United States Patent [19]

Mystrom

[11] **3,765,639**

[45] **Oct. 16, 1973**

[54] **VEHICLE CHAIR HAVING A RESILIENTLY SUPPORTED SEAT**

[76] Inventor: **Karl Gosta Mystrom,** Skeppargatan 13, Unea, Sweden

[22] Filed: **Nov. 9, 1970**

[21] Appl. No.: **88,116**

Related U.S. Application Data

[63] Continuation of Ser. No. 767,990, Oct. 16, 1968, abandoned.

[30] **Foreign Application Priority Data**

Oct. 17, 1967 Sweden 14216/67
Aug. 23, 1968 Sweden 11396/68

[52] **U.S. Cl.** **248/399**
[51] **Int. Cl.** **A47c 3/22**
[58] **Field of Search** 248/399, 400, 401, 248/376, 378

[56] **References Cited**

UNITED STATES PATENTS

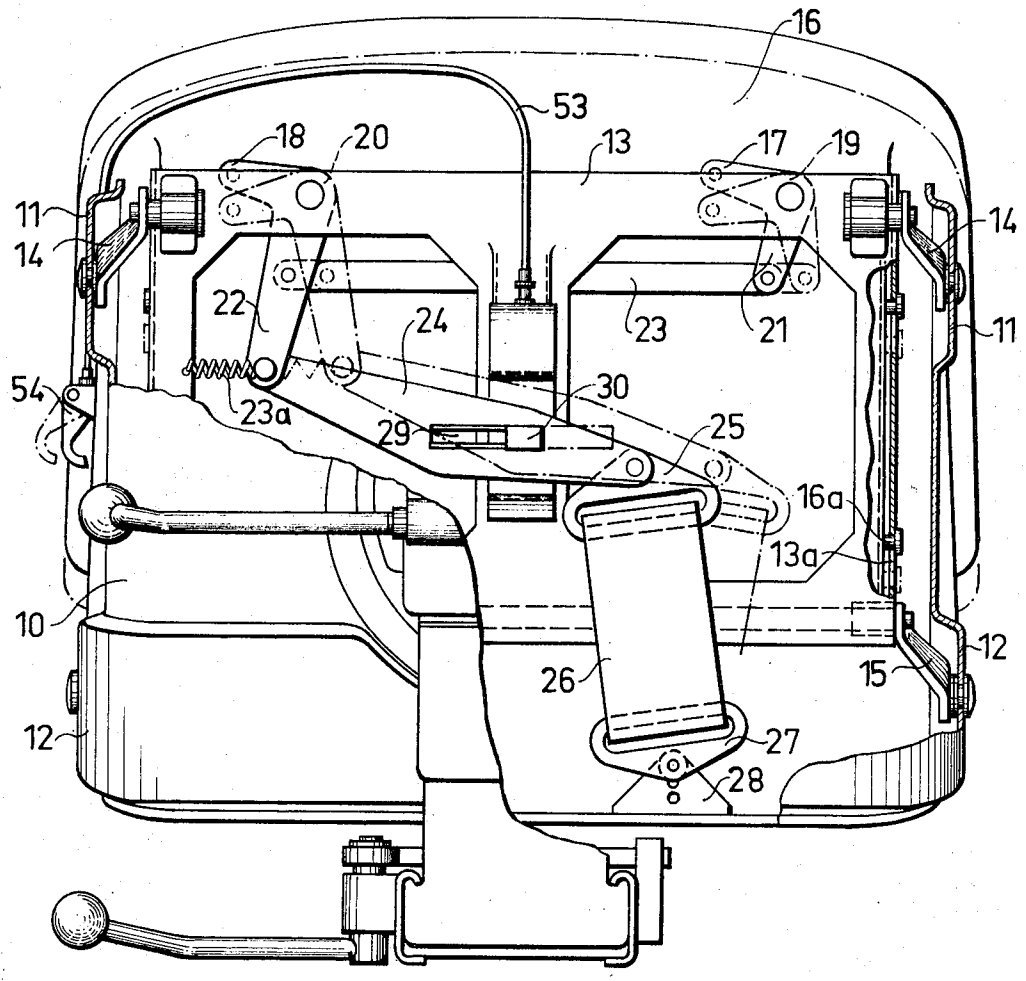
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Primary Examiner—Edward C. Allen
Attorney—Fred C. Philpitt

[57] **ABSTRACT**

A vehicle chair capable of automatic adjustment in accordance with occupant weight. The chair is supported by spring means acting through a lever. To adjust the chair for different occupant weight the lever is respositioned automatically by first releasing the normal coupling between seat, lever, and spring; and second, the lever is positioned in accordance with occupant weight. Then the coupling between seat, lever, and spring is reestablished for normal operation. In one embodiment the lever is moved relative to its pivot to adjust for weight variations. In another embodiment the application of force to the lever from the seat is shifted for purposes of compensation.

5 Claims, 12 Drawing Figures



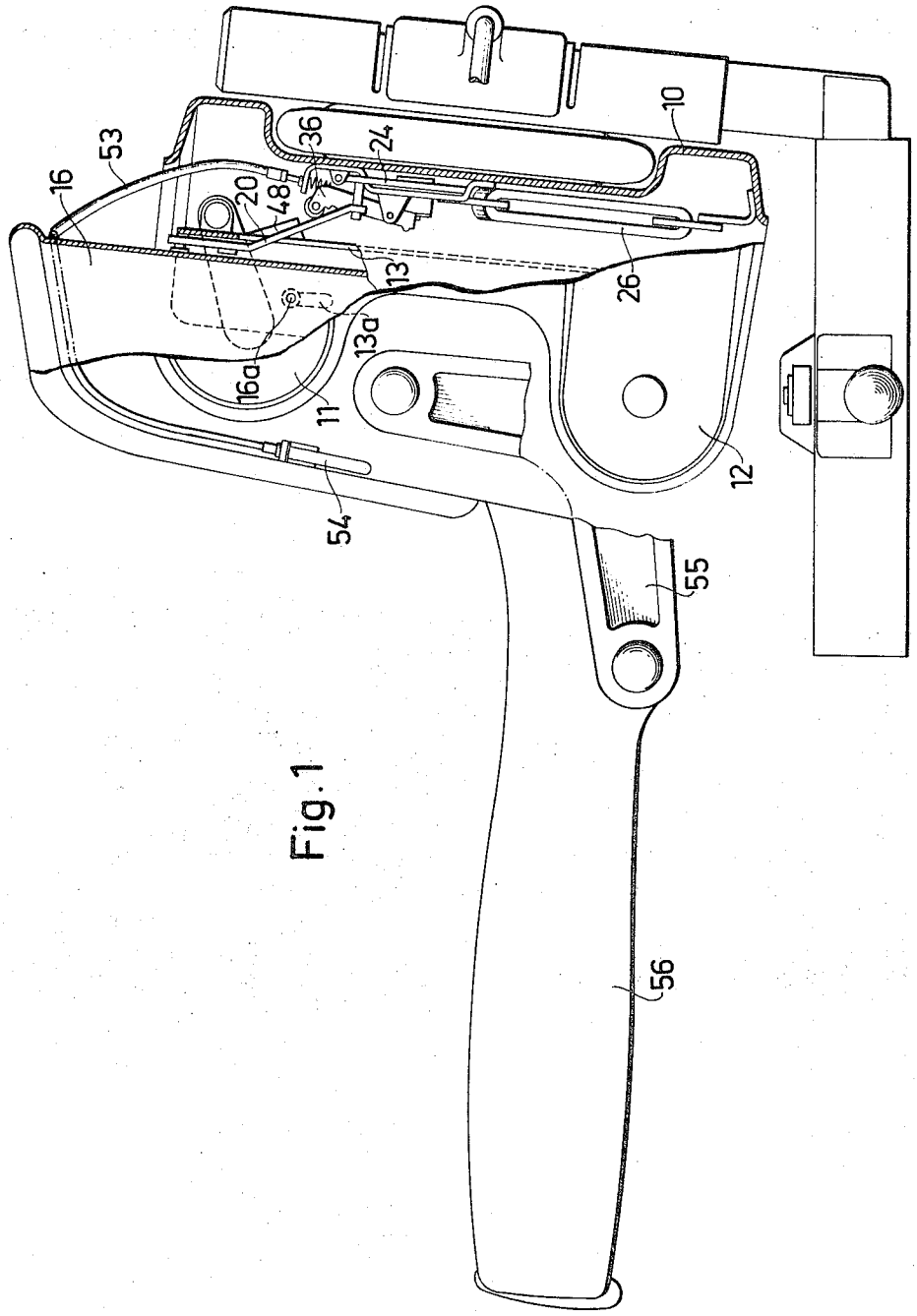


Fig. 1

Fig. 2

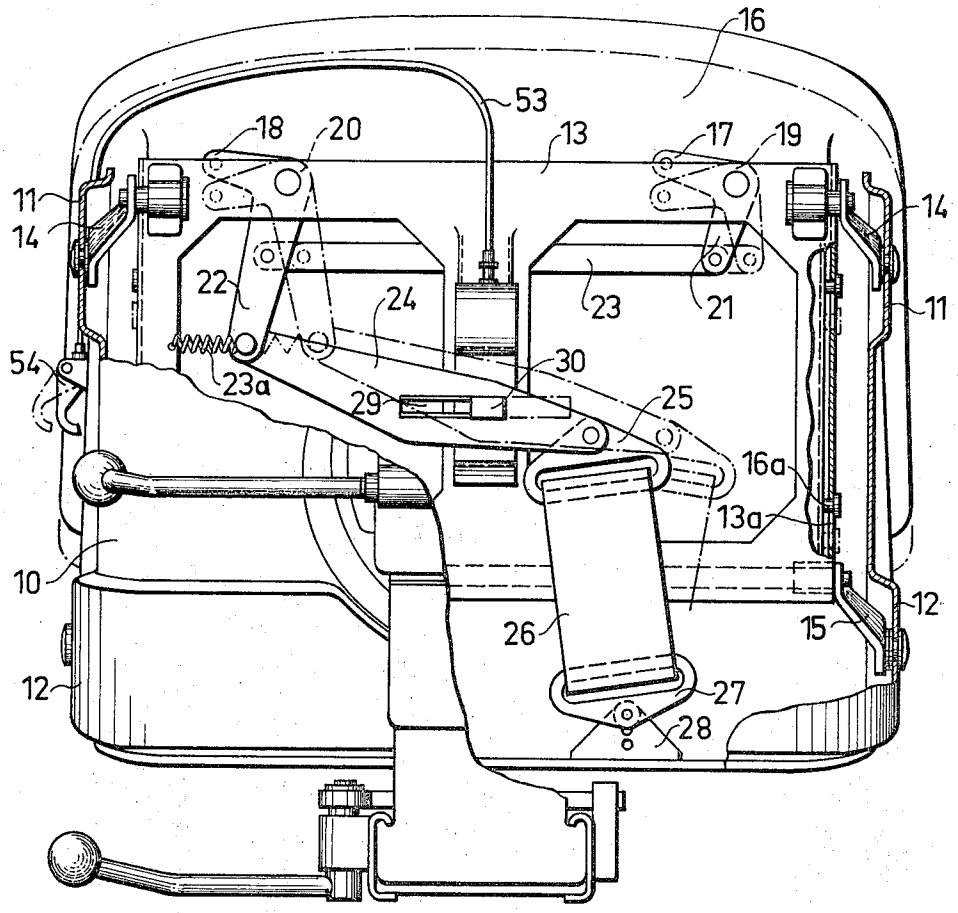

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Fig. 3

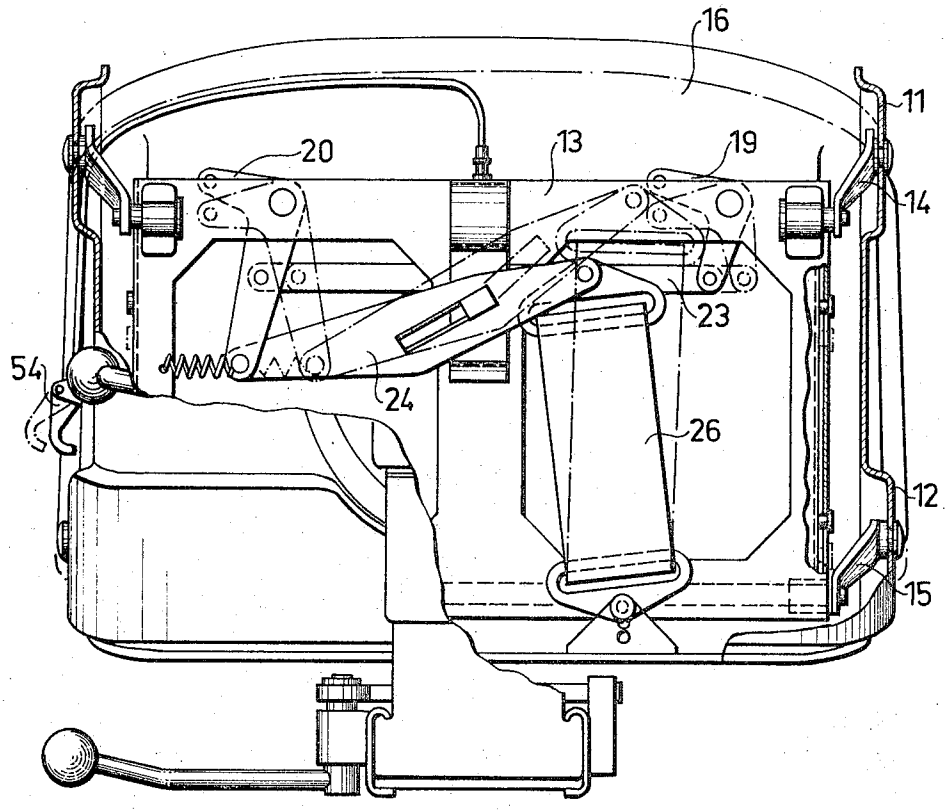


Fig. 4

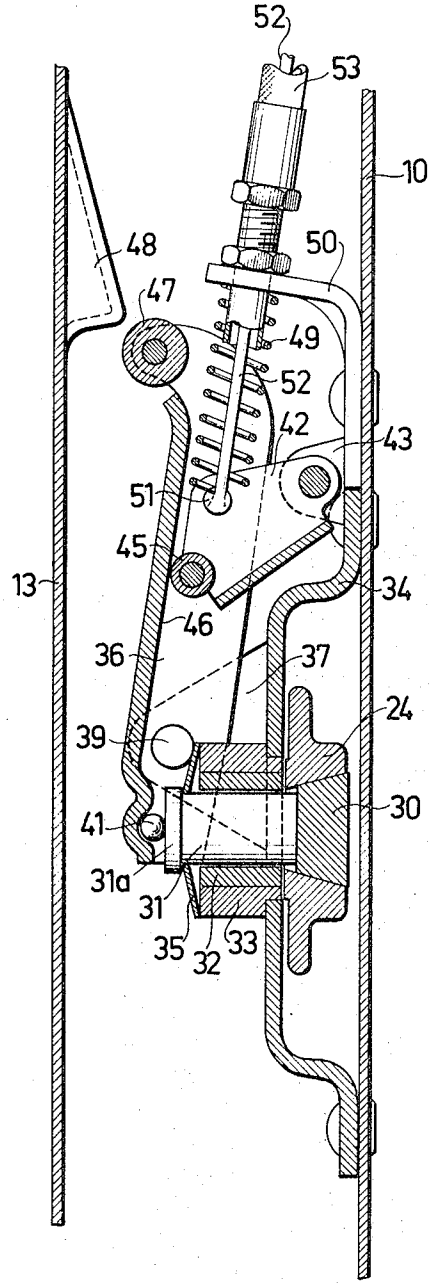
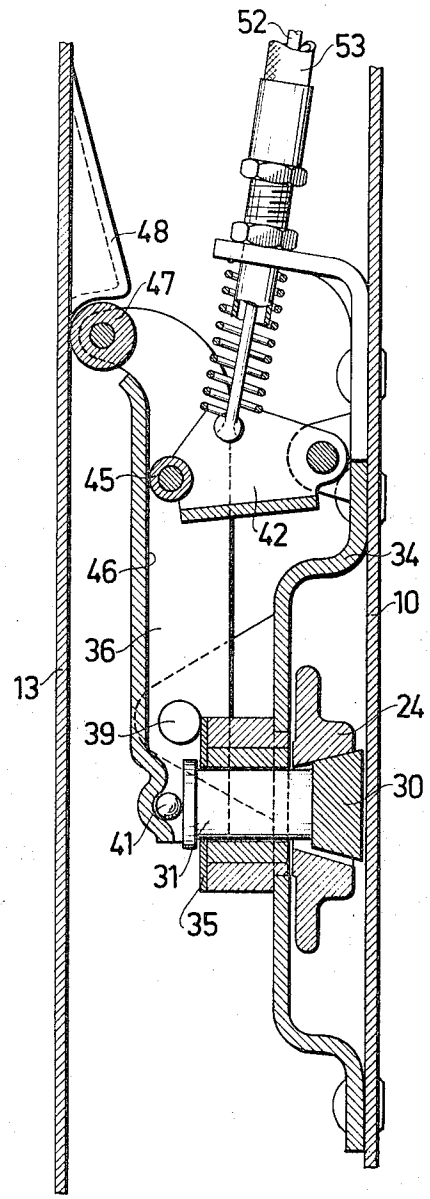

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Fig. 5


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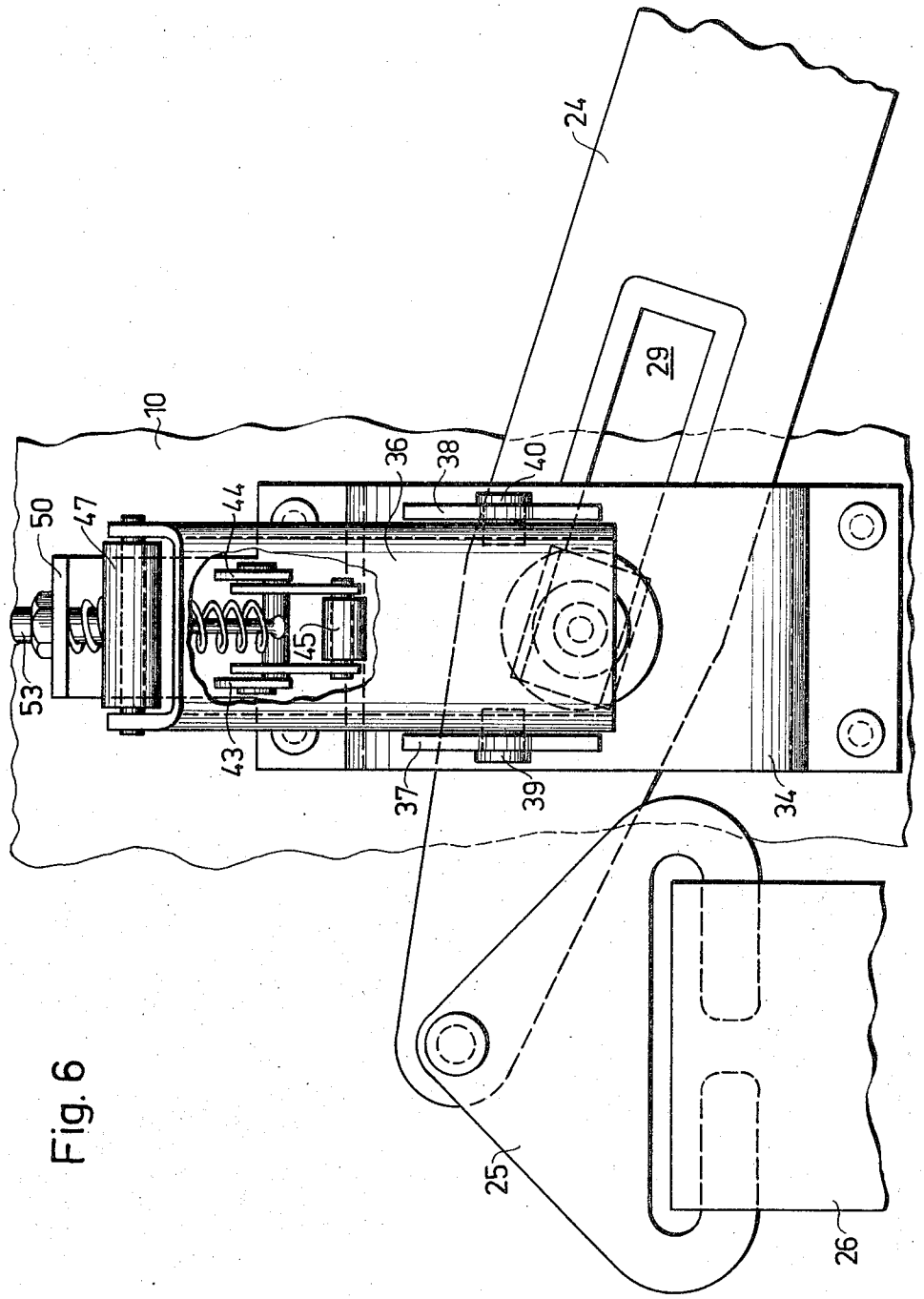


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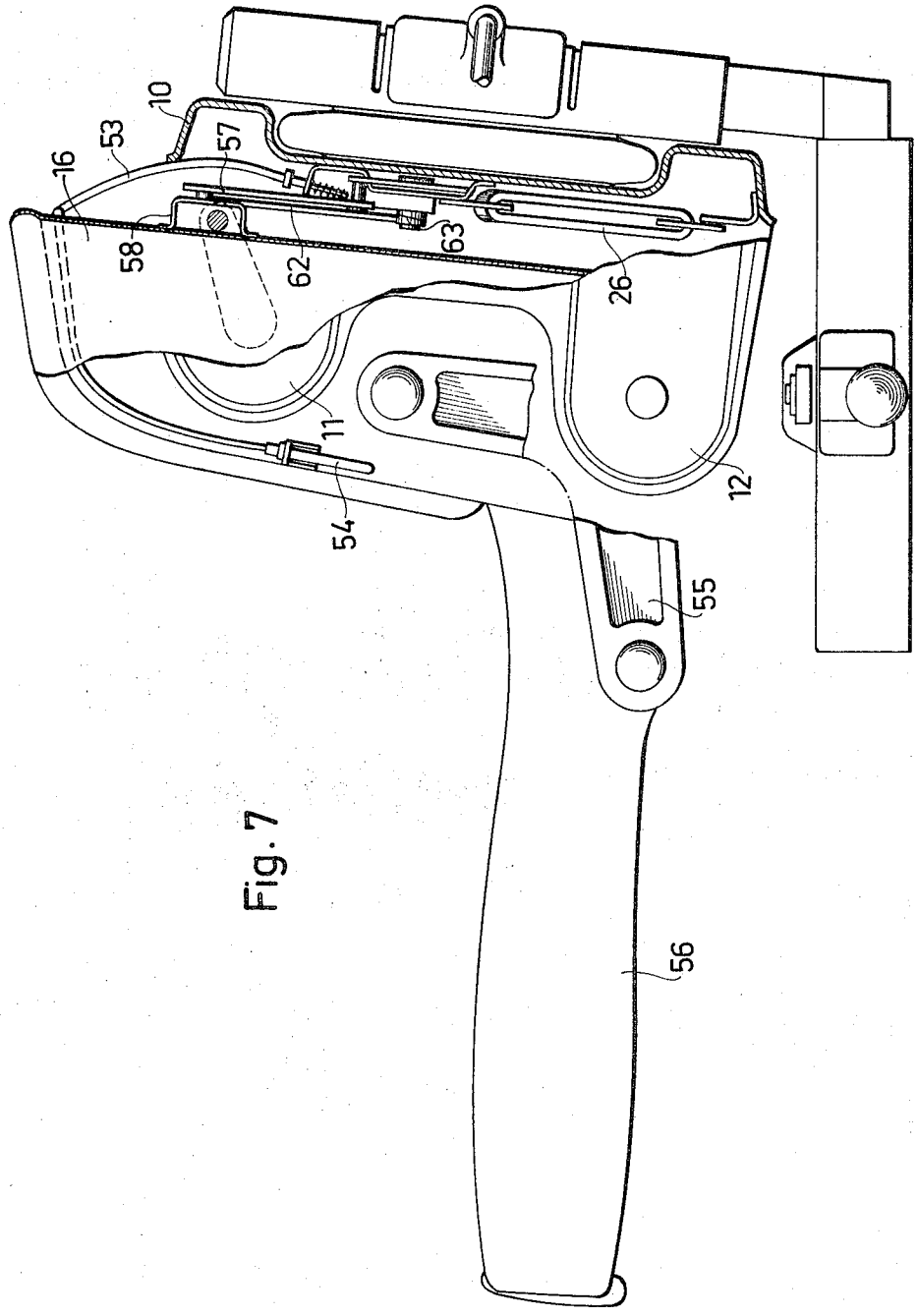


Fig. 7

Fig. 8

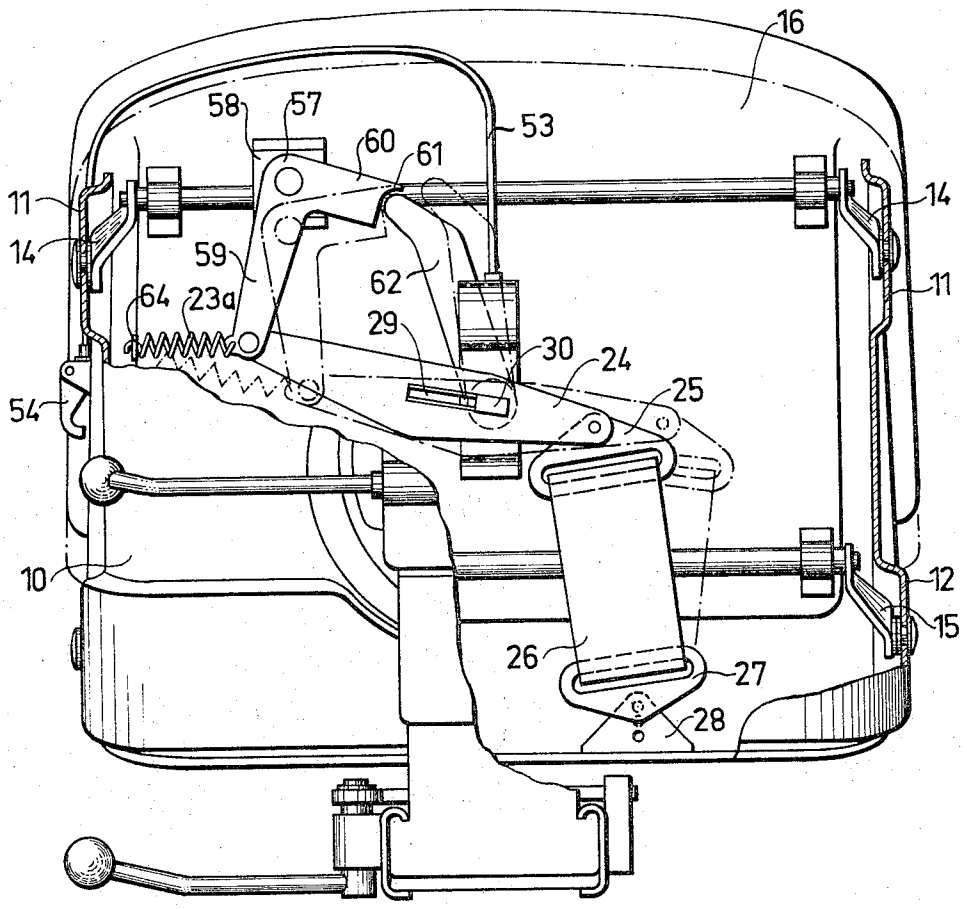


Fig.9

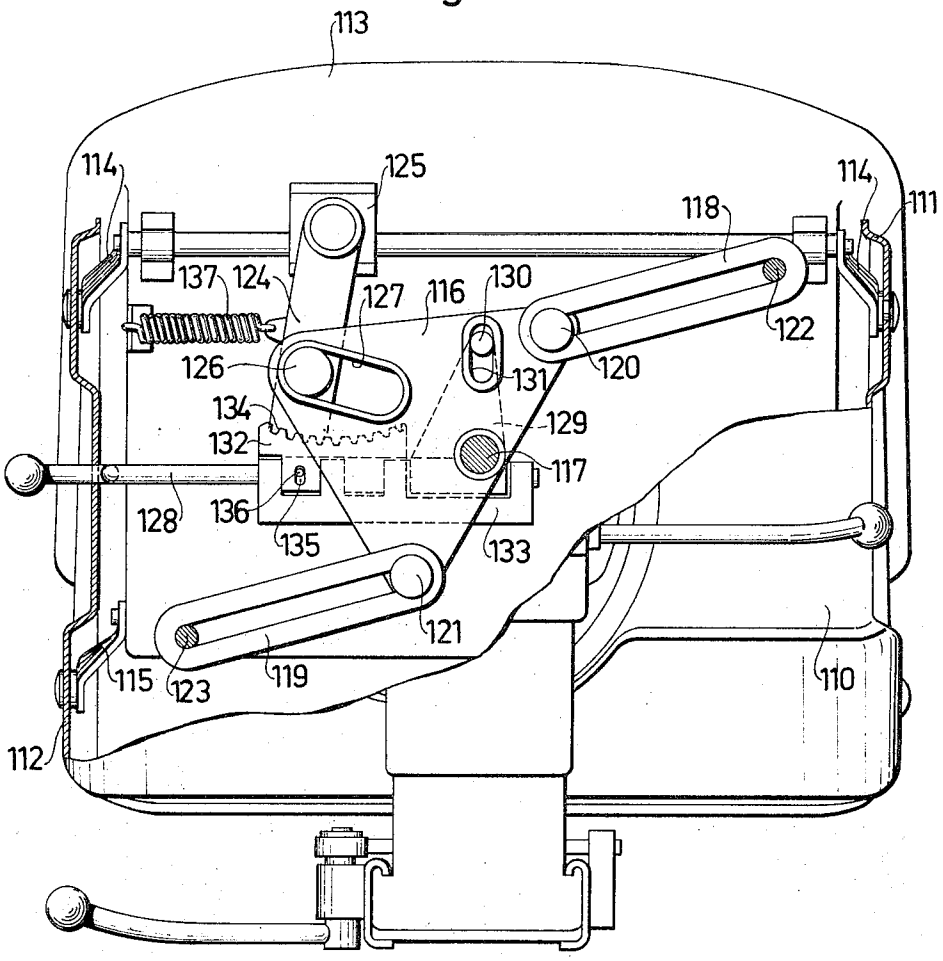

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Fig. 10

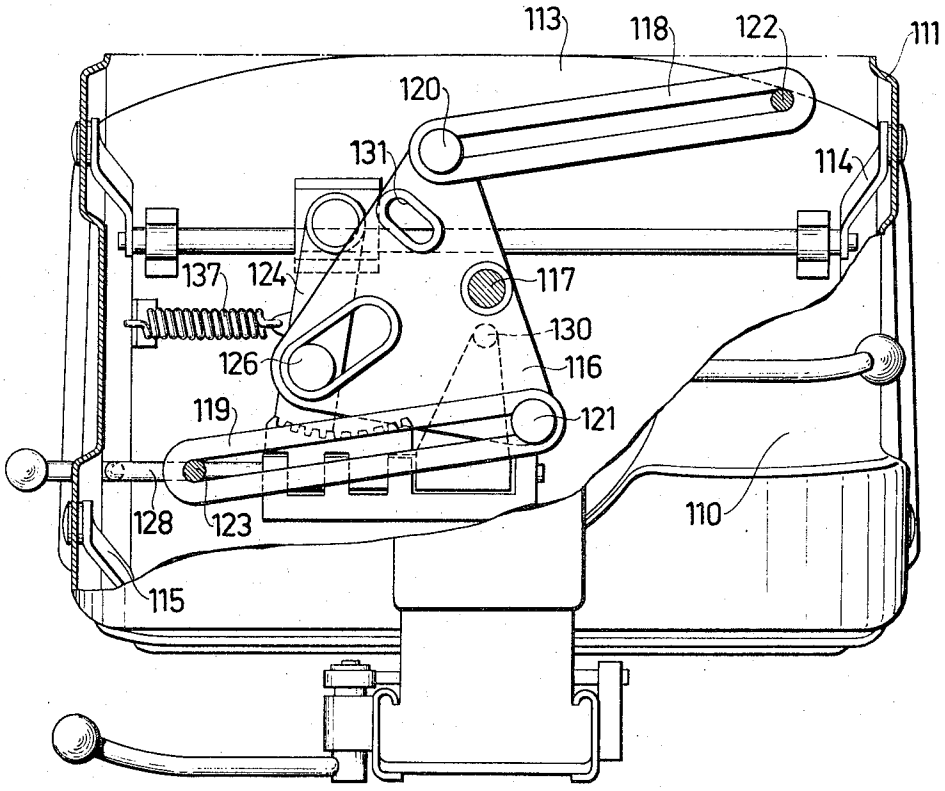

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Fig. 11

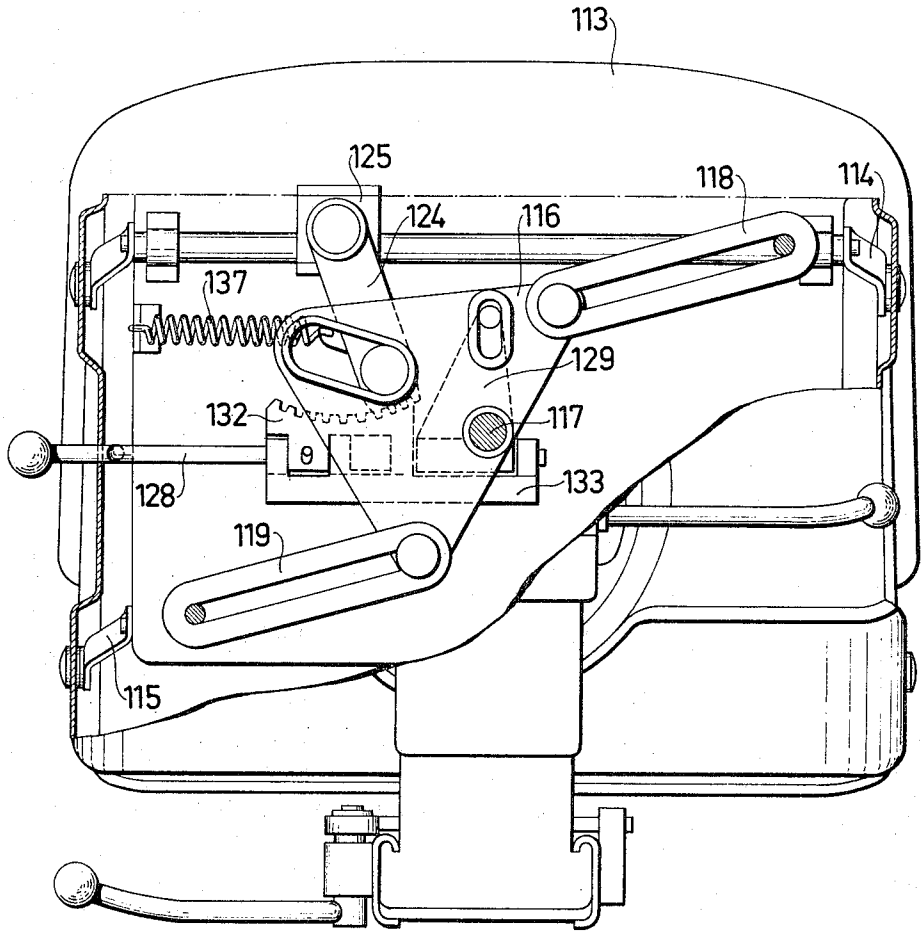
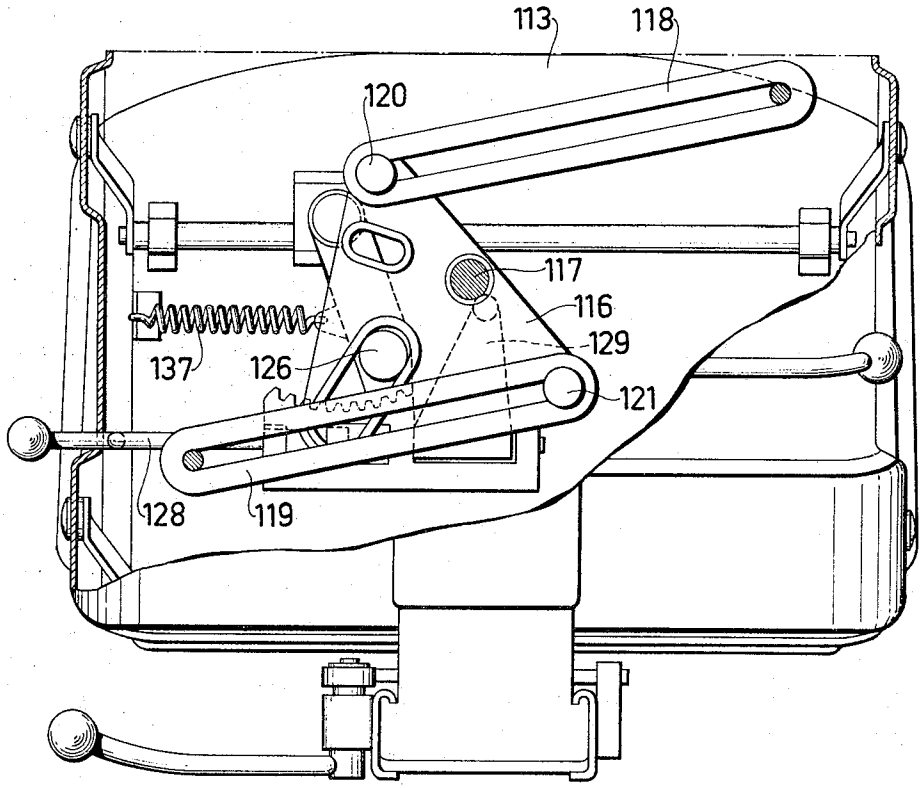


Fig. 12



VEHICLE CHAIR HAVING A RESILIENTLY SUPPORTED SEAT

This application is a continuation of Ser. No. 767,990 filed Oct. 16, 1968, and now abandoned.

It has been known since long ago to provide vehicle chairs with a resiliently supported seat moveable in a substantially vertical direction between an upper and a lower end position and spring biased towards its upper end position. In order to make it possible to adjust the spring load on the seat to match the weight of the person occupying the chair such vehicle chairs are usually provided with manually operated means for controlling the spring forces.

A drawback of these known controlling devices is, however, that a user of the seat must, in order to obtain the proper setting of the spring tension, repeatedly adjust the spring load during a ride. When driving on roads of comparatively good quality having only sparsely occuring substantial surface irregularities it may be found impossible to make the proper adjustment of the spring tension. In many cases said adjustments may also be very difficult to carry out during the ride and, consequently, in order to avoid any traffic risk due to insufficient attention to the driving, it will be necessary to stop the vehicle temporarily during each adjustment. It has also been found that the trouble with adjusting the spring tension repeatedly has caused many people to refrain from making any adjustment at all.

The present invention has for its object to eliminate the above drawbacks of the known vehicle chairs comprising resiliently supported seats and to provide an improved vehicle chair permitting the correct spring load to be set without any complicated and repeated ajdustment steps. A seat made in accordance with the invention is primarily characterized by a preferably manually releasable device for automatically adjusting the spring load on the seat to match the weight of a passenger, said device comprising a lever means acting as a beam balance and having an adjustable arm ratio, said lever means being subjected to two opposed torques the one of which is caused by the weight load on the seat while the opposite torque is caused by the forces of spring means counteracting the downward movement of the seat.

The invention will now be described in greater detail, reference being had to the accompanying drawings, in which:

FIG. **1** shows a side elevation, partly in section, of a vehicle chair according to a first embodiment of the invention;

FIGS. **2** and **3** are views, partly in section, of the chair according to FIG. **1** showing the chair as viewed from its back and with the seat in its upper and lower end positions, respectively;

FIGS. **4** and **5** are partial side elevations, in section and on an enlarged scale, showing a spring tension adjustment device in inoperative and operative conditions, respectively;

FIG. **6** is a partial front view of said device;

FIGS. **7** and **8** are views corresponding to FIGS. **1** and **2** and illustrating a second embodiment of the invention;

FIGS. **9** and **10** are views corresponding to FIGS. **2** and **3** showing a third embodiment of the invention with the spring biasing means set to counteract the load of a light-weight person; and

FIGS. **11** and **12** are corresponding views of the embodiment according to FIGS. **9** and **10** with the spring tensioning means set so as to counteract the load of a heavy-weight person.

The chair according to FIGS. **1** to **6** comprises an adjustable support frame portion **10** having the shape of a pressed plate with an upper and a lower pair of forwardly extending arms **11** and **12** disposed on opposite sides of the chair. Said arms **11** and **12** carry a frame plate **13** by means of two pairs of links **14** and **15**, respectively, having their one ends pivotally connected to the arms **11** and **12**, respectively, and their other ends pivotally coupled to the plate frame **13** so as to permit said frame to carry out a parallel movement. The frame **13**, in turn, serves to support the back **16** of the chair by means of the one pair of arms **17** and **18** of two double-armed links **19** and **20** which are pivotally mounted on the frame **13** and have their other pair of arms **21** and **22** interconnected by a link **23** forming, together with the arms **21** and **22**, a parallelogram mechanism causing the links **19** and **20** to pivot in unison.

The back **16** of the chair is guided in the frame **13** by means of pins **16***a*, projecting sideways therefrom and received for displacement in substantially vertical elongated openings **13***a* in side flanges of the frame. The movement of the back **16** in frame **13** will be limited by the length of the openings **13***a*.

Between arm **22** and frame **13** is connected a tensile spring **23***a* tending to move the back **16** of the chair to its upper end position with respect to the frame **13**. At its free end the arm **22** is pivotally connected to the one end of a lever **24** carrying at its other end a pivotable mounting **25** for a spring **26** having the shape of an endless belt. At its opposite end the spring **26** is coupled to a second mounting **27** journalled in a bracket **28** fixed to the frame portion **10**.

At its middle the lever **24** is provided with an oblong opening **29** extending mainly in the longitudinal direction of the lever and, as best shown in FIGS. **4** and **5**, having inclined longitudinal edge surfaces cooperating with the tapered head **30** of a pivot bolt **31** received in the opening **29**. Said bolt **31** is journalled in a bushing **32** in a bearing sleeve **33** rigidly mounted on a bracket **34** secured to the frame portion **10**. Between the one end surface of the bearing sleeve **33** and an annular flange **31**a at the end of the bolt **31** opposite to the head **30** there is provided a washer spring **35** which tends to maintain the bolt **31** in the position shown in FIG. **4** to secure a frictional engagement between the co-operating inclined surfaces of the bolt head **30** and the opening **29** in lever **24**.

The bolt **31** is, however, against the action of the washer spring **35**, axially displaceable from the position of FIG. **4** to the position shown in FIG. **5** by means of a release mechanism comprising a lever **36** pivotally journalled in two parallel flanges **37** and **38** on the bracket **34** by means of two pivot pins **39** and **40**. At its free end the lever **36** has a semispherical depression serving to receive a ball **41** through which the lever **36** can apply an axial force on the bolt **31**. The lever **36** is operated by a camming means **42**, at its one end pivotally journalled in two flanges **43** and **44** projecting from the bracket **34** and at its other end carrying a cam roller **45** co-operating with a camming surface **46** on the lever **36**. At its upper end the lever **36** is provided with a locking roller **47** adapted to co-operate with a shoulder **48** projecting from the back of the frame plate **13**.

The camming means 42 is normally maintained in the position shown in FIG. 4 by a spring 49, bolt 31 being, due to the action of the spring washer 35, kept with its tapered head 30 in frictional engagement with the lever 24. Said spring 49 is arranged between an end flange 50 of the bracket 34 and a traversing bolt 51 journalled in the camming means 42 and serving as a mounting for the wire 52 of a Bowden-cable 53 passing through an opening in the flange 50. For operating the camming means 42 through the cable 53 there is provided a control handle 54 at the left side of the back 16, said handle being coupled to the cable 53.

The release mechanism above described serves to facilitate a relative displacement between the lever 24 and the bolt 31 and, hence, an adjustment of the arm length ratio of the lever 24 through releasing the frictional engagement between the co-operating surfaces of the bolt head 30 and the opening 29 in the lever 24. Since the resistance of the spring 26 against downward movement of the back 16 and the seat 56, carried by the back 16 by means of arms 55, is determined by said ratio every displacement of the lever 24 will cause a change in said spring resistance. Said resistance will assume its minimum value when the lever 24 is in its position shown in solid lines in FIGS. 2 and 3 while the maximum resistance will be obtained when the lever is in the position shown in dash-dot lines.

The manner of operation of the above described chair will now be explained in greater detail.

When the bolt 31 is in its position shown in FIG. 4, as above explained, the lever 24 is unmovable relatively the bolt 31 due to the frictional engagement with the bolt head 30. Since the locking roller 47 is in its retracted position out of the path of movement of the shoulder 48 the roller 47 will not bar any displacement of the frame 13, which has been shown in its upper end position in FIGS. 4 and 5. Due to the engagement between the lever 24 and the bolt 31 the back 16 and the seat 56 are prevented from movement relatively the frame 13 as the links 19 and 20 are blocked against pivoting by the connection between the arm 22 and the lever 24. When the seat 56 is weight loaded it will, together with the back 16, move in unison with the frame 13. The lever 24 functions now as a beam balance. At the one end thereof is applied a force transmitted from the frame 13 through the arm 22 and, at the other end, there is applied a force derived from spring 26. The lever 24 will assume a balance position in which the torques caused by said forces are of the same magnitude. In order that the seat shall have the same spring characteristics irrespecively of the weight of the person using the seat it is necessary to adjust the arm length ratio of the lever 24 in view of the weight of the user. In the chair above described this adjustment can take place automatically in the following manner.

Before placing himself on the seat a passenger activates the release mechanism for the bolt 31 by means of the control handle 54. The locking roller 47 is hereby swung into a position under the shoulder 48 to lock the frame 13. At the same time the frictional engagement between the bolt head 30 and the lever 24 is released. Through the action of the spring 23*a* the lever 24 will now move into its left end position shown in solid lines in FIG. 2. When the passenger then sits down on the seat while still keeping the handle 54 in its released position, lever 24 will move rightwards a distance determined by the weight of the passenger and the bias of the spring 23*a*. Thereupon the handle 54 is released causing the lever 24 to be locked in its new position and the locking roller 47 to be swung out of the path of movement of the shoulder 48 and to release the frame 13. The lever 24 then functions as a beam balance in the manner above described with the spring tension of the seat properly adjusted so as to match the weight of the passanger.

In the chair according to FIGS. 7 and 8 the frame 13, serving to carry the back 16 in the embodiment of FIGS. 1 to 6, has been omitted. In FIGS. 7 and 8 the back 16 is instead directly carried by links 14 and 15. Further, link 20 mounted on the frame 13 has been replaced by a link 57 pivotally mounted in a bracket 58 fixed to the back 16, while the links 19 and 23 are eliminated. Similar to the link 20 link 57 has two arms 59 and 60, the one arm 59 having its free end pivotally connected to the one of the lever 24. The other arm 60 of the link 57 is at its free end provided with a shoulder 61 cooperating with a locking arm 62, which replaces the lever 36 in the embodiment of FIGS. 1 to 6 and can be swung into the position shown in solid lines in FIG. 8 by means of the handle 54 and the cable 53. The locking arm 62 is preferably journalled concentrically with bolt 31 and arranged, upon movement from its rest position shown in dotted lines into its position of engagement with the shoulder 61, to provide the required axial displacement of the bolt 31 for releasing the lever 24 by means of an inclined cam surface diagrammatically shown at 63 in FIG. 7.

The function of the chair according to FIGS. 7 and 8 is substantially analogous to the function of the chair shown in FIGS. 1 to 6. When a passenger, before sitting down on the seat, activates the release mechanism of the bolt 31 by means of the handle 54, locking arm 62 is swung into engagement with the shoulder 61 on arm 60. At the same time the frictional engagement between head 30 and lever 24 is caused to cease due to the axial displacement of the bolt 31. The lever 24 will now be moved into its left end position by the spring 23*a* which is arranged between a mounting 64 on the back 16 and arm 59. When the passenger then places himself on the seat, while still holding the handle 54 in its release position, lever 24 will move rightwards and link 57 will, around the pivot formed through engagement between the shoulder 61 and the locking arm 62, be swung into a balance position determined by the weight of the passenger and the tenion in the spring 23*a*. When the handle 54 is then released the lever 24 is locked to the bolt 31 and the locking arm 62 will return to its inoperative position shown in dash-dot lines.

The seat illustrated in FIGS. 9 to 12 comprises an adjustable frame portion 110, consisting of a pressed plate with an upper and a lower pair of forwardly extending arms 111 and 112 located at opposite sides of the chair. Said arms carry the back 113 of the chair by two links 114 and 115 having their one ends pivotally connected to the back 113 and their opposite ends journalled in the arms 111 and 112, respectively. The links 114 and 115 will permit a parallel movement of the back 113 and the seat carried thereby.

A triangular metal plate 116 is mounted on a pivot pin 117 carried by the frame portion 110. The plate 116 forms a lever acting as beam balance influenced by two counteracting torques, the one of which is caused by two tensile springs 118 and 119 in the form of endless belts connected between a pin 120 and 121, re-

spectively, projecting from the plate **116,** and a fixed mounting in the shape of a pin **122** and **123,** respectively, secured to the frame portion **110.** Both springs **118** and **119** are arranged to swing the plate **116** in clockwise direction. The opposed torque on the plate **116** is caused by the weight load on the seat which is transferred to the plate **116** through a link **124** pivotally mounted in a bracket **125** secured to the back **113** and carrying at its free end a pin **126** extending into an oblong opening **127** in the plate **116.** It will be apparent from the drawing that the torque applied on the plate **116** by the weight load on the seat acts in counterclockwise direction.

In order to make it possible to adjust the spring tension of the seat to match it to the weight of a user there is provided a device for variation of the length of the torque arm over which the weight load on the seat acts on the plate **116.** This device comprises an arm **129** mounted on an operating rod **128** and carrying at its free end a locking pin **130** adapted to be moved into an opening **131** in the plate **116** in order to lock the plate against pivoting movement on the pin **117** during adjustment of the spring tension. Said device further includes a toothed segment **132** journalled concentrically with the operating rod **128** in a bracket **133** secured to back **113** of the chair. The toothed segment **132** is normally in engagement with a number of teeth **134** provided at the free end of the link **124.** Through this engagement the link **124** is locked against pivoting movement. As appears from FIGS. **9** and **11,** the toothed segment **132** has in the portion thereof, casing the operating rod **128,** an oblong opening **135.** The operating rod **128** is provided with a radially projecting pin **136,** which extends into said opening **135** and serves to convey the turning movement of the operating rod **128** to the toothed segment **132** to bring said segment out of engagement with the teeth **134** on the link **124,** thereby releasing the latter. The pin **136** and the opening **135** are, however, arranged so as to form a connection with a certain clearance between the operating rod **128** and the toothed segment **132.** This arrangement will make sure that the plate **116** is locked by the locking pin **130** before link **124** is released from its engagement with the toothed segment **132.** A spring **137** is tensioned between a mounting on the back **113** and the link **124,** said spring being arranged to bias the link towards its left end position in which the pin **126** contacts the left end surface of the opening **127** in the plate **116.**

The spring load on the seat is adjusted in the following manner. Before placing himself on the seat, being in its upper end position as shown in FIGS. **1** and **2,** a user has to lock the plate **116** in the position shown in said Figures by a corresponding turning movement of the operating rod. This movement of the rod **128** will also release the link **124,** which, by the spring **137,** is moved into its left end position shown in FIG. **9.** When the user then sits down on the seat, while retaining the operating rod **128** in said position, the link **124** is swung rightwards through an angle determined by the weight of the user and the bias of spring **137.** The operating rod **128** is then released and due to the action of return spring, not shown, it moves into its rest position. During the return movement of the operating rod **128** the toothed segment **132** is brought into engagement with the teeth **134** on the link **124,** whereupon the locking pin **130** is brought out of its engagement with the opening **131** in the plate **116.** Thus, the link **124** will be locked in its new position before the plate **116** is again released. The plate **116** then functions as a beam balance which continuously tends to assume a balance position in which the opposed torques caused by the springs **118** and **119** and by the weight load on the seat, respectively, are of the same magnitude.

Naturally, the above described embodiments can be modified in many different ways within the scope of the invention. For instance, the adjustment of the arm ratio of the beam balance lever of the chairs shown in FIGS. **1** to **8** can be obtained through a displacement of the bolt **31** as well as through a displacement of the lever. Said ratio can also be adjusted through variation of the position of the attack point of the spring force on the lever. Finally, it should be noted that the complete lever arrangement can be positioned in any suitable place, for instance below the seat instead of behind the back of the chair, and that many of the described mechanisms can be replaced by other means having corresponding functions.

I claim:

1. A vehicle chair in which a seat is supported on a frame by spring means acting through a fixed lever arm wherein said lever arm is automatically adjusted to compensate for varying occupant weight comprising:

a. means for releasably coupling said seat to a second frame to allow, when released, relative movement between said seat and said second frame,

b. means for releasably coupling said second frame to said lever arm,

c. manually actuated means for releasing both said couplings and fixing said frame with respect to said second frame when said seat is unoccupied,

d. second spring means coupling said seat, said second frame and said lever arm to automatically adjust said lever arm in accordance with occupant weight when said seat is occupied,

e. wherein the length of said lever arm is automatically adjusted in accordance with occupant weight and said chair is capable of normal use when said manually actuated means is restored.

2. The vehicle chair of claim **1** wherein said lever arm is adjusted by displacement relative to a pivot point.

3. The vehicle chair of claim **1** wherein said lever arm is adjusted by varying the point on said lever arm at which a load is applied from said seat.

4. The vehicle chair of claim **1** wherein said lever arm is adjusted by varying the attack point position of said spring.

5. The vehicle chair of claim **1** wherein said manually actuated means further locks said second frame to said frame when actuated.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,765,639 Dated October 16, 1973

Inventor(s) KARL GOSTA NYSTROM

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Please correct the inventors name from Karl Gosta Mystrom to Karl Gosta Nystrom. Also correct the address from Skeppargatan 13, Unea, Sweden to Skeppargatan 13, Umea, Sweden.

Signed and sealed this 23rd day of April 1974.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334.