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(54) Title: POSTURE ADAPTIVE WORK CHAIR

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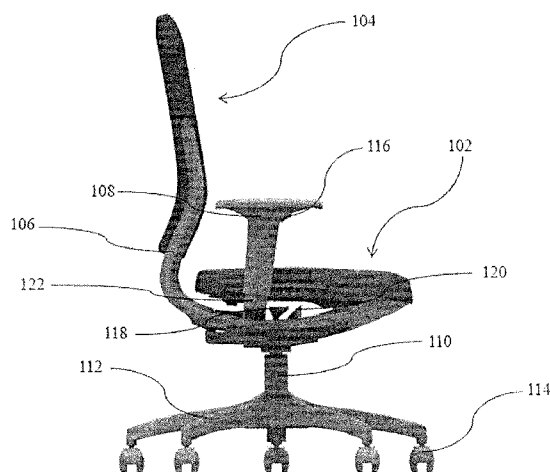


FIGURE 2

(57) **Abstract:** The present subject matter relates to a work chair which adapts to dynamic body postures of a user. The posture adaptive work chair comprising a seat sub-assembly (102) having a front edge (138) and a seat base sub-assembly (124); a pair of a spine members (106) cantilevered from the front edge (138) of the seat sub-assembly (102); a back sub-assembly (104) supported by the pair of spine members (106), the back sub-assembly (104) is configured to flex in multiple axes based on direction of load applied by a user; and a tilt limit lever (120) movably coupled to the seat base sub-assembly (124); said tilt limit lever (120) being configured to enable tilting of the back-sub assembly (104) to a plurality of tilt positions (132, 132', 132'').



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POSTURE ADAPTIVE WORK CHAIR

TECHNICAL FIELD

The present subject matter generally relates to a chair, and more particularly,
5 relates to a work chair which adapts to dynamic body postures of a user.

BACKGROUND

The modern workplace with increased use of network connectivity is reducing the need for people to move around in office for communication purpose. The intensely competitive nature of today's work culture has made tight deadlines and
10 targets as innate part of long working schedule for most users, forcing them to remain seated for long hours. Further, even at home and in normal daily routine, due to increased use of technology and internet based social networking people tend to remain seated for long duration.

Ergonomic field studies indicate that static postures are associated with
15 increasing number of health concerns. Static postures place a strain on the body, leading to fatigue and even spinal injuries over a period of time. No matter how comfortable is a chair, static seated postures can cause musculo-skeletal injuries and pain even after regular exercise. Furniture that would encourage frequent change in posture or help the users to be more active can prevent these risks associated with
20 static positions adopted at work.

Hon (HNI group) has introduced a task/workstation chair comprising a seat and a back which can flex in multiple axes for allowing change in posture and providing support simultaneously. However, the back is connected with the seat towards its central axis and enables the multiple axes flexing only through a short
25 distance from central pivot point. Hence, said task/workstation chair is neither very

comfortable nor helps in dynamic body movements effectively due to its limited flex capabilities. Teknion, a U.S. based company introduced a multipurpose chair comprising an integrated seat and back, wherein the back provides flexing motion. However, Teknion's multipurpose chair lack flexibility, does not support the posture
5 well and is not very efficient in terms of preventing risks associated with static positions of a user.

Hence, there is a need identified for a chair which helps in efficient interaction between the user and surrounding elements with ease and comfort. Further, there is a need for a chair that assists dynamic body movements and supports body posture
10 changes, minimizes the risks associated with static body postures during long duration sitting and overcomes aforementioned as well as other challenges in relation with sitting postures.

SUMMARY

The present subject matter relates to a chair which adapts to dynamic body
15 postures of a user.

It is an object of the present subject matter to provide a chair designed to intuitively adapt to users' posture changes.

It is another object of the present subject matter to encourage users to be playfully active while sitting.

20 It is yet another object of the present subject matter to keep users' body alert thereby bringing focus at work and better productivity.

It is yet another object of the present subject matter to provide a chair having synchronous easy flex system enabling dynamic body movements in sitting condition.

It is yet another object of the present subject matter to provide a chair, wherein
25 the seat and back are firmly connected to the base frame and are cantilevered in such a

way that it gives a multi-dimensional movement possibility just with a simple lean on the sides or back, without need for complex manual adjustment.

It is yet another object of the present subject matter to provide a back tilt with variable limit adjustment with different positions based on nature of activity
5 performed.

It is yet another object of the present subject matter to provide a chair comprising a knee point cantilevered seat and back frame which is appropriate for use in workplaces and homes.

BRIEF DESCRIPTION OF DRAWINGS

10 These and other features, aspects, and advantages of the present invention will become better understood when the following detailed description is read with reference to the accompanying drawings in which like characters represent like components throughout the drawings, wherein:

FIGURE 1 illustrates a perspective view of a chair in accordance with an
15 embodiment of the present subject matter.

FIGURE 2 illustrates a side view of a chair in accordance with an embodiment of the present subject matter.

FIGURE 3a and 3b illustrate perspective views of an upholstered back sub-assembly with spine members and seat base sub-assembly in accordance with an
20 embodiment of the present subject matter.

FIGURE 4a, 4b, 4c and 4d illustrate structure and operation of a tilt limiter of the chair in accordance with an embodiment of the present subject matter.

FIGURE 5 illustrate a perspective view of a visitor chair in accordance with an embodiment of the present subject matter.

DETAILED DESCRIPTION

The embodiments of the present subject matter are described in detail with reference to the accompanying drawings. However, the present subject matter is not limited to these embodiments which are only provided to explain more clearly the present subject matter to the ordinarily skilled in the art of the present disclosure. In the accompanying drawings, like reference numerals are used to indicate like components.

Described herein is a work chair, comprising a pedestal base member, a seat sub-assembly comprising a front edge and base sub-assembly, a back sub-assembly and an adjustable armrest sub-assembly. The back sub-assembly is supported by two spine members which are cantilevered from the front edge of the seat sub-assembly. The front edge can be defined as the portion where knees bend in sitting position. The back sub-assembly flexes in multiple axes as result of direction of load applied by a user's back on the work chair through the large cantilever formed by the spine members attached firmly at the front edge. For example, if the force applied on the back of the chair is acentric the flex will be also be acentric resulting in a 3 dimensional back movement based on the direction of load applied and following the posture adopted by the user. The spine members comprise of a combination of C-type and V-Type sections having continuous rib with cut-out in certain locations flexes through its geometry and plastic material properties. The two spine members are connected also near the rear part of the seat through a spine connector aiding in structural stability and being integral part of the tilt limiting feature. In an embodiment, the spine members are made up of Glass filled Poly-Amide. However, the aforementioned material is exemplary and not limiting in any way. It is clear to person skilled in the art that the spine members may comprise of any other suitable material showing similar properties. The seat sub-assembly comprising a seat base

sub-assembly and is cantilevered from the front edge enabling a smooth landing while sitting and providing with synchronous flexing movement with the back sub-assembly during posture changes. Further, flexing of the back sub-assembly can be restricted as per user's requirement at multiple positions through a tilt limiter lever
5 adjustment mounted within the seat base sub-assembly. For example, the tilt limit lever can be operated to allow the flexing/reclining of the back sub-assembly in three different positions. Hereinafter, various modes of carrying out the aforementioned invention have been discussed with the help of illustrations.

FIGURE 1 illustrates a perspective view of a main chair 100 in accordance
10 with an embodiment of the present subject matter. The main chair 100 comprises a seat sub-assembly 102 comprising a front edge 138 and base sub-assembly 124, a back sub-assembly 104, adjustable armrest sub-assembly 108 and pedestal base member 112. The back sub-assembly 104 is supported by two spine members 106 which are cantilevered from a front edge 124 of the seat sub-assembly 102. Further,
15 the main chair 100 includes a plurality of components including but not limiting to two adjustable armrest sub-assemblies 108, a telescopic gas-lift cylinder 110 and a pedestal base member 112. The adjustable armrest sub-assembly 108 is provided on two laterally opposite sides of the seat sub-assembly 102 and can be used by a user to place arms on them in sitting position. The telescopic gas-lift cylinder 110 is fixedly
20 attached between the pedestal base member 112 and the seat sub-assembly 102. Further, the telescopic gas-lift cylinder 110 is actuated longitudinally between the central axes of the pedestal base member 112 and the seat sub-assembly 102 respectively to adjust seat height of the work chair. The pedestal base member 112 is provided with a plurality of castors 114 for ease of displacement of the main chair 100
25 from one place to another.

FIGURE 2 illustrates a side view of the main chair 100 in accordance with an embodiment of the present subject matter. The main chair 100 comprises a plurality of adjustment features, for instance, a push button 116, a seat height adjustment lever 118 and a tilt limit lever 120. The push button 116 is provided to adjust height of the adjustable armrest sub-assembly 108 in longitudinal direction with a series of intermediate stopper positions starting from a bottom end 122 of the adjustable armrest sub-assembly 108. The seat height adjustment lever 118 is provided for adjusting height of the seat sub-assembly 102 from the pedestal base member 112 through actuation of the telescopic gas-lift cylinder 110. The height of the seat sub-assembly 102 is adjusted by operating the telescopic gas-lift cylinder 110 through the seat height adjustment lever 118.

FIGURE 3a and 3b illustrate perspective views of back sub-assembly 102 and the two spine members 106 in accordance with an embodiment of the present subject matter. As can be seen from the figures, the spine members 106 is fixedly connected to a seat base sub-assembly 124 which is fixedly attached between the two spine members 106. The seat base sub-assembly 124 includes a plurality of box geometry with intersecting rib structure for strength. Further, curved portions of the spine members 106 include a plurality of organic shape slots / slits 126 for increasing flexibility of the spine members 106.

In an embodiment, the organic shape slots / slits 126 are flower-bud shaped for enhanced flexibility. Further, the spine members 106 comprise a combination blend of C-type and V-Type sections having continuous rib with cut-out in certain locations flexes through its geometry and plastic material properties. The plastic material is glass filled poly-amide. However, the aforementioned plastic member is disclosed for exemplary purpose only and is not to be construed limiting in any way as any suitable

material which shows similar plastic properties can be used to form the spine members 106. Further, the left hand and right hand spine members can move in differential motion (3-Dimensional) resulting in multi-axis movement.

FIGURE 4a, 4b, 4c and 4d illustrate structure and operation of a tilt limit lever 120 of the main chair 100 in accordance with an embodiment of the present subject matter. As can be seen in Figures 4a to 4d, the tilt limit lever 120 is moveably coupled to the seat base sub-assembly 124 such that a handle of the tilt limit lever 120 is accessible from the outer side of one of the spine members 106. The tilt limit lever 120 further comprises a tilt angle position snap 140 which engage with a tilt angle position slot 142 which is integral with the seat base sub-assembly 124. The two spine members 106 are connected to a rear part of the seat base sub-assembly 124 through a spine connector 128. The spine connector 128 aids in structural stability and forms an integral part of tilt limiting feature through resting on the backrest stopper 130 at multiple tilt angle positions. When the tilt limit lever 120 is operated through its handle to shift from a first position 132 (upright position) to a second position 132' (mid tilt position), the backrest stopper 130 rotates to stop the back-spine connector 128 at a particular position.

In an embodiment, the tilt limiter can be shifted to three different positions – a first position 132 (upright position), a second position 132' (mid tilt position) and a third position 132'' (full tilt position) resulting in three different back tilt angles of the back sub-assembly 104. In first position 132, the tilt angle of the back sub-assembly is maintained at upright position without tilting which can also be called as no tilt position. Said position results in completely upright position of the back sub-assembly 104 and when a user pushes against the back sub-assembly 104, the back sub-assembly 104 flexes about a point of mating of the backrest stopper 130 and the back-

spine connector 128. Similarly, the back rest portion can be adjusted in three tilt positions corresponding to the first position 132, the second position 132' and the third position 132'' namely upright position, mid tilt position and the full tilt position.

In operation, when the tilt limit lever 120 is pushed to shift for example from
5 the first position 132 to the second position 132', the tilt limit lever 120 moves radially about a pivot 134 of the tilt limit lever 120 and a tilt angle position snap 140 engages in one of tilt angle position slots (142, 142', 142'') corresponding to the first position 132, to the second position 132' and to the third position 132'' respectively thus achieving resistance and positive feedback between the multiple tilt limit
10 settings. Upon the radial motion of the tilt limit lever 120, a tilt limit lever connector 136 which is connected to the backrest stopper 130 moves linearly. Further, the linear motion of the tilt limit lever connector 136 results into rotary motion of the backrest back stopper 130 which limits the back-spine connector 128 at a particular position.

In an embodiment, at the mid tilt position, the back sub-assembly 104 tilts up
15 to a mid tilt position about the point where the spine member 106 is cantilevered from the front edge of the seat sub-assembly 102 and beyond that flexes about the point of mating of the backrest stopper 130 and the back-spine connector 128 when further pushed by the user. Similarly, in the full tilt position, the back sub-assembly 104 tilts to a full tilt position of the adjusting range about the point where the spine member
20 106 is cantilevered from the front edge of the seat sub-assembly 102 and beyond that flexes about the point of mating of the backrest stopper 130 and the back-spine connector 128 at a particular position.

In an embodiment, as shown in Figure 5, the visitor chair 100' comprises an visitor chair base frame structure 138 affixed with the spine members 106' to support
25 the spine members 106', wherein the angular metal base 138 acts as an under-

structure for the visitor chair 100'. The visitor chair 100 according to the present embodiment illustrates a simple aspect of the present invention and replicates upright position feature of main chair 100 as seen in the first position tilt limit position 132 having restricted tilting. The visitor chair 100' is simple, cost-effective version of the
5 main chair 100 and is often used in visitor seating applications.

As can be seen from, the work chair is capable of assisting dynamic body movements, supporting posture efficiently and minimizing the risks associated with static positions.

Although the invention has been described with reference to specific
10 embodiments, this description is not meant to be construed in a limiting sense. Various modifications of the disclosed embodiments, as well as alternate embodiments of the invention, will become apparent to persons skilled in the art upon reference to the description of the invention. It is therefore contemplated that such modifications can be made without departing from the spirit or scope of the present
15 invention as defined.

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We claim:

1. A posture adaptive work chair (100) comprising:
a seat sub-assembly (102) having a front edge (138) and a seat base sub-
5 assembly (124);
a pair of a spine members (106) cantilevered from the front edge (124) of the
seat sub-assembly (102) ;
a back sub-assembly (104) supported by the pair of spine members (106), the
back sub-assembly (104) is configured to flex in multiple axes based on direction of
10 load applied by a user ; and
a tilt limit lever (120) movably coupled to the seat base sub-assembly (124);
said tilt limit lever (120) being configured to enable tilting of the back-sub assembly
(104) to a plurality of tilt positions (132, 132', 132'').
- 15 2. The posture adaptive work chair (100) as claimed in claim 1, wherein the pair
of spine members (106) being fixedly connected to a rear part of the seat base sub-
assembly (124) through a spine connector (128), the spine connector (128) being
configured to facilitate tilting of the a back sub-assembly (104) to the plurality of tilt
positions (132, 132', 132'').
20
3. The posture adaptive work chair (100) as claimed in claim 1 and 2, wherein
each of the spine members (106) comprising:
a curved portion having a plurality of slots (126) to increase flexibility of each
of the spine members (106); and
25 a number of sections having continuous rib with cut-outs to enable flexing of
each of the spine members (106).
4. The posture adaptive work chair (100) as claimed in claim 1, wherein at least
one adjustable armrest sub-assembly (108) being disposed on each of the lateral
30 opposite side of the seat sub-assembly (102) to support arms of the user in sitting
position;
at least one adjustable armrest sub-assembly (108) such that by operating a
push button (116) the height of the armrest sub-assembly (108) is adjusted in
longitudinal direction.

5. The posture adaptive work chair (100) as claimed in claim 1, wherein a pedestal base member (112) being fixedly connected to the base seat sub-assembly (124);

5 said pedestal base member (112) comprising a plurality of castors (114) rotatably attached at the bottom portion of the pedestal base member (112) in order to displace the work chair (100) from one place to another.

6. The posture adaptive work chair (100) as claimed in claim 1 and 5, wherein a
10 telescopic gas-lift cylinder (110) being fixedly attached between the pedestal base member (112) and the base seat sub-assembly (124);

 said telescopic gas-lift cylinder (110) being actuated by operating a seat adjustment lever (116) to adjust height of the work chair (100).

15 7. The posture adaptive work chair (100) as claimed in claim 1, wherein the tilt limit lever (120) comprising a tilt angle position snap (140) configured to engage with at least one tilt angle position slot (142, 142', 142'') for each tilt position (132, 132', 132'') when said tilt limit lever (120) moves radially about a pivot (134) of the tilt limit lever (120).

20

8. The posture adaptive work chair (100) as claimed in claim 1 and 7, wherein the tilt limit lever (120) is movably connected to a tilt lever connector (136) so that radial movement of the tilt limit lever (120) results in linear motion of the tilt lever connector (136).

25

9. The posture adaptive work chair (100) as claimed in claims 1 and 8, wherein the tilt lever connector (136) is rotatably connected to a backrest stopper (130) so that linear motion of the tilt limit lever connector (136) results in rotary motion of the backrest stopper (130) being configured to engage with a back-spine connector (128)
30 at each tilt position (132, 132', 132'').

9. The posture adaptive work chair (100) as claimed in claims 1, wherein each tilt position (132, 132', 132'') is carried out by the user operating the tilt limit lever

(120) or applying load on the back sub-assembly to achieve different tilt positions (132, 132', 132'') of the back sub-assembly (104).

10. The visitor chair (100') comprising a base frame structure (138a) fixedly
5 attached to the pair of spine members (106) as claimed in claim 1, wherein the pair of spine members (106') supports the back sub-assembly being tilted in first position (132).

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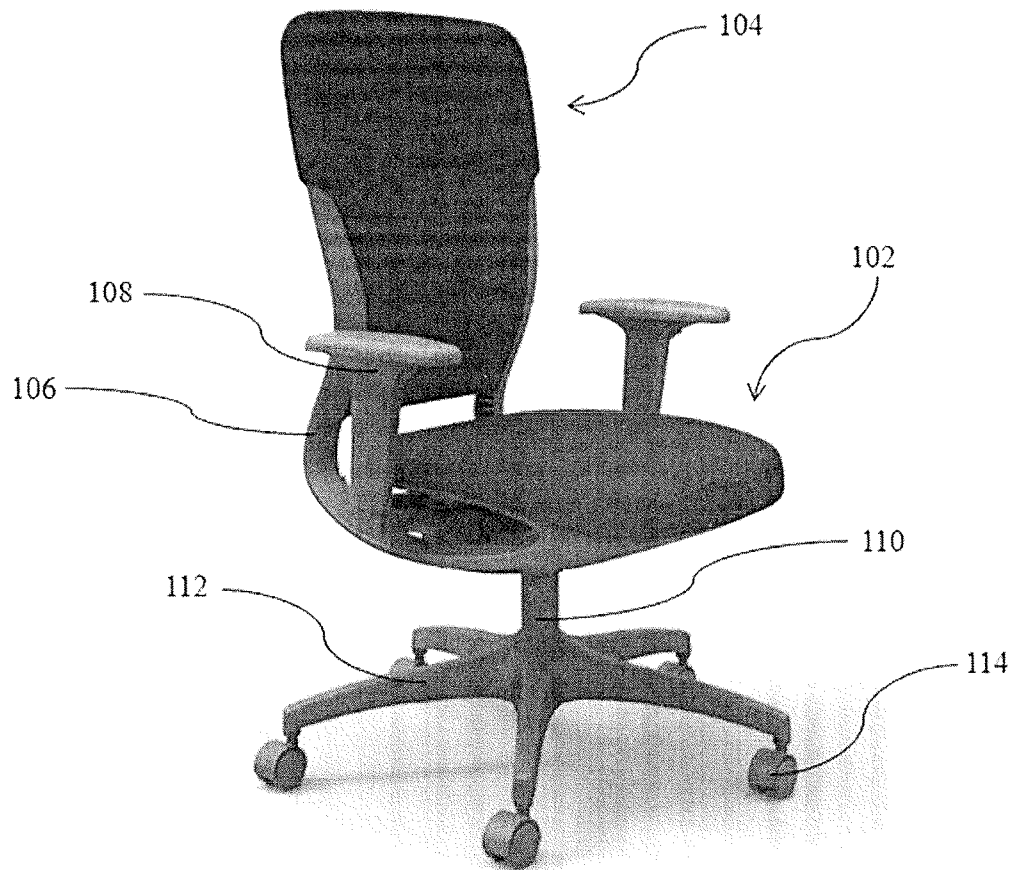
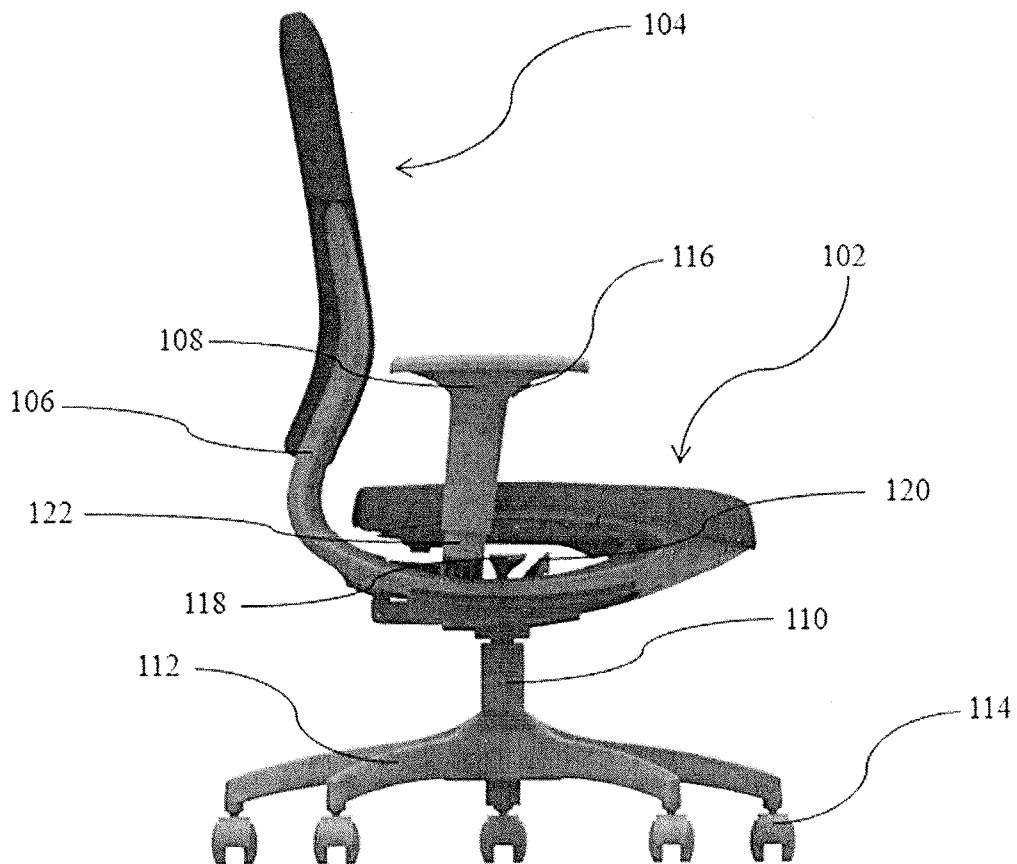


FIGURE 1

100FIGURE 2

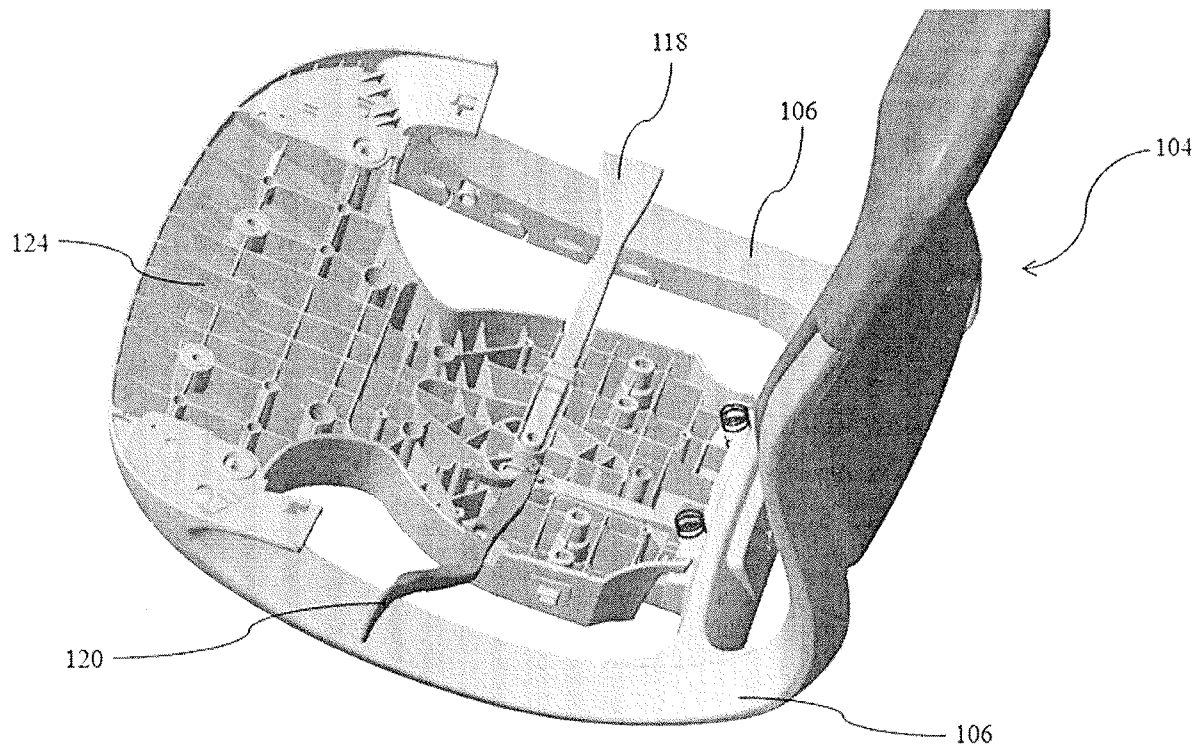


FIGURE 3a

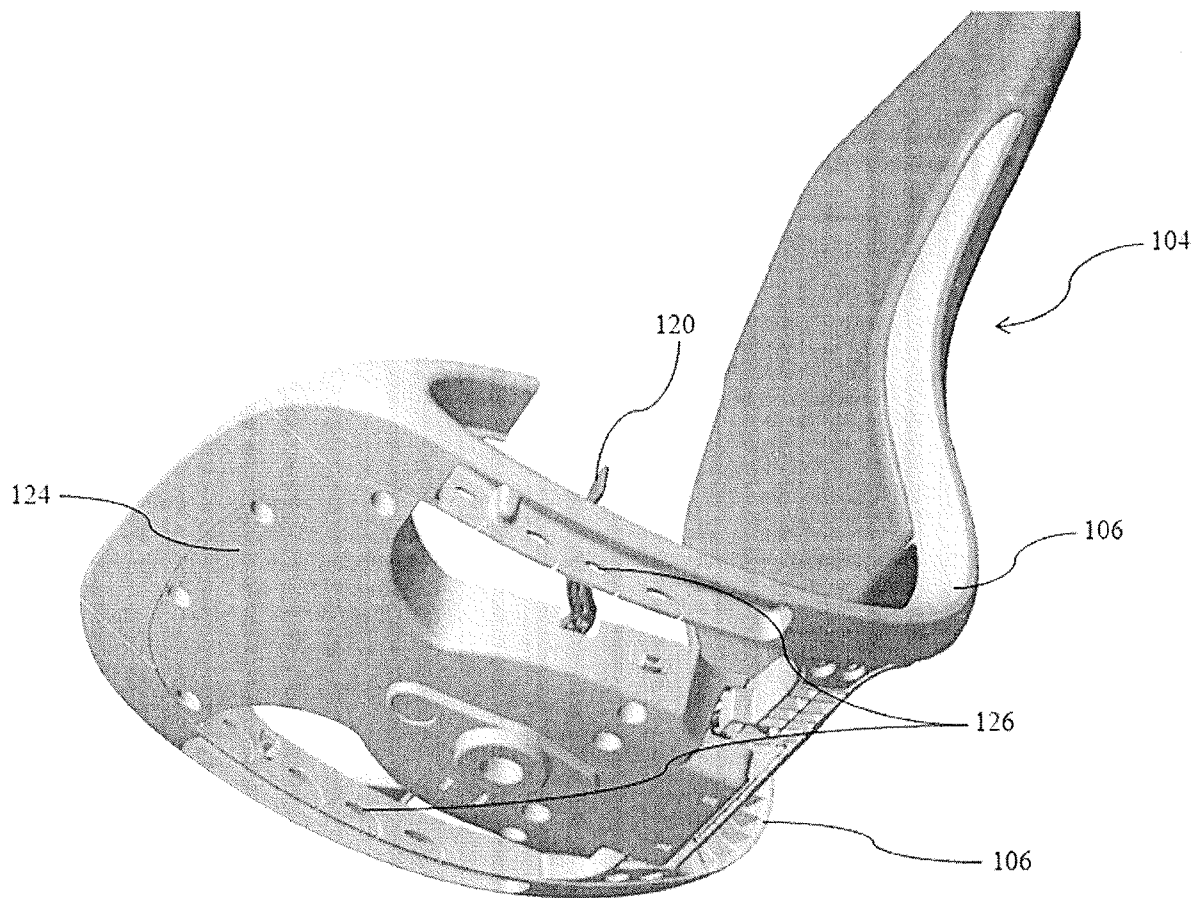


FIGURE 3b

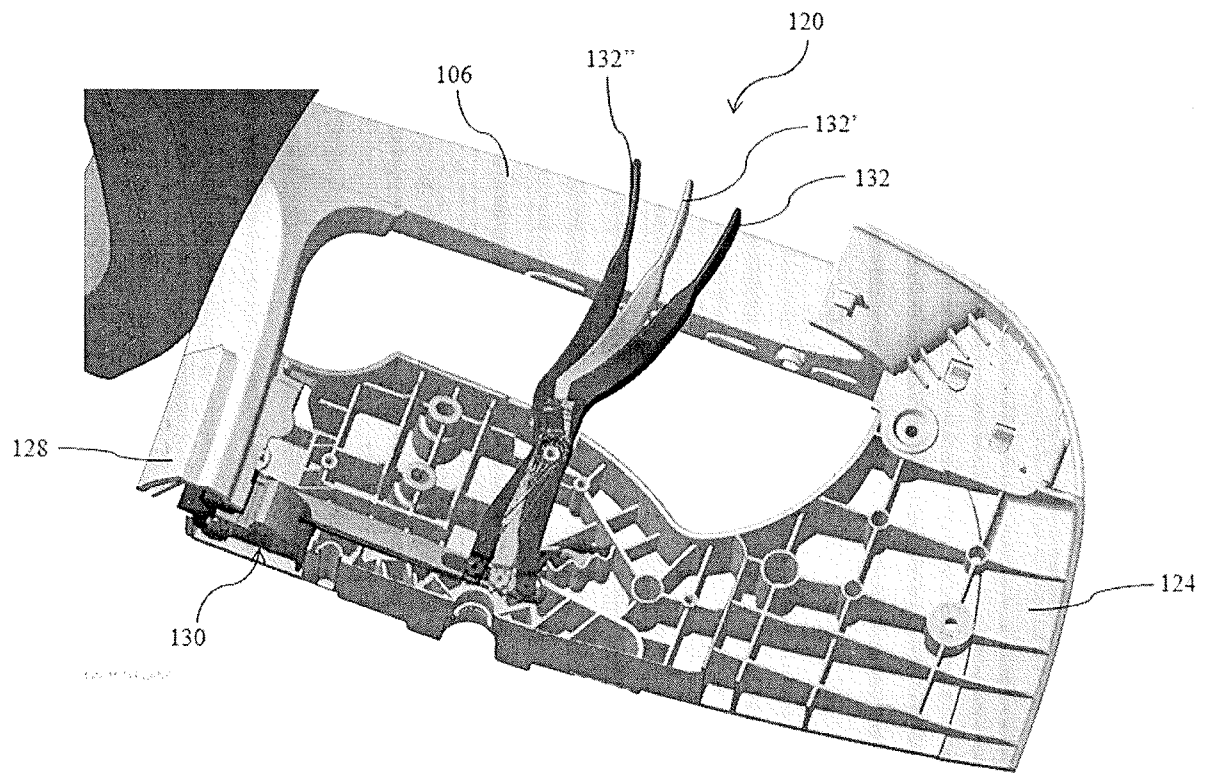


FIGURE 4a

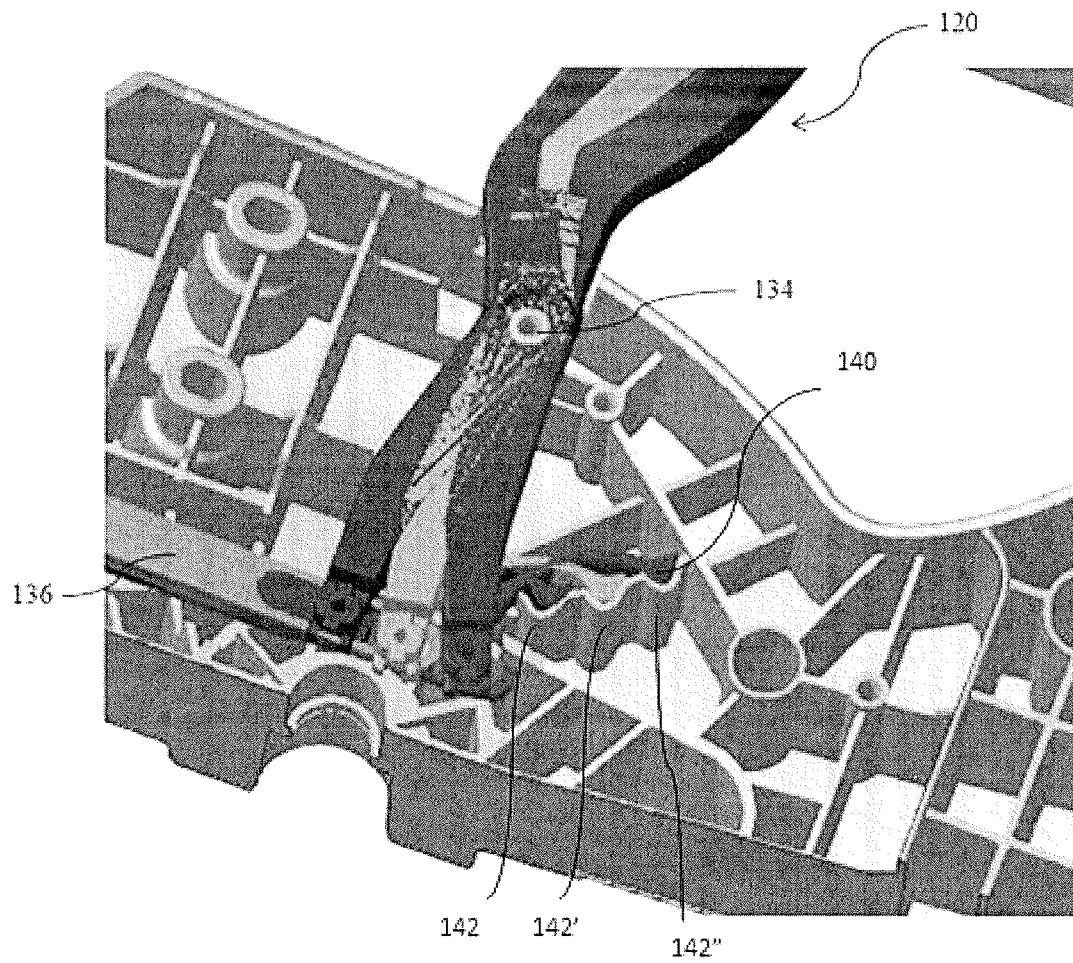


FIGURE 4b

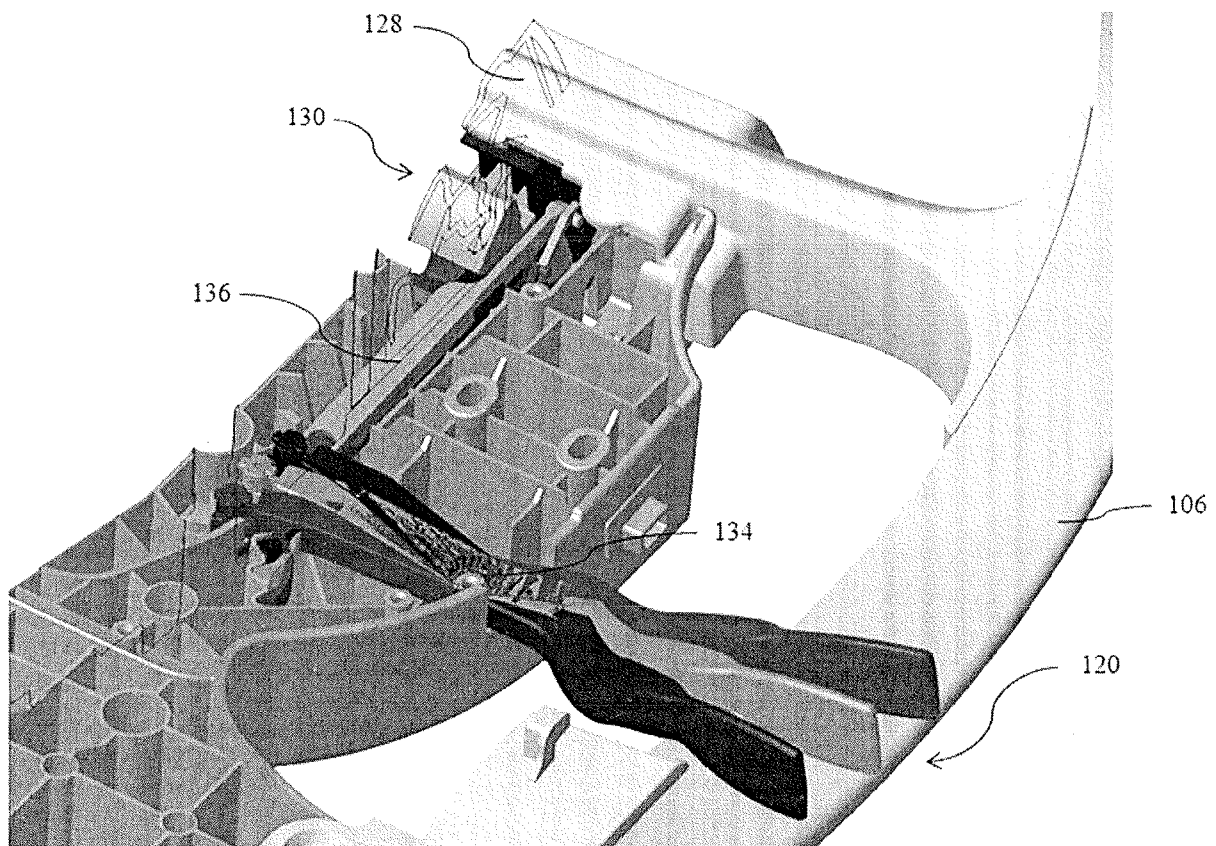


FIGURE 4c

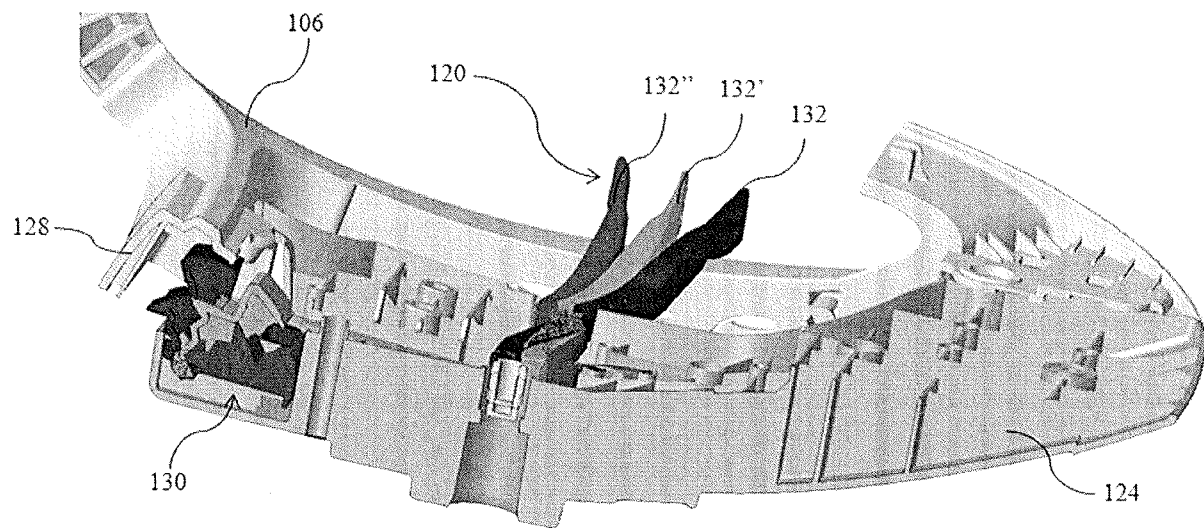


FIGURE 4d

100'



FIGURE 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB2018/057715

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A47C 1/024; A47C 1/02; A47C 1/026; A47C 1/031; A47C 1/032 (2018.01)

CPC - A47C 1/024; A47C 1/02; A47C 1/026; A47C 1/031; A47C 1/032 (2018.08)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

See Search History document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2000-342377 A (KOKUYO CO LTD) 12 December 2000 (12.12.2000) machine translation	1, 4, 5, 7, 9b, 10
Y	US 2009/0261644 A1 (PIRETTI) 22 October 2009 (22.10.2009) entire document	1, 4, 5, 7, 9b, 10
Y	US 2002/0190557 A1 (KOEPE et al) 19 December 2002 (19.12.2002) entire document	1, 4, 5, 7, 9b, 10
Y	US 5,895,095 A (CHEN) 20 April 1999 (20.04.1999) entire document	4
A	US 2015/0102648 A1 (SIDIZ, INC.) 16 April 2015 (16.04.2015) entire document	1-5, 7, 9b, 10
A	US 5,328,242 A (STEFFENS et al) 12 July 1994 (12.07.1994) entire document	1-5, 7, 9b, 10

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent 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

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"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 when the document is taken alone

"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

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Date of the actual completion of the international search

15 January 2019

Date of mailing of the international search report

11 FEB 2019

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PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB2018/057715

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☒ Claims Nos.: 6, 8, 9a
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.