May 19, 1964 H. J. NAEF 3,133,764

ARTICULATION DEVICE FOR A CHAIR WITH A TILTING BACK

Filed Oct. 16, 1961

FIG 4

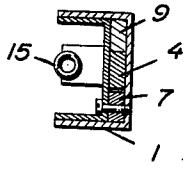


FIG 3

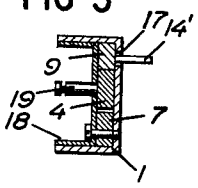


FIG 1

FIG 2

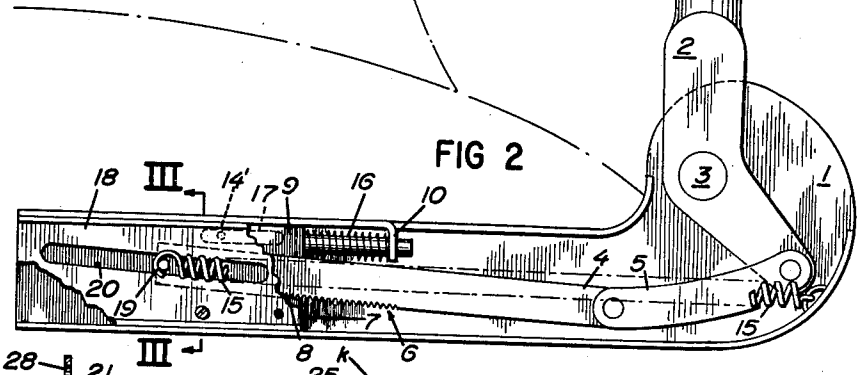


FIG 6

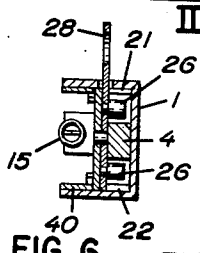


FIG 5

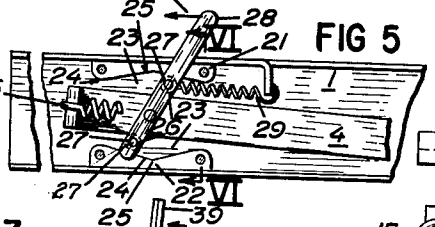


FIG 7

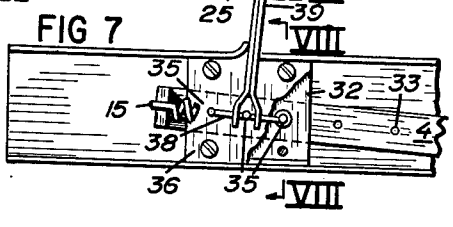
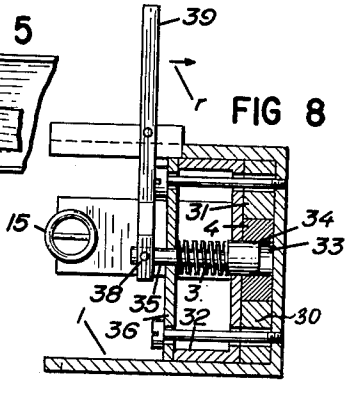


FIG 8



Hans J. Naef
INVENTOR

BY Irwin S. Thompson
ATTORNEY

United States Patent Office

3,133,764

Patented May 19, 1964

3,133,764

ARTICULATION DEVICE FOR A CHAIR WITH A TILTING BACK

Hans J. Naef, Zurich, Switzerland, assignor to Krestis Anstalt, Vaduz, Liechtenstein, a corporation of Liechtenstein

Filed Oct. 16, 1961, Ser. No. 145,128
Claims priority, application Switzerland Oct. 25, 1960
21 Claims. (Cl. 297—367)

There actually exist numerous types of articulation devices for chairs with tilting backs, and particularly for touring automobiles. However, most of them present serious drawbacks, the main ones of which are:

(*a*) Too large an overall size, which makes the use of chairs with tilting backs as berths very difficult. In fact, certain portions of the articulation devices project above the seat cushions and the back cushions, when the latter are placed in the plane of the seat in order to form a berth. This of course is not acceptable from the point of view of esthetics, and especially from the point of view of comfort.

(*b*) Generally complex designs, necessitating consequent machining and assembling, which is the cause of too high a manufacturing cost for the fitting-out of cars produced in great numbers.

The present invention has for its object an articulation device for a chair with a tilting back comprising a fixed member fast with the seat and a mobile member fast with the back, pivoted the one with respect to the other and connected together through an elastic return device tending to push the back onto the seat of the chair. Another object is to remedy the aforementioned drawbacks by the fact that the invention comprises a device which linearly locks the angular positions of the mobile member with respect to the fixed member and by the fact that the elastic return device as well as the linear locking device are wholly located inside of the elements forming the frame of the chair.

The annexed drawings shows schematically and by way of example two embodiments of the articulation device which is the object of the invention, as well as two variants of the linear locking device.

FIG. 1 is a top view of the first embodiment of the articulation device.

FIG. 2 is a top view of the second embodiment of the articulation device.

FIG. 3 is a section along line III—III of FIG. 2.

FIG. 4 is a section along line IV—IV of FIG. 1.

FIG. 5 shows a variant of the linear locking device.

FIG. 6 is a cross-section along line VI—VI of FIG. 5.

FIG. 7 shows a second variant of the linear locking device.

FIG. 8 is a cross-section along the line VIII—VIII of FIG. 7.

The articulation device according to the embodiments illustrated comprises a fixed member **1** and a mobile member **2** respectively connected rigidly with the seat and the back of the chair. The chair comprises a frame formed of a seat member and of a back member which carry the cushioning springs and the cushions themselves.

The fixed member **1** is preferably directly formed as an element of the seat, whereas the mobile member **2** is constituted by a tubular element of the back of the chair. This arrangement is of particular interest, since it enables the elimination of any casing or protecting element for the articulation device itself.

The fixed member **1** is constituted by one of the elements of the seat member having a cross-section of the general shape of a U and one extremity of which constitutes the protective casing of the articulation device. The back part of the U-shaped sectional iron is located towards the outside of the seat.

The mobile member **2** is constituted by one of the tubular elements of the back member, the extremity of which is flattened and pivoted on the fixed member **1** by means of an axle **3** constituted for example by a rivet.

The articulation device comprises further a linear locking device which controls the relative angular positions of the fixed member **1** and the mobile member **2** and an elastic return device tending to push the back against the seat on the chair.

In the first embodiment, illustrated in FIGS. 1 and 4, the device locking the relative angular positions of the fixed and mobile members comprises a toothed bar **4** mechanically connected to the mobile member **2** by the intermediary of a coupling rod **5**. The toothing **6** of the bar **4** is formed in its lower edge and is located in front of a toothed locking segment **7** made fast with the fixed member **1** by any known means. The segment **7** presents, on its side directed towards the toothing **6** of the bar **4**, a toothing **8** identical to said toothing **6**. A locking wedge **9** abuts, on the one hand, on one wing of said U of said fixed member **1** and, on the other hand, on the edge of the bar **4** opposite the one carrying the toothing **6**. The locking wedge **9** is subjected to the action of a spring **16** resting on a downwardly bent portion **10** of the top wing of the fixed member **1**. Spring **16** tends to displace the wedge **9** in the direction of the arrow *f*, which causes the toothed bar **4** to be applied against the toothed locking segment **7**. A linking rod **11** mechanically connects the locking wedge **9** to an arm **12** fast with a control rod **13**, pivoted on the fixed member **1** and provided at one of its extremities with an operating member **14**.

The locking device is said to be linear since in order to control the relative angular positions of the fixed and mobile members, the relative rotational movement is converted by means of coupling rods into a relative linear displacement. The locking is then effected between two parts, the relative displacements of which are approximately rectilinear.

In the case where it is necessary to provide an articulation device at each side of the chair, it is possible to control the displacements of the locking wedges **9** of the two articulation devices, simultaneously from only one operating member through the intermediary of the control rod **13** which in this case would be angularly fast with an arm **12** of each of the articulation devices and would connect these two devices while being located in the inside of elements constituting the frame of the chair.

The elastic return device is constituted by a coil spring **15** one extremity of which is fixed at the free extremity of the toothed bar **4**, whereas the other extremity of spring **15** is attached to the fixed member **1**. This coil spring **15** tends to push the back against the seat of the chair.

The attaching points of coil spring **15** are such that it is not exactly parallel to the axis of the bar **4** when the latter is in a locking position. Thus a small component of the force of said spring tends to maintain the toothed bar **4** continuously in contact with the locking wedge **9**.

The operation of the articulation device described is the following:

In rest position, the chair is maintained in a predetermined position, in fact, the locking wedge **9** applies, under the action of the spring **16**, the toothed bar **4** against the toothed locking segment **7**. The toothings **6** and **8** carried respectively by bar **4** and locking segment **7** cooperate one with the other to prevent any rectilinear displacement of bar **4** with respect to said locking segment **7**,

so that a particular relative angular position of the fixed and mobile members is maintained.

When the user wants to change the slope of the back of the chair, he actuates the operating member **14** in the direction of the arrow *g*, which displaces the locking wedge **9** against the action of the spring **16**. From that moment, the bar **4**, which is continuously maintained in contact with the locking wedge **9** by means of the coil spring **15**, displaces itself in the direction of the arrow *i* and its toothing **6** escapes the toothing **8** of the locking segment **7**. The bar **4** is thus able to displace itself longitudinally with respect to the locking wedge **9**, thus enabling the back to be displaced angularly with respect to the seat of the chair.

The user chooses the new back position he wants and then releases the operating member. The locking wedge **9** displaces itself under the action of the spring **16** and applies the bar **4** against the locking segment **7**. The toothings **6** and **8** of these two parts are again engaged the one with the other and any relative longitudinal displacement of the bar **4** and the locking segment is again prevented. The chair is again in a locking position, the respective angular positions of the back and of the seat being fixed.

The second embodiment illustrated in FIGS. 2 and 3 is similar to the one described above and differs from it only in the way in which the displacement of the locking wedge **9** is obtained. In fact, in the second embodiment of the articulation device for the chair, the operating member **14'** is constituted by a rod fast with the locking wedge **9** and projecting out through a slot **17** provided in the back part of the U-shaped element constituting the fixed member **1**.

Further, a guide **18** may be mounted within the fixed member **1** which serves to maintain the bar **4** in a plane containing the locking wedge **9** and the locking segment **7**. Further, the coil spring **15** is fixed on the free extremity of the toothed bar **4** through the intermediary of a finger **19** rigid with the bar **4** and extending out through an opening **20** provided in the guide **18**.

Although the foregoing arrangement adopted for the second embodiment does not allow simultaneous control of two articulation devices disposed on opposite sides of a chair, it enables an important reduction in size, resulting from the absence of the linking rod **11**, the arm **12**, and the control rod **13**.

This embodiment involves a lower manufacturing cost than the first one due to the omission of the above mentioned elements.

The actual tendency of the manufacturers of automobiles to accept and even to promote a locking of the positions of a back with respect to the seat on only one side of the chair which has until now been considered as inacceptable, renders the second embodiment of the articulation device very important. This tendency has been more and more expressed since the time when seats of two or more places have appeared in order to replace the seats of two chairs.

In the variant illustrated in FIGS. 5 and 6, the linear locking device is constituted by a bar **4** which does not comprise a toothing mechanically connected in the above described manner to the mobile member **2** of the chair by means of a rod. This bar is longitudinally displaceable between two bearing parts **21**, **22** rigidly connected to the fixed member **1**. Each of said bearing parts presents a housing **23** situated in front of the bar **4** and formed by two inclined planes **24**, **25** of opposite slope. In the space comprised between the bar **4** and each set of inclined planes **24**, **25**, a roller **26** is lodged and adapted to roll on the edge of the bar **4**. These rollers **26** are pivoted with clearance around axles **27** rigidly fastened to an operating member **28** itself pivoted on a flange **40** fixed at the inside of the seat element forming the fixed member **1**. A spring **29** tends to maintain the operating member **28** in such a position that one of the rollers **26** is

in contact, on the one hand, with the bar **4**, and on the other hand, with the inclined plane **25**, whereas the other roller **26** rests on the bar **4** and on the inclined plane **24**. In that position the locking of the bar **4** is realized by the wedging of the rollers **26** between the bar itself and the inclined planes **24**, **25** respectively. The longitudinal position of the bar **4** being fixed with respect to the fixed member **1**, it is obvious that the angular position of the mobile member **2** is then also established with respect to the fixed member **1**.

In order to free the bar **4**, it suffices to actuate the operating member **28** in the direction of the arrow *k* against the action of the spring **29**, which will displace the rollers **26** and place them in such a position that they are no longer in contact with the bar **4** and one of the inclined planes **24**, **25**. The user is also able to displace angularly the back of the chair with respect to the seat, the bar **4** being longitudinally displaceable between the bearing parts **21**, **22**. When the user has placed the back in its new position, he releases the operating member **28**, and the rollers **26** take again their active locking position in which they are in contact with the bar **4** and one of the inclined planes **24**, **25** under the action of the spring **29**. The longitudinal position of the bar **4** is again fixed, by wedging, with respect to the bearing parts **21**, **22** so that relative angular displacement of the fixed and mobile members can no longer occur.

This linear locking device is of special interset due to the fact that it is progressive, that is, that the back can be fixed in any angular position with respect to the seat within a possible adjusting zone.

In the variant illustrated in FIGS. 7 and 8 the linear locking device comprises a bar **4** mechanically connected to the mobile member in the above described manner. This bar **4** slides freely between two guides **30**, **31** and a guiding sectional iron **32**, and the bar is provided with equally spaced holes **33**. Fingers **34** are engaged in said guiding sectional iron **32** and each finger **34** is located on a separate control rod **35** engaged in a boring of a top plate **36**. Springs **37** urge the fingers **34** forwardly in the guiding sectional iron **32**, which is however only possible when one of the holes **33** of the bar **4** is located in alignment with a finger. The distance separating two successive fingers **34** is less than the pitch of the holes **33** of the bar **4**, so that only one finger **34** can be engaged at a time in a hole **33**. In this manner, it is possible to have a number of positions for which the bar **4** is locked, through the engagement of a finger **34** in a hole **33**, equal to the number of holes **33** multiplied by the number of fingers **34**.

The three control rods **35** carrying the fingers **34** are connected together by means of a rod **38**. An operating member **39**, pivoted on the fixed member **1**, is mechanically connected to the rod **38**.

In order to free the bar **4**, it suffices to displace the operating member **39** in the direction of the arrow *r*, which causes the displacement of the three fingers **34** against the action of the springs **37**. The bar and thus the back of the chair may then be displaced with respect to the fixed member until the back reaches the new desired position, whereupon the user releases the operating member **39**. The fingers **34** are then again subjected to the action of the springs **37**, and one of these fingers engages in one of the holes **33** of the bar **4** and fixes its position with respect to the fixed member.

The principal advantages of this articulation device with respect to similar devices actually existing are the following:

(1) The overall size is greatly reduced and all the elements of the articulation device can be directly lodged in the inside of elements of the chair frame.

(2) The number of component parts and accordingly the manufacturing costs are low; this comes from the fact that the fixed member, the mobile member and the protective housing for the articulation device are constituted

by elements of the seat and the back which are existing parts and manufactured independently of the articulation device.

(3) The assembling can be performed very quickly, due to the fact that there are only a few component parts, as well as from their arrangement.

(4) The possibility of obtaining, by means of the linear locking device, a very large number of different positions for the back of the chair. That number may even be unlimited in the case of the progressive linear locking device.

(5) Since the fixed member is an actual element of the seat, it is obvious that its dimensions are such that they do not constitute a handicap, whatever the position of the back may be. Until now, most of the fixed members were projecting when the backs were in the berth position, which is a very inconvenient arrangement.

(6) The mechanism being very simple, it is possible to make it very strong.

Two embodiments of the articulation device and two variants of the linear locking device have been described by way of example, but it goes without saying that numerous modifications could be made without departing from the scope of the claimed protection. The two essential features of this articulation device are that:

(*a*) All the parts are arranged in the inside of component elements of the chair.

(*b*) The locking device works linearly, that is, the relative displacement of the locking parts is rectilinear. Accordingly it is possible to place the locking device within an element of the chair frame, that is, inside an element of the seat or of the back.

Thanks to the form given to the mobile member it is possible to obtain, for a given size, a maximum length between the pivoting point 3 of the fixed and mobile members, one with respect to the other, and the pivoting point of the rod 5 on the mobile member 2. This arrangement provides a linear displacement of maximum amplitude, the size being fixed, for an angular displacement of the back with respect to the seat of the chair. Thanks to this arrangement it is possible, in the first embodiment, to provide the bar 4 with a toothing of ordinary size with dimensions adequate to ensure the solidity of the device, while having a small angular displacement of the back of the chair correspond to the passage from one locking position to the next one.

I claim:

1. An articulation device for a chair having a frame, a seat and a tilting back and comprising a fixed member fast with said seat and a mobile member fast with the back, said articulation device pivoting said mobile member with respect to said fixed member, and elastic return means connecting said fixed member to said mobile member for biasing the back onto the seat of the chair, said articulation device including means for linearly locking the angular positions of said mobile member with respect to said fixed member, said elastic return means and said linear locking means being wholly housed in the inside of elements forming said frame of the chair.

2. An articulation device as claimed in claim 1 which comprises means to transform the angular movement of said mobile member into a rectilinear movement.

3. An articulation device as claimed in claim 2 in which said linear locking means comprises means defining the angular positions of said back with respect to said seat.

4. An articulation device according to claim 3 in which said linear locking means comprises a toothed bar mechanically connected to said mobile member, and a toothed locking segment, said toothed bar being longitudinally displaceable in front of said toothed locking segment.

5. An articulation device as claimed in claim 4 and comprising a spring and a locking wedge subjected to the action of said spring, said toothed bar being in contact with said locking wedge, the action of said spring tending to displace said locking wedge in such a manner as to apply said toothed bar against said toothed locking segment.

6. An articulation device as claimed in claim 5 and comprising an operating member mechanically connected to said locking wedge of at least one of said articulation devices, said operating member being arranged to cause the displacement of said locking wedge against the action of said spring when said operating member is actuated.

7. An articulation device as claimed in claim 3 in which the operation of said locking means is progressive, so that it enables fixing said chair back in an unlimited number of angular positions with respect to said seat of the chair.

8. An articulation device as claimed in claim 7 and comprising a bar located between two bearing parts each presenting a housing limited by inclined planes provided in their faces situated in front of said bar.

9. An articulation device as claimed in claim 8 in which a roller is located in each of said housings between said bar and the said inclined planes.

10. An articulation device as claimed in claim 9 and comprising an operating member in which said rollers are pivoted on two axles fast with said operating member pivoted with respect to said fixed member on an axis passing between said two rollers.

11. An articulation device as claimed in claim 10 in which said operating member is subjected to the action of a spring tending to apply each roller against said bar, on the one hand, and on an inclined place on the other hand.

12. An articulation device as claimed in claim 3 in which said linear locking means comprises a bar sliding freely between two guides fastened on said fixed member and in which said bar contains a plurality of equally spaced holes.

13. An articulation device as claimed in claim 12, in which fingers are subjected to the action of springs tending to engage them in the said holes in order to fix the position of said bar with respect to said fixed member.

14. An articulation device as claimed in claim 13 in which the distance between two fingers is less than the distance between two successive holes of said bar.

15. An articulation device as claimed in claim 14 in which an operating member, pivoted on said fixed member, is mechanically connected to said fingers in order to displace them against the action of their springs.

16. An articulation device as claimed in claim 3 in which said elastic return means comprises a coil spring attached, on the one hand, to said fixed member, and, on the other hand, to the free extremity of said bar of said linear locking means.

17. An articulation device as claimed in claim 15 in which the axis of said coil spring is slightly displaced with respect to the axis of said bar, so as to produce a force component tending to apply said bar against said locking wedge.

18. An articulation device as claimed in claim 1 in which said fixed member comprises an element of said frame of said chair.

19. An articulation device as claimed in claim 1 in which said mobile member comprises an element of said tilting back.

20. An articulation device as claimed in claim 2 in which said rectilinear movement is a maximum for a given angular movement of the back of said chair.

21. An articulation device for a chair having a frame, a seat and a tilting back and comprising a fixed member rigidly connected to said seat and a mobile member rigidly connected to said back, said articulation device pivoting said mobile member with respect to said fixed member, and elastic return means connecting said fixed member to said mobile member for urging said back toward said seat, said articulation device compirsing the combination of means for linearly locking the angular

positions of said mobile member with respect to said fixed member, said locking means comprising two elements displaceable linearly the one with respect to the other and lockable in different positions the one with respect to the other, said frame comprising several hollowed members rigidly fastened together, and at least some of said hollowed members of said frame housing wholly said elastic return means and said linear locking means.

References Cited in the file of this patent

UNITED STATES PATENTS

648,715	Walton	May 1, 1900
1,271,561	Gage	July 9, 1918