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US 4989915 (HANSAL) 5 February 1991
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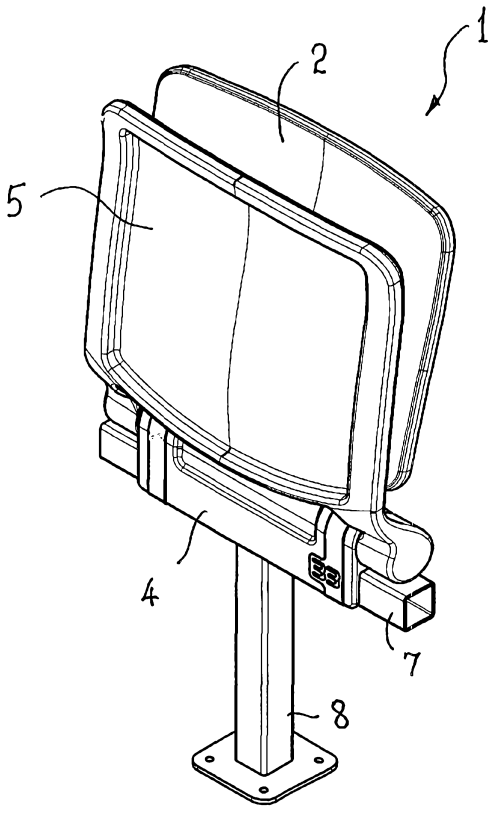
(54) Title: A STADIUM SEAT AND A METHOD OF MOUNTING A STADIUM SEAT



(57) Abstract: A seat (1, 41, 61) for stadia, auditoria and the like is disclosed. The seat has a fixed backrest (2, 42) pivotable between a horizontal use position and a vertical standby position. A spring (33) or other resilient means urges the seat (5, 45) into the standby position. A damping mechanism such as a viscous grease damps the motion, preferably in both directions. Mounting straps (51, 52, 71, 72) enable a body (45) to be clamped to a spine (7, 47). By lightly tightening the straps, the position of the seat on the spine can be subject to small final adjustments before final tightening.

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A Stadium Seat and a Method of Mounting a Stadium Seat

Field of the Invention

The present invention relates to stadium seating and, in particular, to a stadium seat mounting arrangement.

Background Art

Stadium seats generally take the form of a fixed backrest and a pivotably mounted seat. The seat is pivotable between a substantially vertical standby position and a substantially horizontal use position. A resilient member such as a spring or an elastomeric equivalent, is interposed between the seat and backrest and urges the seat into the standby position.

In many stadia and auditoria, a horizontal spine extends in the row direction between adjacent aisles. The individual seats are connected to the spines after the spines have been erected. In one style of mounting, the spines are provided with welded metal attachments to which the stadium seats are engaged. In another, the spines are pre-drilled and a fastener is used to secure the stadium seat to the spine. Both of these attachment methods have the disadvantage that fine adjustment of position of the stadium seat is not possible.

In an alternative arrangement, the stadium seat is provided with a body in two parts which are shaped so as to be clamped to the spine. Normally fasteners extend between the two parts and these can be tightened to increase the clamping action. By loosely attaching the stadium seats to the spine, it is possible for the each seat's final position to be determined with precision. This is normally done by setting the spacing of the seats in the front row, and then setting the spacing of the seats in the second row so that the seats in the second row fall in between the seats in the first row. This procedure is repeated for each row in turn.

European Patent Application No. EP1 166 683AI exemplifies the prior art arrangements where two moulded body parts are used to clamp the stadium seat to the spine. In this specification the clamps 5 have a length approximately equal to the

height of the spine 3. The clamps 5 engage with a generally U-shaped opening in the body part which mates with the spine 3 on three adjacent surfaces thereof.

US Patent No. 4,850,159 illustrates another prior art arrangement where, as illustrated in Fig. 2 and 5, the portion to be mounted on the spine 14 has a cut away recess which mates with the upper profile of the spine. Two substantially rigid steel straps 116 and 120 fabricated from flat metal bar are provided. The steel strap 116 is welded at one end to the portion to be mounted. The steel strap 120 is hooked at one end into the portion to be mounted. The other end of the straps 116, 120 are bolted together by a fastener 130 to secure the arrangement. The straps 116, 120 are preformed into the profile of the spine 14. This arrangement suffers from the expense of welding straps 116 in position (which requires accuracy of positioning to ensure a good fit) and the cost of forming both the strap profile and the hook in the strap 120 (and its corresponding recess).

Furthermore, the strength of the hook determines the overall strength of the clamp arrangement. Thus the straps 116, 120 must not be flexible but must be strong enough so that the deformed hook does not bend under load. Similarly, since the strap 116 is welded to the seat it cannot be thin and flexible either.

Neither of these arrangements represents a low cost arrangement which can be quickly and inexpensively installed. The speed of installation is very important in stadium seating in particular since the number of seats is large (typically 20,000 – 100,000) and whilst the seat assemblies can be mass produced, their installation must be carried out manually. Thus small savings in installation time per seat quickly results in very significant cost reductions in the supply and install contacts awards during stadium construction.

Furthermore when a spectator arrives at a stadium, it is necessary for him to manually move the seat into the horizontal position against the urging of the resilient member in order to sit on the seat. Such an arrangement has the very desirable advantage that when the spectators leave, the seats are automatically returned to the standby position

and thus do not reduce the width of the aisle between adjacent rows of seats and along which the spectators move.

However, an unintended consequence of the movement of the seat is that the seat and backrest (which are generally moulded from plastics material) make a noise caused by the seat hitting the backrest (or a stop protrusion for the seat) as the seat returns to its standby position.

As a result, at the end of a performance, for example, as the spectators or patrons all rise from their seats, a volley of staccato like banging noises echoes throughout the auditorium. A similar problem arises where such seats are used for an orchestral auditorium, for example. Should an attendee rise to his feet, the sound of the seat hitting the backrest, or stop, disturbs the performance.

It is known to reduce this problem by the provision of an elastomeric pad or similar compressible body to be positioned on either the seat or the backrest, or both; the intention being to cushion the impact of the seat on the backrest and thereby reduce the noise to a tolerable level. The disadvantage of this stratagem is that the elastomeric pad is not inexpensive and thus the overall cost of the seating arrangement is increased. Also the softer the pad, the better the sound suppression, but the shorter the operating life of the pad.

Another problem that appears in stadium seating arises due to repeated manual movement of the seat back and forth into and out of its standby position. Particularly where the seat makes a noise as it hits the backrest on reaching the standby position, it is known for seated spectators to provide a loud clapping noise by manually moving an adjacent empty seat into and out of the standby position rapidly in order to barrack for their side or generally create a mechanical applause effect. Similarly, it is also known for vandals simply to wantonly destroy stadium seats merely by repeatedly moving the seat into and out of the standby position thereby causing accelerated wear and tear with consequent damage.

It is known from European Patent Application No. 0576 746 AI to provide a separate return spring component and a separate damping component. The damping component or unit 1 is co-axial with the axle 4 about which the seat rotates. The damping effect is carried out by friction between adjacent cylindrical surfaces (3, 4) between which a viscous liquid is trapped. A coil spring 10, is used to form a one-way clutch. This means that the damping is only applied in one (ie upward) direction of seat movement co-axial with the axle 4.

Furthermore, the spring component which powers the seat during its rise from the use position to its standby position is provided by a single spring 12 (or two springs 12, 29) which is/are radial to the seat axle 4.

Since the seat is not damped in both directions of travel it is susceptible to vandals flipping the seat repeated out of its standby position thereby causing unnecessary wear.

Similarly, European Patent Application No. EP 1 166 683 AI discloses a damping arrangement formed by a pair of air cylinders 11 and pistons 14 which only damp the motion of the seat 2 when it is rising from its use position into its standby position.

Genesis of the Invention

It is an object of the present invention to provide an alternative arrangement which substantially overcomes or at least ameliorates the abovementioned installation problem and provides an advantageous system of connecting the stadium seats to the spine and, in particular, in a low cost manner.

Summary of the Invention

In accordance with a first aspect of the present invention there is disclosed a mounting system for connecting stadium seats to a horizontally extending spine, said system comprising an elongate body having a backrest extending therefrom and a seat pivotally mounted from said body and able to pivot with respect to said body and backrest, characterized in that the underside of said body which faces away from said

backrest is shaped to engage with, and mate with, an upper region of said spine but not extend beyond a lower region of said spine, and at least one substantially inextensible flexible strip extends entirely around both said spine and mated body and has its opposite ends joined together to strap said body to said spine.

Brief Description of the Drawings

Preferred embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Fig. 1 is a front perspective view of the stadium seat of a first embodiment with the seat in the substantially vertical standby configuration,

Fig. 2 is a left side elevation of the seat of Fig. 1 with the seat in the substantially horizontal use configuration,

Fig. 3 is a front elevation of the seat of Fig. 1,

Fig. 4 is vertical cross section taken along the line IV-IV of Fig. 3,

Fig. 5 is a view similar to Fig. 2 but showing the seat in the standby configuration,

Fig. 6 is a vertical cross section taken on the line VI-VI of Fig. 5,

Fig. 7 is an exploded perspective view of the seat in the configuration illustrated in Fig. 1,

Fig. 8 is an exploded perspective view of the components of the damped pivotable mounting mechanism,

Fig. 9 is a perspective view of the stadium seat of a second embodiment in its use configuration,

Fig. 10 is a rear elevation of the seat of Fig. 9,

Fig. 11 is a left side elevation of the seat of Figs. 9 and 10,

Fig. 12 is a front elevation of the seat of Figs. 9-11 but showing the seat in the standby configuration,

Fig. 13 is an exploded perspective view of a stadium seat of a third embodiment, and

Fig. 14 is a perspective view of the stadium seat of the third embodiment with the seat in the stand by configuration.

Detailed Description

As seen in Figs. 1-3, the stadium seat 1 of the first embodiment has a backrest 2 supported by a pair of upstands 3 which extend from a central elongate body 4. Pivoted to the elongate body 4 is a seat 5 which in Figs. 1 and 3 is in the substantially vertical standby configuration and in Fig. 2 is in the substantially horizontal use configuration. The central body 4 is supported by a spine 7 which is in turn mounted on a leg 8.

As best seen in Fig. 3 and 6, the seat 5 is provided with a pair of arms 10, 11 which are rotatably supported by the central body 4. As best appreciated from Fig. 6, the right hand pivotable mounting between the central body 4 and the arm 5 is a straightforward rotary mounting and is different from the left hand rotary mounting 14 which includes both a resilient interconnection between the seat 5 and the central body 4 and a damping mechanism.

The details of the rotary mounting 14 are best appreciated from Figs. 6, 7 and 8 and take the form of a first barrel 16 which includes a locating lug 26 which engages with the central body 4 and prevents rotation of the first barrel 16 about its longitudinal axis. The rotary mounting 14 also includes a second barrel 27 which, like the first barrel 16, is essentially a hollow tube closed at one end. The second barrel 17 has a plurality of mounting lugs 27 at its closed end which engage with protrusions 29 on a stub axle 30. The stub axle 30 also includes a pair of prongs 31 which engage with the arm 11 of the seat 5.

Positioned in between the first barrel 16 and second barrel 17 is a helical compression spring 33 each end of which is formed into a transverse member 34, 35. The interior of each of the first barrel 16 and second barrel 17 is provided with a respective slot (not illustrated) which engages the corresponding transverse member 34, 35 when the spring 33 is located within the second barrel 17 and the second barrel 17 is located within the first barrel 16.

Thus with reference to Fig. 8, the prongs 31 can be rotated in an anti-clockwise direction in order to compress the spring 33 and pivot the seat 5 out of the standby

configuration. The energy stored in the spring 33 returns the seat 5 to the standby configuration when a force is no longer applied to the seat 5 to urge it into the substantially horizontal use position.

In order to damp the motion, the interior of the second barrel 17 is filled with a high viscosity liquid, such as grease, prior to insertion of the spring 33 therein. As a consequence, when the spring 33 is inserted into the second barrel 17, the grease fills the spaces between the various turns of the spring 33. Furthermore, when the second barrel 17 is positioned within the first barrel 16, some of the grease also is positioned on the mating cylindrical bearing surfaces of the first and second barrels. The result of the grease is that rotational movement between the first and second barrels 16, 17 - in both directions - is damped. Similarly, compressing and uncompressing the spring 33 is also damped since this requires movement of the grease in order for the spring 33 to change shape. The grease is sufficiently viscous not to be discharged from the combination of the two barrels and thus remains in situ for the operating life of the chair.

The preferred form of damping liquid is polydimethylsiloxane which is a silicone grease having a viscosity of at least approximately 30,000 csp (and preferably up to 60,000 csp) such as that sold under the trade name SIL GEL or 200 FLUID by the Dow Corning Corporation. An alternative damping liquid is that manufactured by Asia Pacific Speciality Chemicals of Sydney, Australia and sold under the name VACUUM FLUID.

An advantage of the more viscous damping liquid is that the seat also rises slowly. Thus a spectator can jump to his feet with excitement, or to applaud good play, and the sit down again without having to manually lower the seat. This is because the seat has only risen by a small amount. This feature is thought to avoid considerable personal injury problems (and the resulting litigation). However, the seat will rise sufficiently quickly so as not to impede egress at the end of the game (or in the event of fire).

Referring now to Figs. 9-14, there is shown a stadium seat 41 according to a second embodiment. The seat 41 has a backrest 42 which is supported by two spaced apart vertically extending upstands 43, 44 which extend from a body 45. The upstands 43, 44 define an opening 46 therebetween. The body 45 is elongate and generally U-shaped when viewed in transverse cross section. This is best appreciated from Fig. 11. The U-shaped body 45 mates with a horizontally extending spine 47 which is supported by a number of spaced apart legs 48, only one of which is illustrated in Figs. 9-12.

Pivotably mounted with respect to the body 45 and backrest 42 is a seat 49 which is movable between a substantially horizontal use configuration illustrated in Figs. 9-11 and a generally vertical standby configuration illustrated in Fig. 12. In order to attach the body 45 to the spine 47 and thereby mount the stadium seat 41, two metal straps 51, 52 extend around the body 45 and the spine 47 passing through the opening 46.

The straps 51, 52 are preferably made of metal and are therefore in practical terms substantially inextensible and can be secured by any known mechanism. A substantial advantage of the straps 51, 52 is that they can be used to initially loosely mount the stadium seat 41 on the spine 47 such that the stadium seat 41 can be slid to the left or right along the spine 47 to determine its final position. Thereafter the straps 51, 52 are tightened to their final state thereby firmly securing the stadium seat 41 to the spine 47.

In a third embodiment illustrated in Figs. 13 and 14, the stadium seat 61 has a backrest 42, body 45 and seat 49 essentially as before. The spine 47 and leg 48 are also as before. However, the transverse extent of the upstands 63, 64 is greater in Figs. 13 and 14 than in Figs. 9-12. Thus each of the upstands 63, 64 is provided with a corresponding aperture 65, 66. It is through these apertures 65, 66 that corresponding straps 71, 72 pass in order to clamp the body 45 to the spine 47.

It will be seen in Fig. 13 that the body 45 is provided with a straight groove 68 which receives the strap 71 in order to locate same relative to the body 45. At the other end of the body 45 is a similar groove 69 which is provided with a recess 70, the groove

69 accommodating the strap 72 and the recess 70 accommodating an indicium portion 74 of the strap 72. In this way the strap 72 is similarly positively located relative to the body 45. The indicium portion 74 carries a number, in this example the number of the seat 61 in a particular row (number 33) but the indicium portion could in addition indicate the row and seat number such as H42 indicating seat 42 in row H, for example.

Each of the straps 71, 72 is provided with an aperture in one end and a threaded hole in the other end. A fastener in the form of a grub screw 76 is passed through the aperture and is threadably engaged with the threaded hole in order to tighten the strap 71, 72. An initial engagement between the grub screw 76 and the threaded hole is normally sufficient to loosely mount the stadium seat 61 on the spine 47 so that it can thereafter be adjusted into its final position. Then the grub screw 76 is tightened. Preferably the grub screw 76 is provided with a head (known per se) which is only able to be tightened and not untightened. This prevents vandals attacking the mounting arrangement once the seats have been finally positioned.

The foregoing describes only three preferred embodiments of the present invention and modifications, obvious to those skilled in the seating arts, can be made thereto without departing from the scope of the present invention. For example, the straps 51, 52, 71 and 72 can be fabricated from steel or engineering grade plastics material. Stamped metal straps are particularly useful because the seat number can be fabricated during the stamping operation. In addition, other mechanisms besides the grub screw can be used to tighten the straps. For example, radiator hose clamp technology or a toggle arrangement as used for ski boots, is able to be utilized.

The term "comprising" (and its grammatical variations) as used herein is used in the inclusive sense of "including" or "having" and not in the exclusive sense of "consisting only of".

The claims defining the invention as as follows:

1. A mounting system for connecting stadium seats to a horizontally extending spine, said system comprising an elongate body having a backrest extending therefrom and a seat pivotally mounted from said body and able to pivot with respect to said body and backrest, characterized in that the underside of said body which faces away from said backrest is shaped to engage with, and mate with, an upper region of said spine but not extend beyond a lower region of said spine, and at least one substantially inextensible flexible strip extends entirely around both said spine and mated body and has its opposite ends joined together to strap said body to said spine.
2. The system as claimed in claim 1 wherein for each strip there is a corresponding strip receiving recess formed in the top of said body.
3. The system as claimed in claim 2 wherein at least one of said strips includes an indicium portion indicating the number and/or row of said seat and said strip receiving recess is shaped to receive the indicium portion.
4. The system as claimed in any one of claims 1-3 wherein said opposite ends of said flexible strip are joined together with a fastener having a head shaped to be rotated in only a tightening direction.
5. The system as claimed in any one of claims 1-4 wherein a rotary mounting interconnects said seat and backrest and includes a damping means to slow the movement of said seat between a substantially horizontal use position and a substantially vertical standby position, characterised in that said damping means slows the movement of said seat in both directions.
6. The system as claimed in claim 5 wherein said damping means includes a first hollow cylindrical member, a second co-axial cylindrical member retained within said first member, and a helical spring retained between said first and second members, characterised in that a viscous liquid is trapped between said first and second members and engaged with the turns of said spring.
7. A mounting system for connection of a stadium seat to a horizontally extending spine, said system being substantially as herein described with reference to Figs. 9-14 of the drawings.

8. A method of mounting a stadium seat to a horizontally extending spine, said method being substantially as herein described with reference to Figs. 9-14 of the drawings

Dated this 24th day of January 2012

THE PRODUCT PEOPLE PTY LTD

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FRASER OLD & SOHN
Patent Attorneys for the Applicant

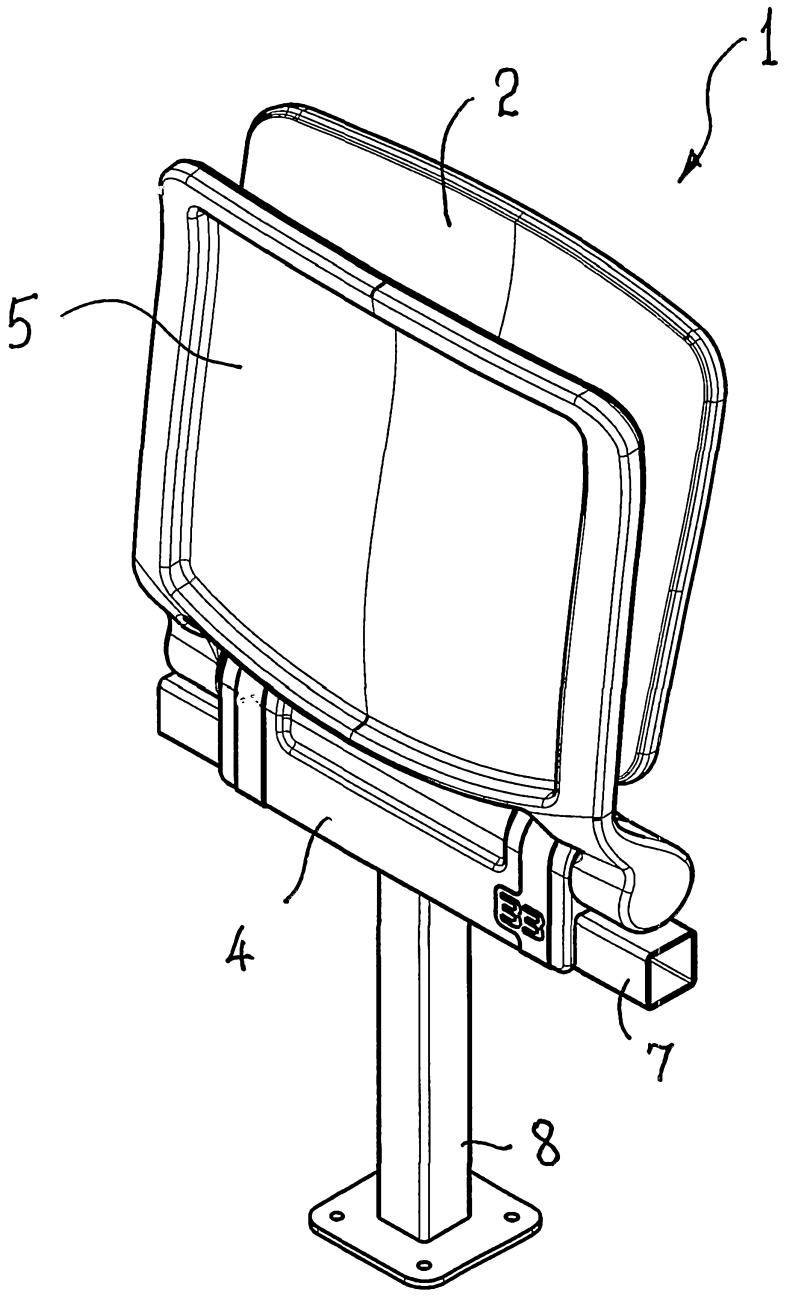

FIG. 1

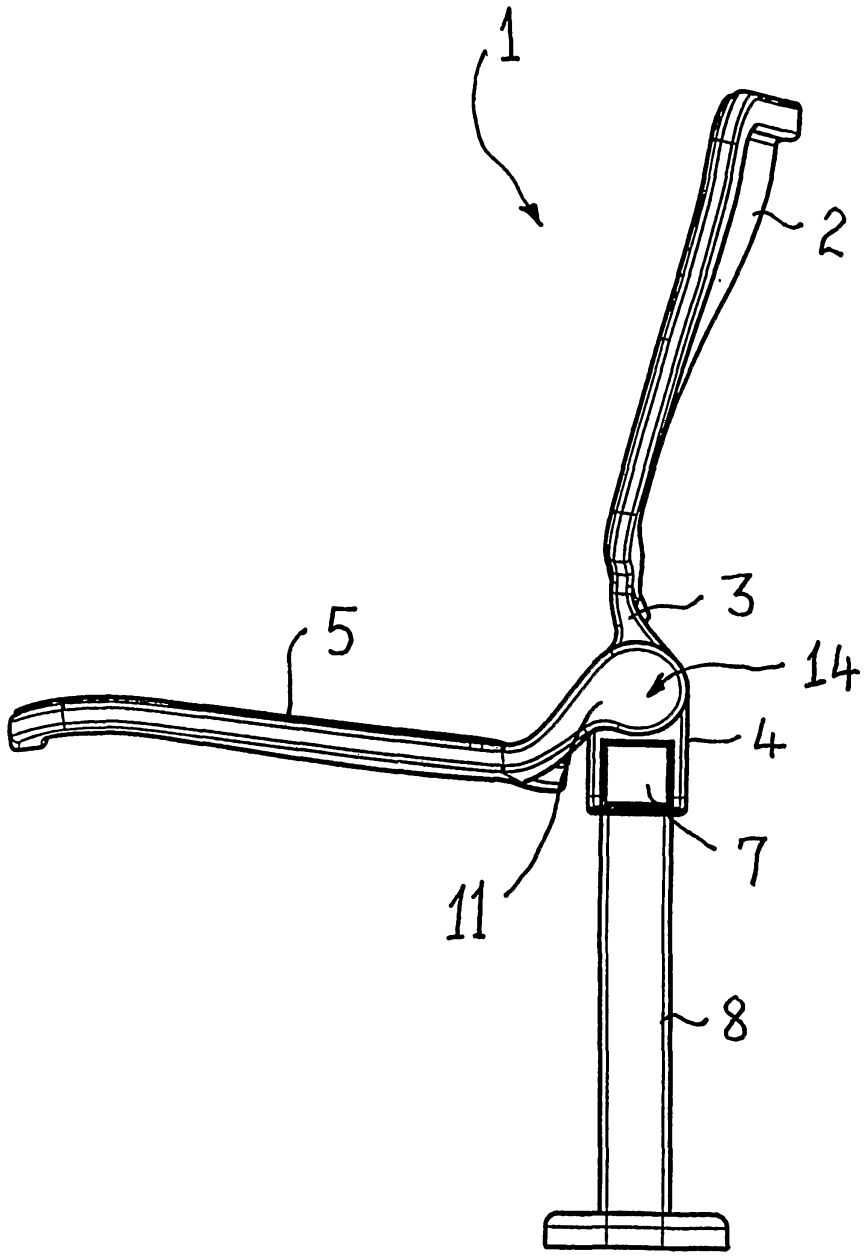

FIG. 2

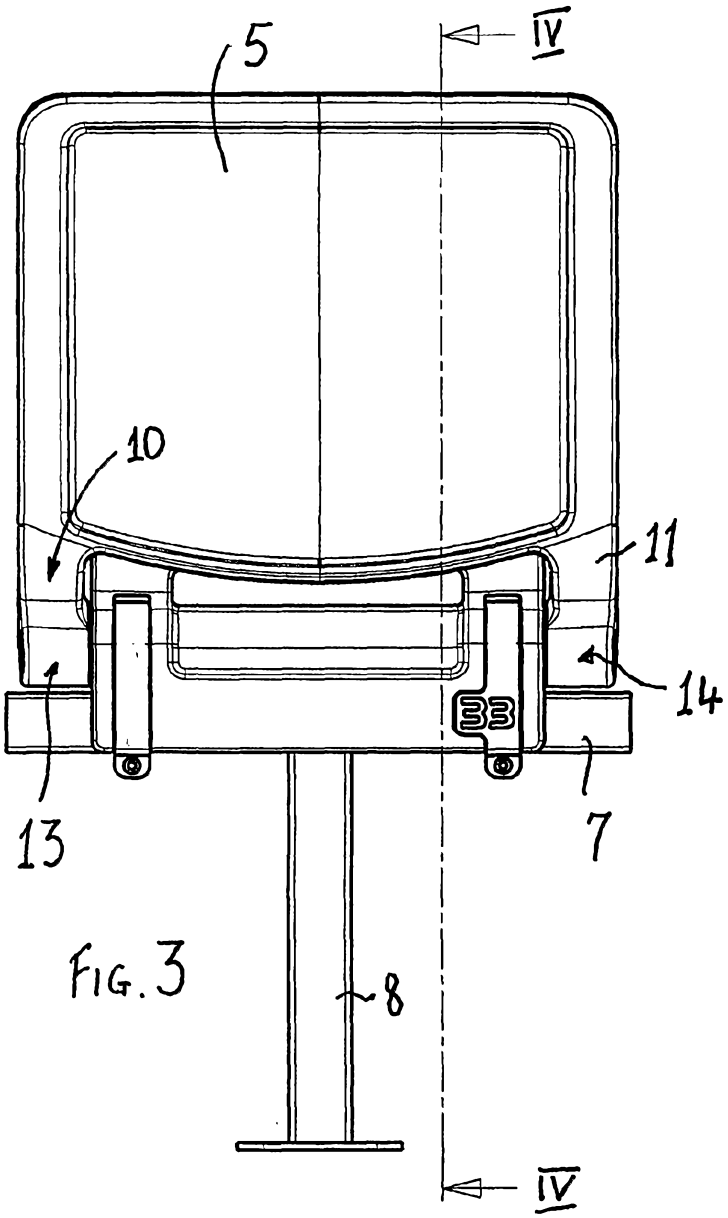

FIG. 3

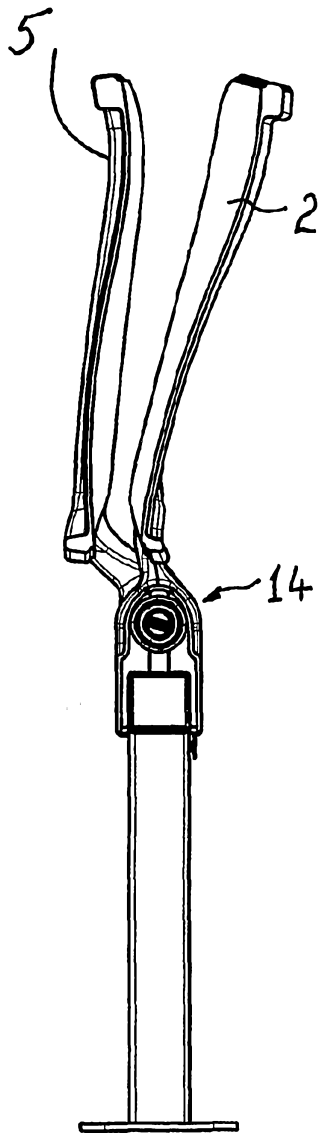

FIG. 4

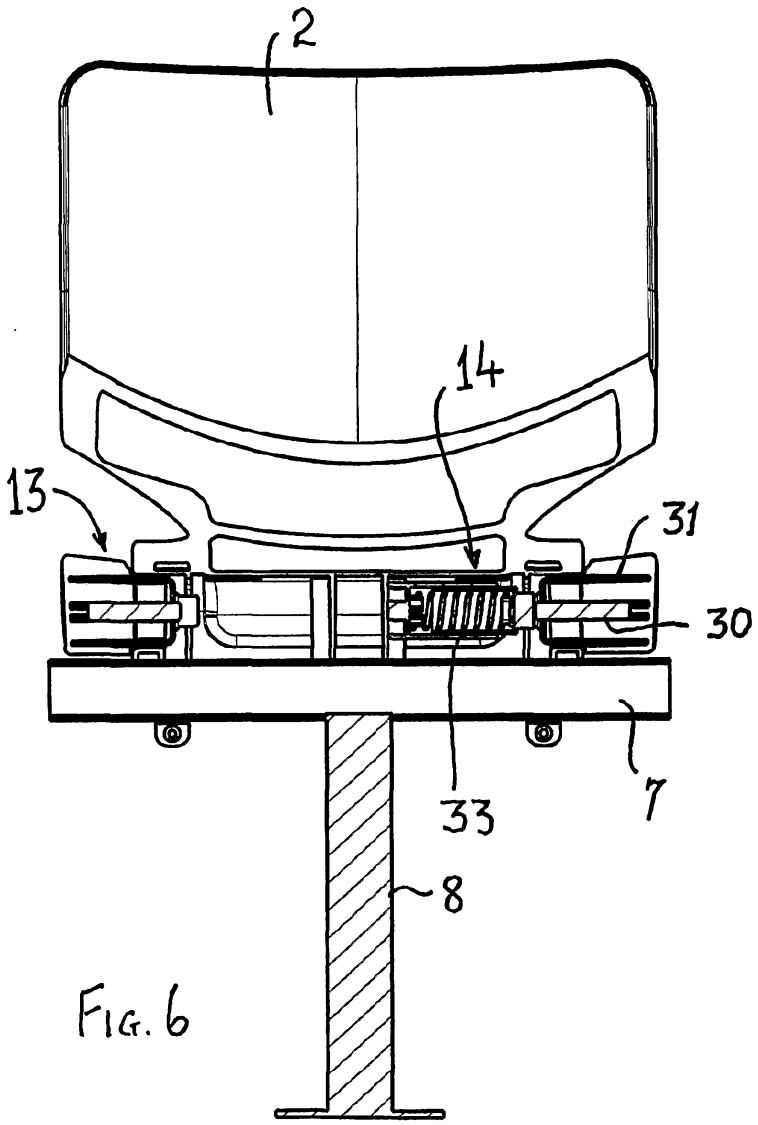

Fig. 6

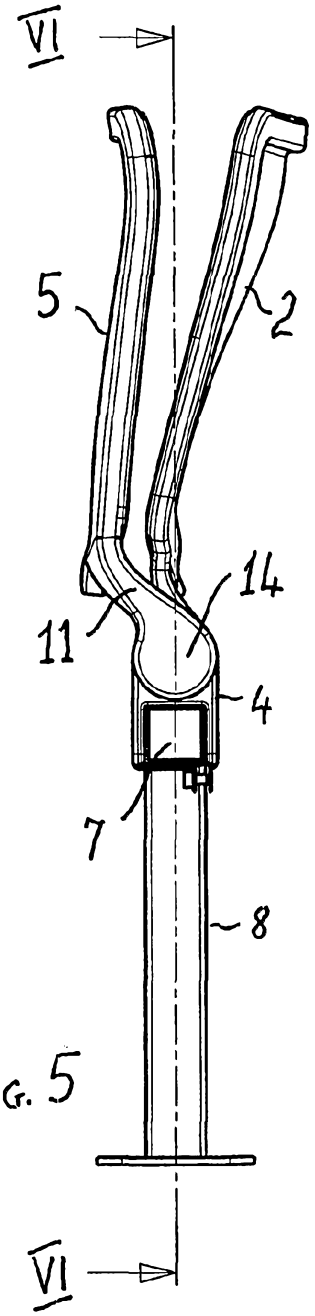

Fig. 5

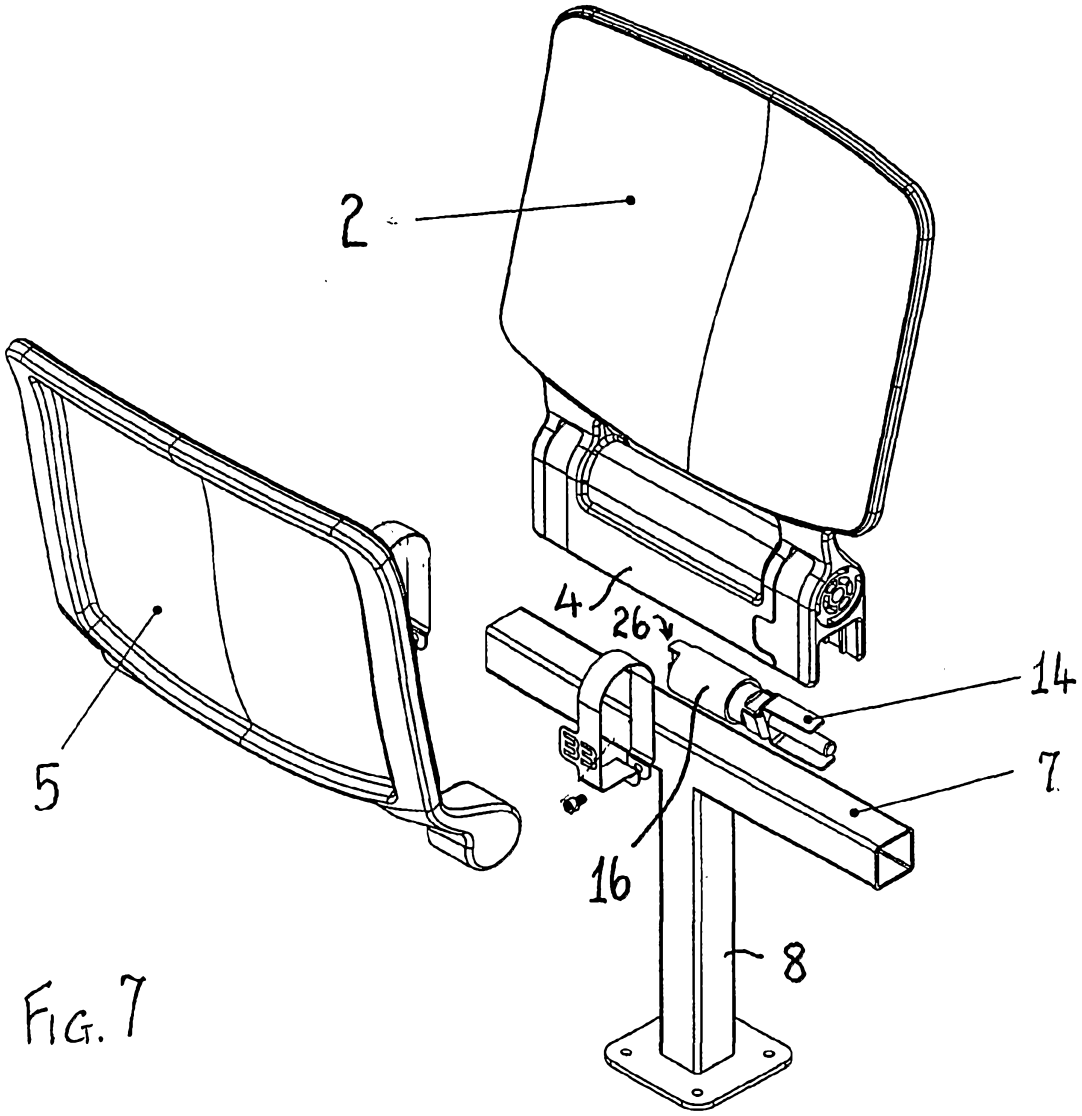

FIG. 7

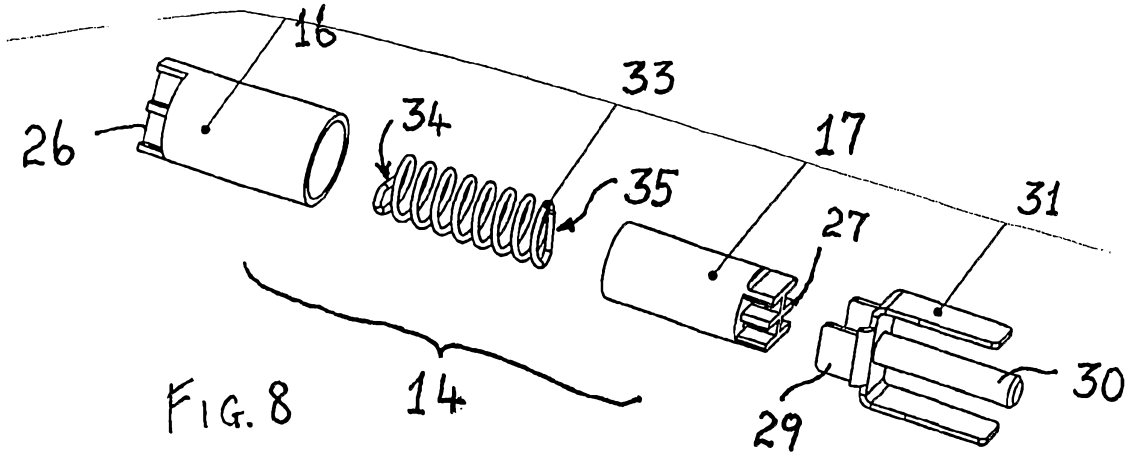

FIG. 8

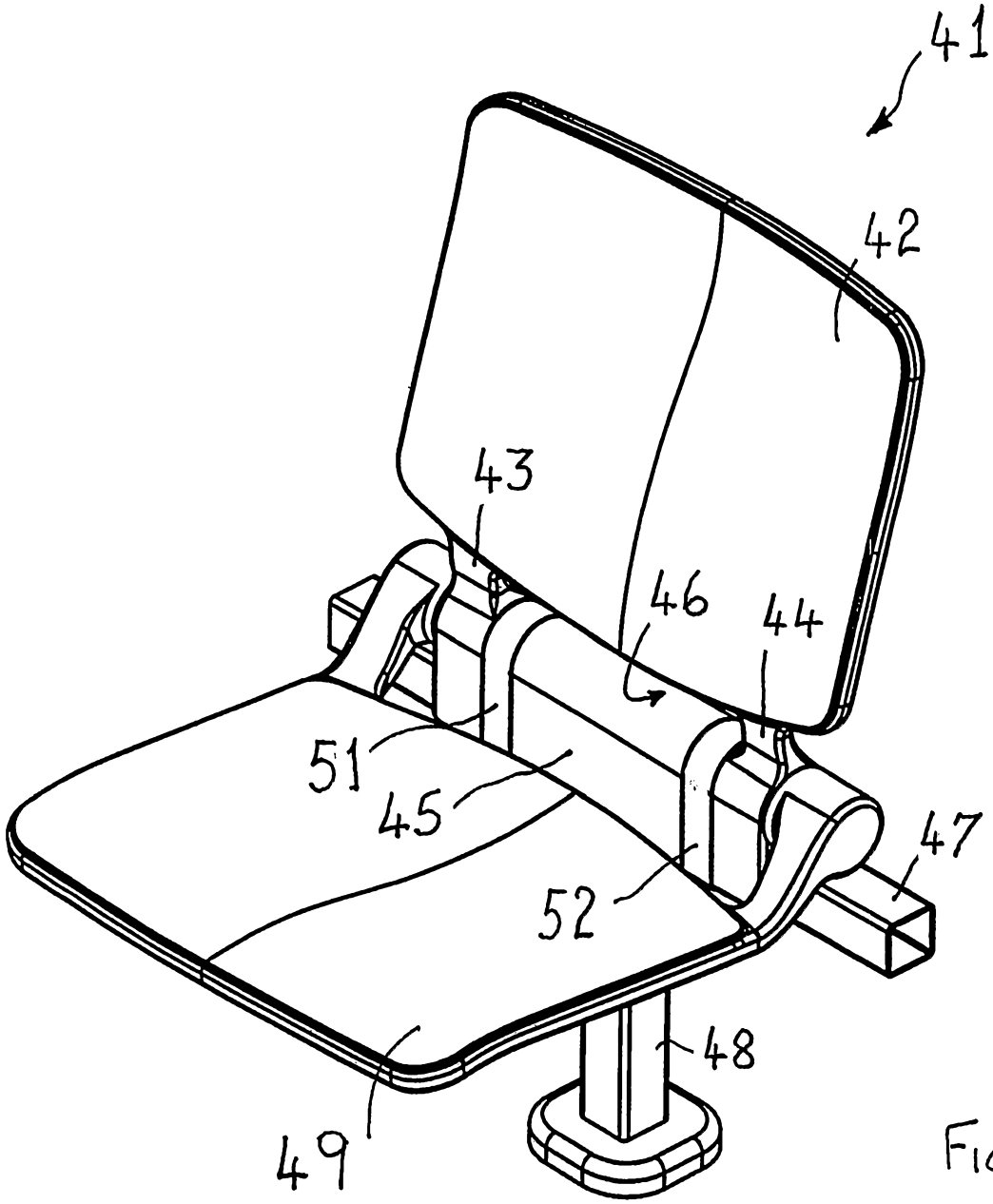

FIG. 9

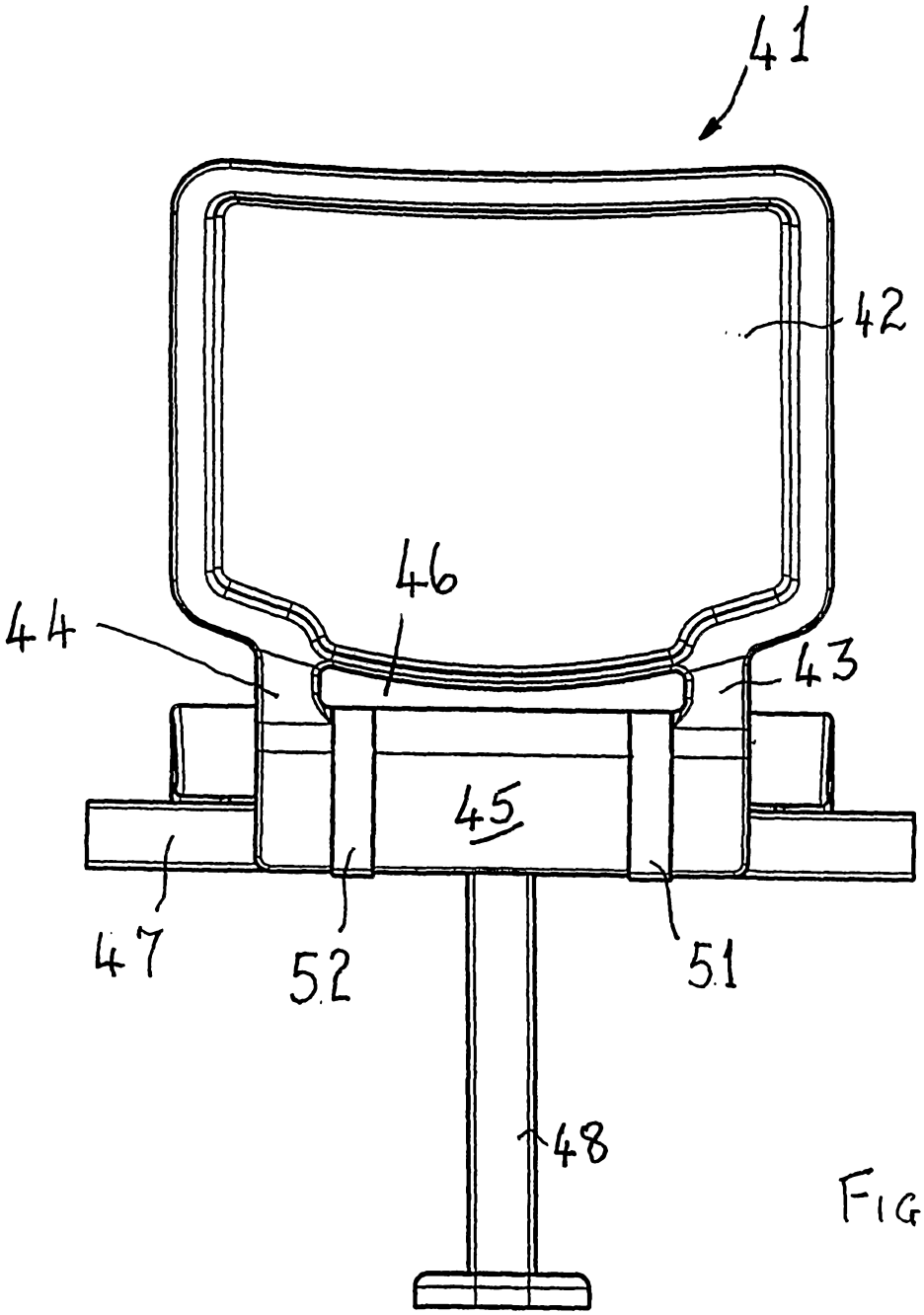

FIG. 10

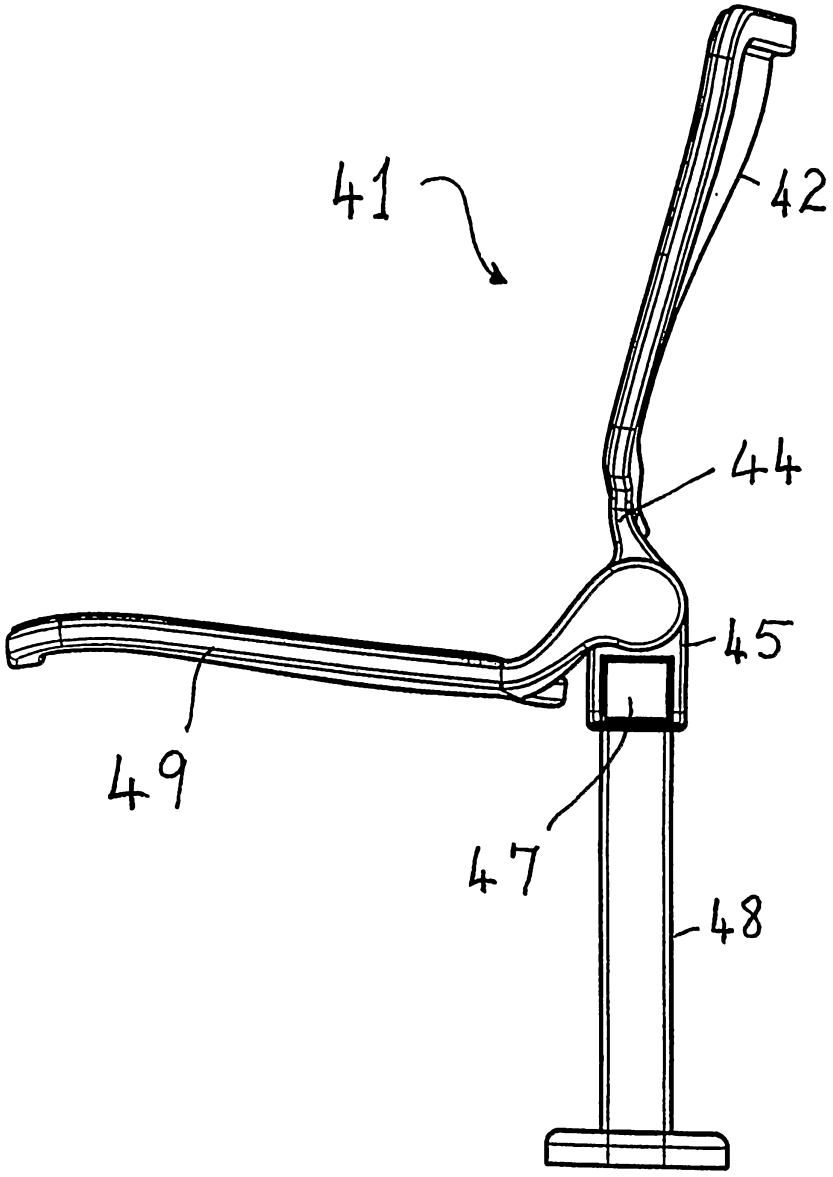

FIG. 11

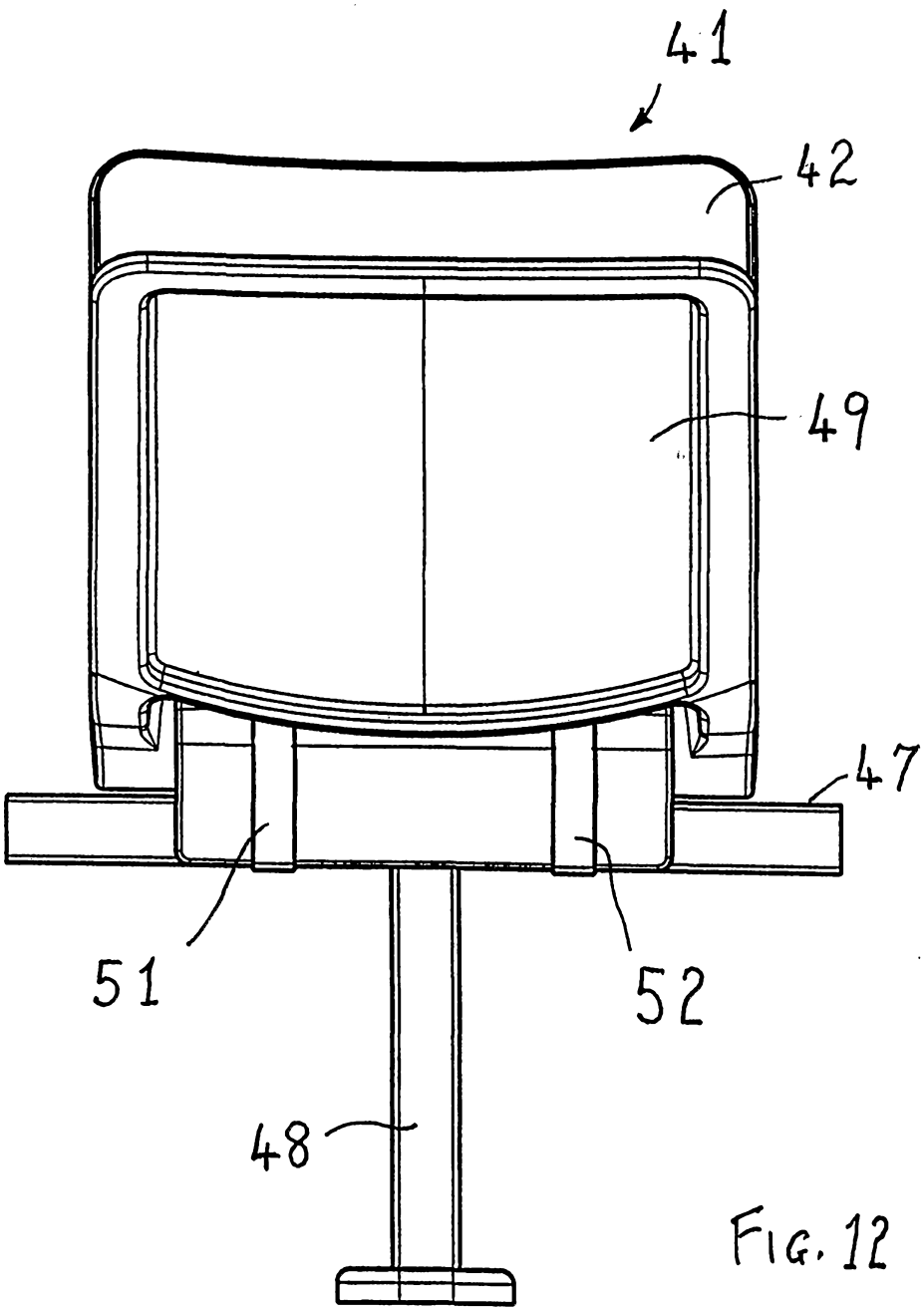

FIG. 12

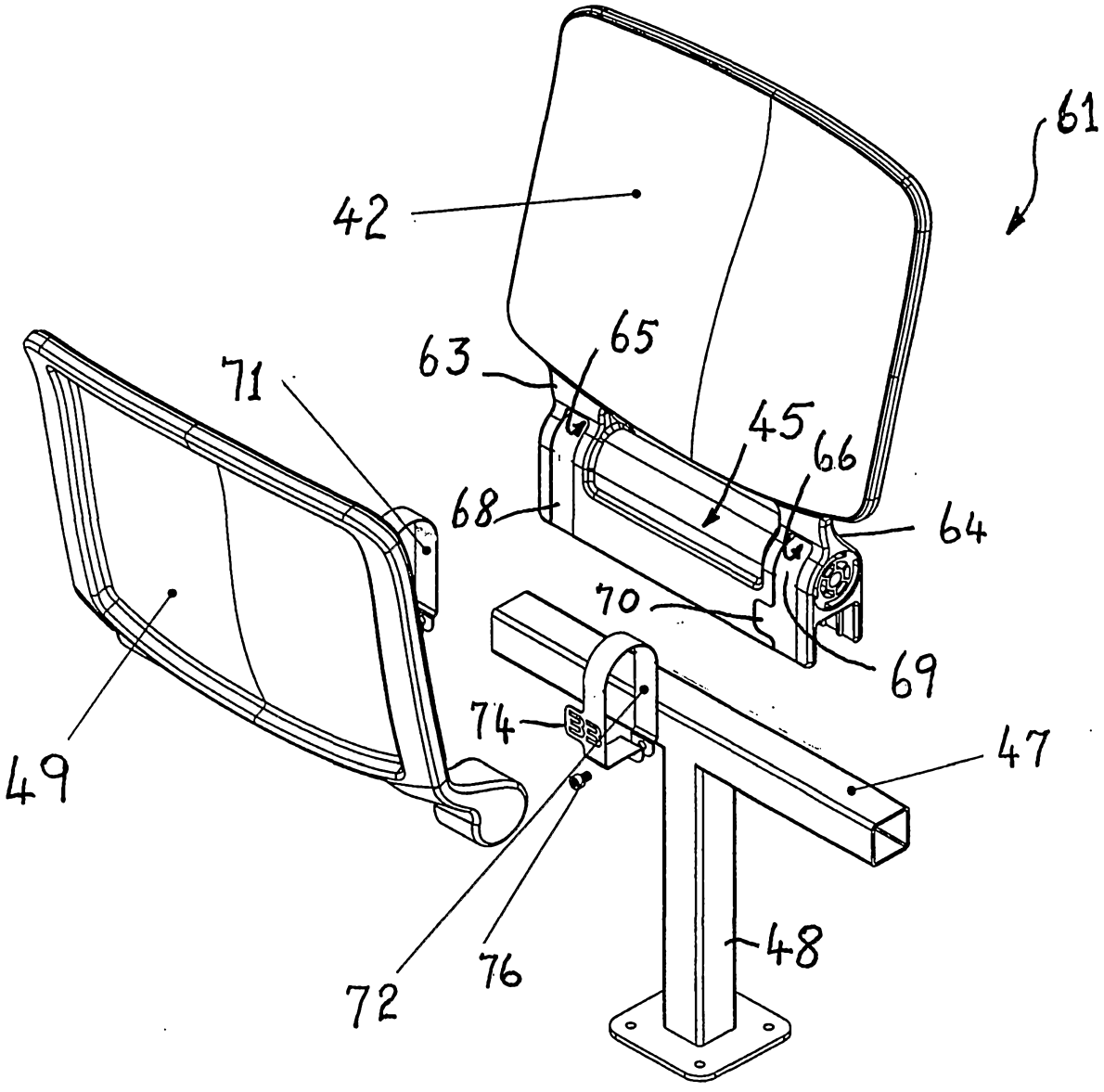

FIG. 13

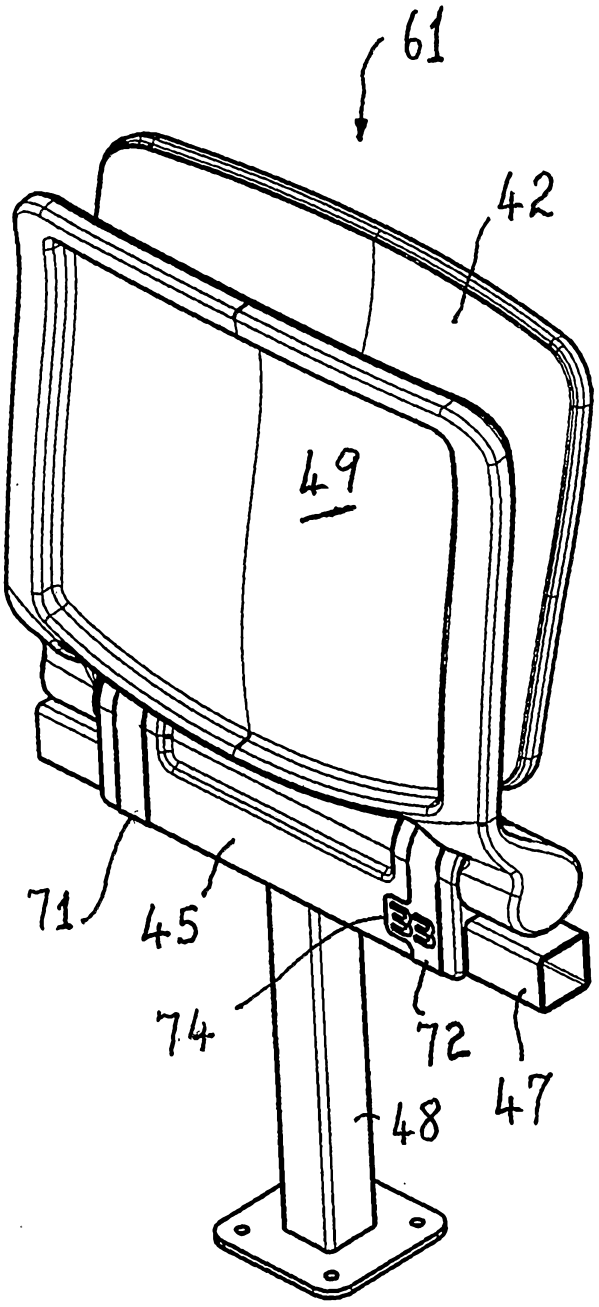

FIG. 14