-06-2019

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