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(54) Backrest for chair

(57) A backrest for a chair which pivots around an axis coincident with the H point axis relative to the chair, and to a chair which can shift in response to a person sitting on the chair, the chair also comprising a backrest which pivots around the H point.

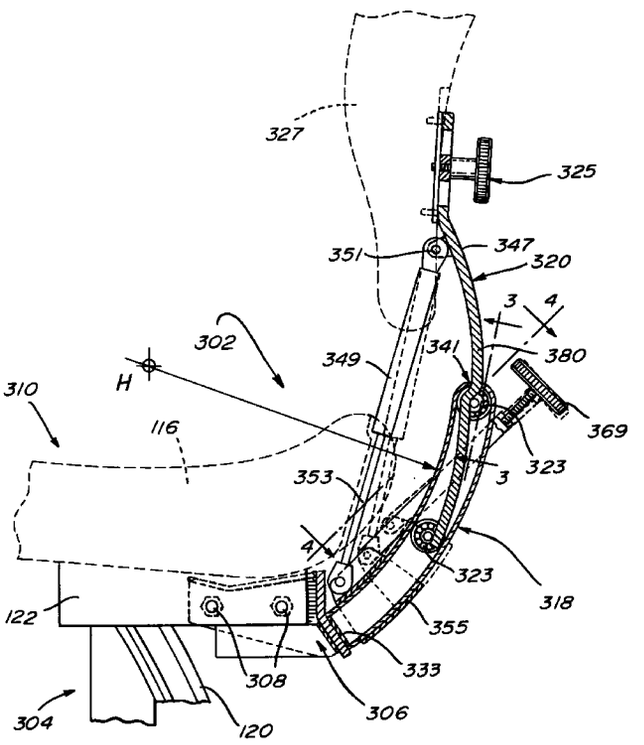

Fig. 1

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a chair which can shift in response to a person sitting on the chair, the chair also comprising a backrest which pivots about an axis coincident with the H point axis relative to the chair.

2. Description of the Prior Art

An improvement in terms of a working station chair but which must still be classified as a rocking chair is the chair described in U. S. Patent 4,738,487, issued April 19, 1988 to Shalinsky et al. In the Shalinsky et al patent, the chair is pivoted at the base such that the seat "rocks" forwardly and rearwardly to follow the person's center of gravity. The Shalinsky et al chair is limited as to height since the arc of travel of the seat is determined by the radius from the pivot point on the base.

Another category of chairs for work stations which aims to allow passive forward and rearward movement of the seat in order to follow the attitude of the person leaning forward in a working mode or leaning back in a rest mode, includes the Serber U. S. Patent 4,650,249, issued March 17, 1987, and the Cowan et al U. S. Patent 5,048,893, issued September 17, 1991. In these patents, an arcuate track is provided at the top of the post and a carriage travels in the track with a seat mounted on the carriage. The arrangement allows the seat to passively adjust itself with the person's body in relation to changes in the center of gravity of the body.

However, it has been found that although the above chairs provide reasonable adjustment in the fore and aft directions and allow for tilting of the seat, they provide a compromise in terms of vertical adjustment. In fact, when a person leans forward to work, there is a vertical upward component to the movement. This movement is a somewhat rotational movement pivoting about the knees or ankles of the person. Likewise, when the person leans back in a rest position, there is a natural downward vertical component to the movement which is a rotation in the opposite direction pivoting about the ankles or knees.

Conventional backrests rotate around an axis located below the seat or at the back thereof. Upon tilting of such a backrest, the movement of the dorsal support member of the backrest is greater than that of the upper part of the body of the user in contact with the dorsal support member. The greater relative movement of this dorsal support member, as compared to that of the upper body of the user, is a disadvantage, since discomfort is produced from that friction. For example, the relative movement of the dorsal support member tends to pull out the shirt tail tucked inside the pants of the user leaning against the backrest.

It has been previously realized that when the backrest pivots about an axis which is essentially coincident with an axis passing through the hips (H point) of a person properly positioned on the chair, the movement of the backrest then coincides with the movement of the body, such that no such relative movement occurs between the dorsal support member and the upper part of the body of the user. Therefore, no friction occurs and no discomfort is felt. U. S. Patents 5,024,484 and 5,052,753, both by Jurek Buchacz, describe a backrest which pivots about a point above the seat and in front of the backrest and including the H point. However, the mutual adjustment means permitting the sliding of the backrest in the seat in U. S. Patent 5,052,753, as well as the frame members and runners described in U. S. Patent 5,024,484, offer too much friction to permit a smooth operation of the backrest. Furthermore, the backrests taught in these two United States patents are mounted on conventional seats or on seats which also pivot about the H point axis.

A chair and backrest assembly is subject of our International Application No. PCT/CA94/00453, filed August 22, 1994. The backrest described herein is an improvement over our earlier backrest.

The H point, actually an H axis, is defined as the pivot center of the torso and thigh [Society of Automotive Engineers (SAE) Handbook, 1986, p. 34.55]. As seen in Fig. 1 of the SAE Handbook (p. 34.33), the H point is defined as the point of intersection of the torso line and the hip axis. It is important to note that, while anatomical characteristics such as lower leg segment or thigh segment can vary significantly according to the user, the H point remains relatively constant. Thus, by taking into account parameters such as the cushion compression of the seat upon proper sitting of the user, and the buttocks segment of the majority of users (for example, the 95th percentile), the definition and location of the H point of the majority of users can be accurately predicted. From this H point, an H point relative to the chair can be positively located on the chair.

SUMMARY OF THE INVENTION

It is an aim of the present invention to provide a chair structure which can be combined with a horizontal adjustment mechanism such as described in the Cowan et al U. S. Patent 5,048,893.

It is still a further aim of the present invention to provide a chair with a backrest such that the backrest provides a passive adjustment in the horizontal plane in response to a shift in gravity of the person sitting on the chair.

It is an additional aim of the present invention to provide a chair with a backrest such that the passive adjustment in the horizontal plane of the backrest in response to a shift in gravity of the person sitting on the chair accompanies the passive adjustment in the vertical plane of the chair.

It is yet another additional aim of the present invention to provide a backrest for a chair which pivots around

the H point relative to the chair.

In a chair construction of the present invention, there is provided a backrest for a chair whereby the backrest will tilt rearwardly and downwardly in response to a rearward shift in the weight of a person sitting on the chair, the tilt of the backrest following a rotational movement about an axis essentially coincident with the H point relative to the chair, the chair including support means, the backrest having mounting means, a track fixedly connected to the mounting means, the tack defining a circular arcuate segment having a radial center essentially coincident with the H point relative to the chair, a follower element having a first and a second end, the first end being mounted to a dorsal support member, the second end being slidable on the track, low friction sliding means provided between the second end and the track, whereby the backrest will tilt rearwardly and downwardly in response to a rearward shift in the weight of a person leaning against the dorsal support member; the backrest further comprising resilient means extending between the follower element and the track such that the dorsal support member is maintained in an uppermost equilibrium position with a person sitting erect on the chair in a work position and whereby the follower element will slide downwardly along the track in response to a rearward shift in the weight by the person when the person moves from a work position to a rest position on the chair against the resistance provided by the resilient means, and the dorsal support member and follower element will return to the uppermost equilibrium position as the person leans forward to the work position from the rest position.

The term "chair" as found in the specification and claims is intended to include seating devices in general.

Other features and advantages of the invention will be apparent from the description of the preferred embodiments given hereinafter. However, it should be understood that the detailed description, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this description of the preferred embodiments.

BRIEF DESCRIPTION OF THE DRAWINGS

Having thus generally described the nature of the invention, reference will now be made to the accompanying drawings, showing by way of illustration, a preferred embodiment thereof, and in which:

Fig. 1 is a side view of an embodiment of a backrest adapted to be mounted on a chair;

Fig. 2 is a side view of the backrest of Fig. 1 in a different operative position;

Fig. 3 is a cross-sectional view taken along line 3-3 in Fig. 1;

Fig. 4 is a cross-sectional view taken along line 4-4 of Fig. 1; and

Fig. 5 is a cross-sectional view taken along line 5-5 of Fig. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference will now be made to Figs. 1 to 5. A preferred embodiment of a backrest 302, adapted to be mounted on a chair 310 is illustrated. The chair 310 includes a support 304, and a seat 116 mounted thereon. The backrest 302 also includes a mounting member 306 adapted to be mounted on the support 304. In Figs. 1 and 2, an embodiment of the mounting member 306 is shown as including fasteners 308 securing the mounting member 306 of the backrest 302 to the seat pan 122.

The backrest 302 also includes a track member 318 fixedly mounted to the mounting member 306 and into which the follower element 320 slides. The follower element 320 is welded or otherwise fixed to a low friction device, such as ball bearings 323. The follower element 320 is fixedly mounted at its top end to a vertical adjustment device 325 for the dorsal support member 327. The vertical adjustment device 325 permits a lowering or a raising of same in relation with the height or desire of the user.

The track member 318 includes a housing 329 comprising two end walls 331 and 333, a bottom wall 335, a top wall 337, and side walls 339 (339a representing the right-hand side wall), as best exemplified in Figs. 1, 2, and 5. The end wall 331 of the housing 329 is provided with an opening 341 through which the follower element 320 can pass.

The track member 318 defines a segment of a circular arc having a radial center essentially coincident with the H point of the chair. The follower element 320 is provided with ball bearing members 323 mounted on a shaft 343, the shaft 343 being welded or otherwise fixed to the follower element 320. The side walls 339 of the housing 329 can also include a Teflon (a trade-mark of E. I. duPont de Nemours) strip 345 which reduces the friction between the ball bearing member 323 and the adjacent side wall 339.

It is noted that the follower element follows a circular path which also has a radial center essentially coincident with the H point relative to the chair.

The top portion 347 of the follower element 320 rotatably mounts an air cylinder 349 through a bracket 351 or other mounting member. The air cylinder 349 also includes a piston 353 rotatably mounted on a carriage 355. The carriage 355 is provided with a side wall 357, a top wall 359, and a bottom wall 361, thereby encasing the housing 329. As best exemplified in Figs. 4 and 5, the top wall 361 of the carriage 355 is provided with a channel-shaped recess 363 with side walls 365, the side walls 365 of the recess 363 rotatably mounting the piston 353 by way of fasteners 367.

As seen in Figs. 1, 2, and 4, the carriage 355 is adapted to slide on the housing 329 by means of a knob

369 mounting a bolt 371 which is threaded and passes through a threaded bore 373 in a yoke member 375. The yoke member 375 also comprises legs 377 which are mounted on the top wall 361 of the carriage 355 by way of fasteners 379. The end of the threaded bolt 371, opposite the knob 369, is provided with a retaining member 381, such that a clockwise movement of the knob 369 translates into the yoke member moving in a rearward direction, thereby dragging along the carriage 355 between the position shown in full lines in Figs. 1 and 4 and the position shown in dotted lines in the same Figs. These two positions represent the extreme of the adjustment of the carriage 355 and, therefore, of the air cylinder 349 (also shown in full and dotted lines in Fig. 1).

Thus, as a result of the rearward movement of the carriage 355 along the housing 329, by adjustment of the knob 369, the cylinder 349 will move towards the dotted line position in Fig. 1 and become pre-compressed by the action of the carriage 355 moving on the housing 329.

In operation, a person using the chair will assume a sitting, working position. In such a position, the person is upright or leaning forward over a work table. In such a case, the air cylinder 349 should be sufficient to maintain the backrest in its uppermost position, and thus the follower element 320 will be in its uppermost position as shown in Fig. 1. The backrest is adjusted for a lighter person. The air cylinder 349, because of its resistance, maintains the backrest erect. When the person leans back to a rest position, as shown in Fig. 2, the resistance of the air cylinder 349 is overcome by the action moment and the backrest 302 will move downwardly, the follower element 347 moving downwardly along the arcuate path traced by the track 318. As noted, the sliding movement of the follower element 320 in the track 318 is in a circular arc with the center H at the hip point relative to the chair. The downward movement of the backrest 302 results in a compression of the cylinder 349, as shown in Fig. 2.

Once the person leans forward away from a rest position to an erect or work position, the air cylinder 349 will extend to move the follower element 320 along with the dorsal support member 327 to its original upright position as shown in Fig. 1 in full lines and in dotted lines in Fig. 2.

As noted above, Fig. 2, and Fig. 1 in solid lines, show the backrest 302 adapted for a lighter person. In the event that a heavier person is to use the chair, the knob 369 is rotated so as to move the carriage 355 towards the extreme position shown in dotted lines in Fig. 1 or an intermediate position therebetween. The cylinder 349 will thus be pre-compressed relative to its position shown in full lines in Fig. 1, thereby increasing the resistance to the downward movement of the follower element 320 along the track 318. Thus, the air cylinder 349 can be adjusted to provide equilibrium for heavier persons using the chair by merely adjusting the knob 369. Thereafter, the operation is the same as previously described.

Having described the preferred embodiments of the present invention, it will appear to those ordinarily skilled in the art that various modifications may be made to the disclosed embodiments, and that such modifications are intended to be within the scope of the present invention.

Claims

1. A backrest (302) on a chair, the chair having a seat (310) and a support (304) therefor, the backrest (302) comprising mounting means (306) adapted to be fixedly secured to the support (304), characterized in that a track (318) is fixedly connected to the mounting means (306), the track (318) defining a circular arcuate segment having a radial center essentially coincident with the H point relative to the chair, a follower element (320) having a first and a second end, the first end being mounted to a back support member (327) and the second end being slidable on the track (318), low friction sliding means (323) provided between the second end and the track (318), the backrest (302) further comprising resilient means (349, 353) extending between the follower element (320) and the track (318) such that the back support member (327) is maintained in an uppermost equilibrium position with a person sitting erect on the chair in a work position and whereby the follower element (320) will slide downwardly along the track (318) in response to a rearward shift in the weight by the person when the person moves from a work position to a rest position on the chair against the resistance provided by the resilient means (349, 353), and the back support member (327) and follower element (320) will return to the uppermost equilibrium position as the person leans forward to the work position from the rest position.

2. A backrest as defined in claim 1, wherein positive adjustment means (355, 369) are provided for adjusting the resilient means (349, 353) such that the uppermost equilibrium position of the follower element may be maintained in response to different body loads of users of the chair.

3. A backrest as defined in claim 1, wherein the resilient means (349, 353) is a gas cylinder (349) and piston (353) with the piston (353) connected to a carriage (355) slidable on a second track (329) and the cylinder (349) is mounted in the follower element (320), the second track (329) defining a circular arcuate segment which is coaxial to that of said track (318).

4. A backrest as defined in claim 2, wherein the means to adjust the resilient member (349, 353) for different body loads includes a carriage (355) slida-

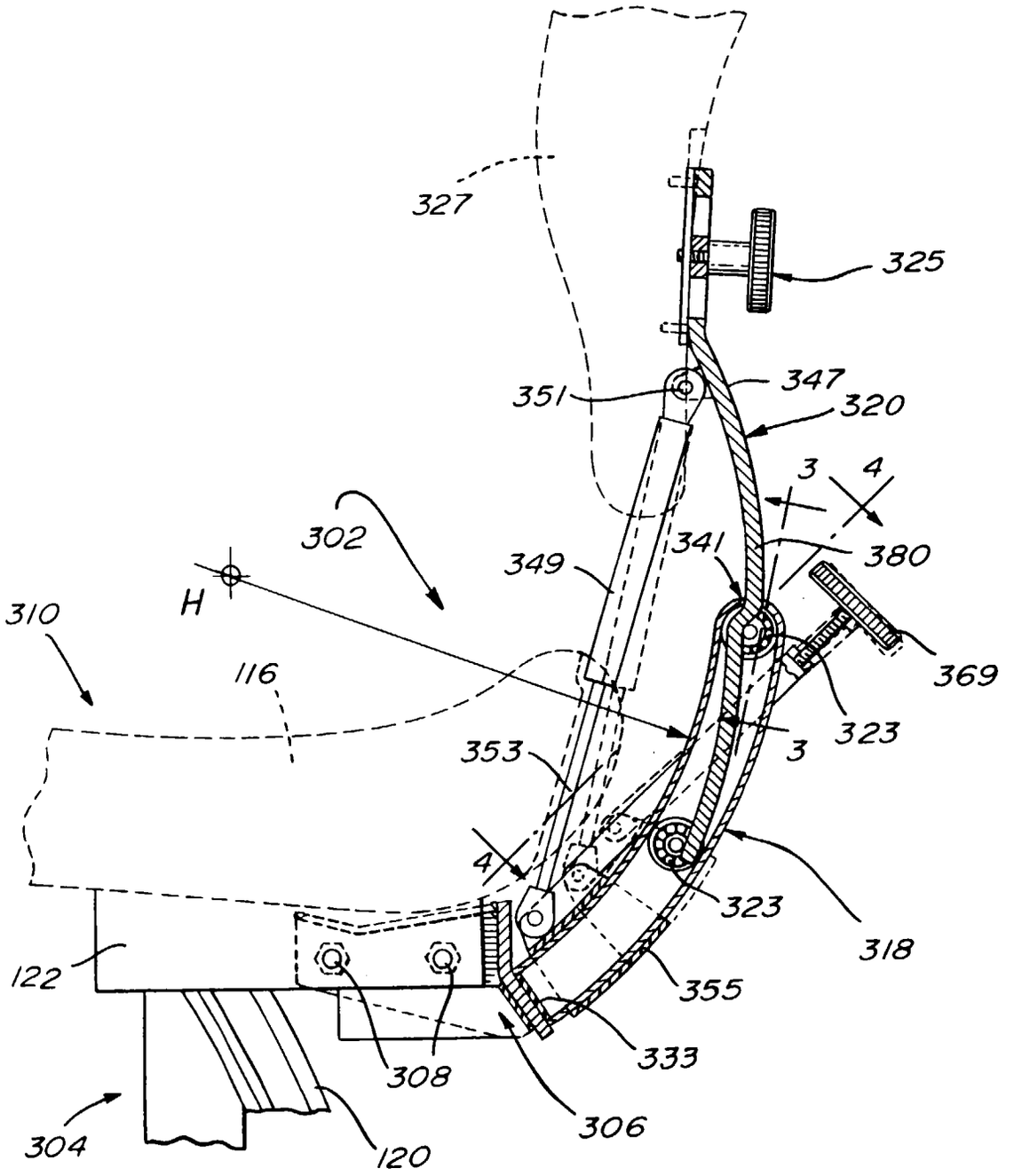
ble on a second track (329), the second track (329) defining a circular arcuate segment which is coaxial to that of said track (318), wherein the carriage (355) receives one end of a piston (353) and gas cylinder (349) such that by moving the carriage (355) in a rearward direction, the gas cylinder (349) will be compressed, thereby increasing the resistance of the gas cylinder (349) for providing resistance to a greater load.

5. A backrest as defined in claim 4, wherein the movement of the carriage (355) is operated by a yoke member (375) having two arms (377), the two arms (377) being connected to the carriage (355), the yoke member (375) having a threaded bore (373) through which a threaded shaft (371) is rotatably engaged, the threaded shaft (371) being mounted at one end to a handle means (369) and at another end to a retaining member (381), such that a clockwise rotation of the handle means (369) translates into a clockwise rotation of the threaded shaft (371) and a rearward direction of the yoke member (375), thereby translating into a rearward direction of the gas cylinder (349) and a compression thereof.

6. A backrest as defined in claim 1 or 5, wherein the low friction device (323) comprises at least one shaft (343) fixed to the follower element (320) and ball bearing wheels (323) mounted at each end of the at least one shaft (343), such that the ball bearing wheels (323) will roll along the track (318).

7. A backrest as defined in claim 3, wherein said track (318) comprises a housing (329) having inner and outer surfaces, bottom (335), top (337), and side walls (339), the follower element (320) sliding along the inner surface of the housing (329); the inner surface of the housing (329) defining said track (318), the carriage (355) encasing the housing (329) and adapted to slide on the outer surface thereof, whereby the outside surface of the housing (329) defines the second track.

8. A backrest as defined in claim 7, wherein the inner surfaces of the side walls (339) are coated with a low friction substance (345).


327
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355
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308
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120

Fig. 1

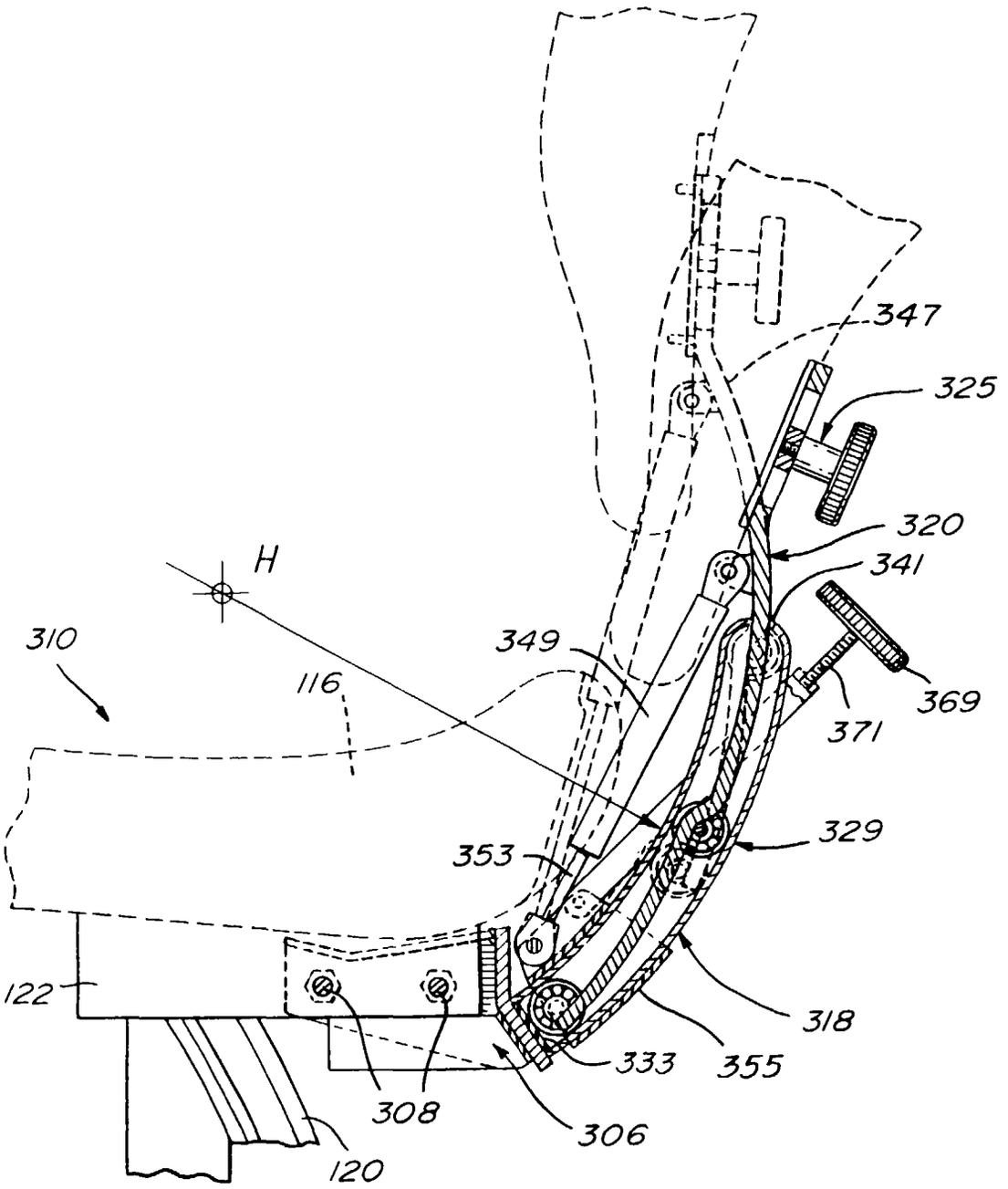
347
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Fig. 2

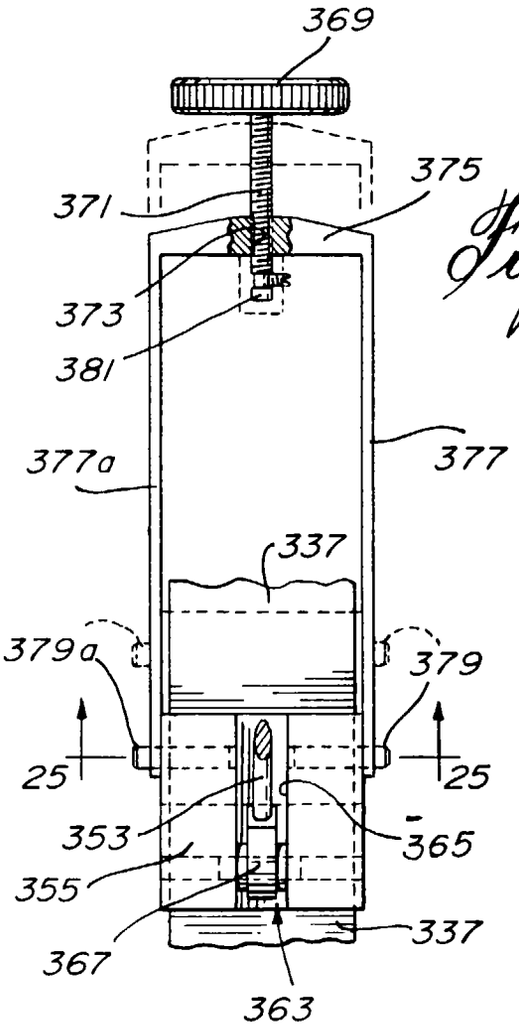

Fig. 4

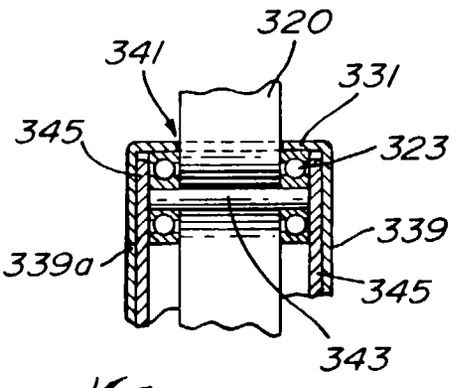

Fig. 3

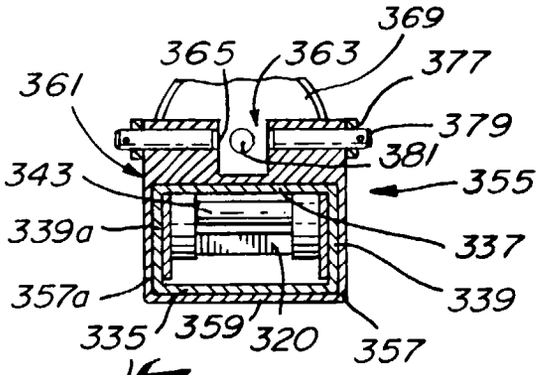

Fig. 5

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 30 2640

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	CH-A-663 526 (PROVENDA MARKETING AG) * page 3, line 28 - line 48; claims 1-3; figure 1 * ---	1	A47C1/024 A47C7/40
A	EP-A-0 517 934 (SIEMENS AKTIENGESELLSCHAFT) * column 2, line 23 - column 5, line 24; figures 1,4,5 * -----	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

A47C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	11 September 1996	Mysliwetz, W

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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