

Seat-operating system

The invention relates to a seat-operating system for moving individual parts of vehicle seats, especially
5 vehicle seats which can be transformed into reclining seats which is [sic] used on long journeys to ensure the comfort of the passengers.

During long-haul flights an important task is to ensure
10 the comfort of the passengers over long flights sometimes lasting 14-20 hours. In addition to providing convenience, this is a substantial element of the competition between the individual airline companies, since when prices are identical travelers generally
15 select the service offering greater comfort. The uncomfortableness experienced during relatively long journeys also occurs in long-distance coach journeys where passengers have to remain seated in a relatively small space for the entire trip.

20 There have been various attempts by vehicle manufacturers and designers to solve the abovementioned problem. One of the main solutions is the construction of seats which, for the purpose of increasing the
25 comfort of the passengers, can be placed flat or adjusted in various ways to form reclining seats.

According to the prior art, a vehicle seat which can be adjusted into a reclining seat is presented in the
30 international patent application published under number WO 97/41000. In the solution presented there, every other seat is raised to form a reclining seat, all other seats remaining in place. During the raising procedure, the raised seat is first of all extended
35 outward telescopically in the direction of the backrest, then the seat is opened at the connecting point between the seat surface and the backrest, becomes flat and a footstool is opened below the seat

surface as a foot rest. Although the passenger remains on the seat during the raising and lowering procedures, the operating of the solution requires a complicated mechanism and the realization of the telescopic raising
5 means is mechanically awkward, critical and unstable.

A convertible seat which can be used in vehicles is presented in European patent description having the registration number EP 516 575. In the solution
10 presented therein, a lifting mechanism lifts the backrest of the seat while the seat surface is pushed forward, and the seat thus turns into a reclining seat. Its disadvantage is that in order to modify the seat the passenger has to stand up; this is critical in
15 planes since it is only possible for a small number of passengers to stand up in aircraft. In the event of an emergency there is no possibility of immediately returning the seat into the basic position.

20 Furthermore, a seat unit which can be converted into a reclining seat is described by the patent descriptions having the registration numbers GB 295 962 and US 5 425 516. These solutions are difficult to operate, their conversion is awkward and they do not offer
25 appropriate convenience.

A disadvantage of the presented solutions is that the passengers have to make additional effort and carry out special operations during the transformation of the
30 seats into reclining seats. It may only therefore be possible, for example, for the passengers to convert all of the seats just once, and for this purpose the cabin has to be left temporarily. This is difficult to realize given today's aircraft traffic, so the use of
35 solutions of this type is severely restricted. The other typical solution is that a plurality of seats or groups of seats may be transformed at the same time into reclining seats. This does not always meet with

the individual requirements of the passengers. In a further group of solutions, the reclining seats transformed from the seats take up more space than the seats themselves, and therefore restrict the movement
5 in the passenger compartment.

When formulating the solution of this invention our aim was to formulate a seat-adjusting system enabling the movement and transformation of one or more vehicle
10 seats and simple conversion thereof into reclining seats.

In the solution of the problem we have correspondingly recognized that if, in the design of the seat-adjusting
15 systems, one or more vehicle seats are arranged on displaceable frames and the spindle of said seats can expediently be displaced in the slotted guide formed on the frame, the aim which has been set can be realized. Furthermore, we recognized that if the seat-moving
20 system is designed in such a manner that one or more vehicle seats [lacuna] on the pivot point of the seat surface and the backrest, and furthermore is suspended on braces between the foot part and the end of the backrest, which braces are moved by means of clamping
25 worms moved on clamping frames, the aim which has been set can be realized.

The invention is a seat-operating system for moving the individual parts of vehicle seats, especially vehicle
30 seats which can be transformed into reclining seats, said seats comprising a plurality of foot parts, seat surfaces and backrests, optionally supplemented by a head restraint, which are rotatably interconnected and are delimited as they move out of [lacuna] into a
35 sitting or reclining position. The system [lacuna] characterized in that the vehicle seat is fitted to the floor of the vehicle on a holding frame which can be adjusted about a fixed or movable spindle, or is

- mounted on an appropriately adjustable holding frame in such a manner that in the lower position the holding frame, together with the foot part, the seat surface and the backrest, forms the seat, and in the raised position the holding frame, together with the floor of the vehicle and the foot part, the seat surface and the backrest, expediently forms a reclining surface with parallel alignment, designed as a foldable unit.
- One of the expedient embodiments of the invention is that a slotted guide is formed in the holding frame in order to guide the spindles during the folding-down procedure. A hydraulic or pneumatic or mechanical or electromechanical moving apparatus which is used for raising the holding frame is connected [lacuna] the holding frame. The holding frame, which is mounted rotatably on the floor of the vehicle on a movable spindle, is connected to a lifting pillar which is provided with a hydraulic or mechanical or electromechanical adjusting unit. Two or three or four or five vehicle seats are mounted one behind the other on the holding frame. The hydraulic or pneumatic or mechanical or electromechanical movement units or shock absorbers are advantageously mounted between those parts of the vehicle seats which are connected by flaps [sic]. The backrest or the seat surface of the vehicle seat is connected to the holding frame or is mounted rotatably thereon.
- Furthermore, according to the invention [lacuna] seat-operating system for moving the individual parts of vehicle seats, especially vehicle seats which can be transformed into reclining seats, said seats comprising a plurality of foot parts, seat surfaces and backrests, optionally supplemented by a head restraint, which are rotatably interconnected and are delimited as they move out of [lacuna] into a sitting or reclining position. This system is characterized in that clamping braces

- are fitted to the vehicle seat at three points - the foot part, expediently at the lower end of the foot part, the seat surface and the folding point of the backrest, said clamping braces being connected to the
- 5 clamping and moving units which position the foot part, the seat surface and the backrest in the sitting and reclining position, and move between these positions and are guided on clamping frames.
- 10 Another expedient embodiment of the invention is that one clamping brace is fitted to the lower end of the foot part of the vehicle seat, two clamping braces, one lower and one upper clamping brace, are advantageously fitted to the folding point of the seat part and the
- 15 backrest, and one clamping brace is fitted to the upper end of the backrest. The vehicle seat is supported by supporting and moving pillars at the point at which the seat part and the backrest are connected in a folding connection. The advantageously fastened clamping and
- 20 moving units and clamping braces are guided onto the moving parts of the vehicle seat on trolleys which are mounted movably on the clamping frames. The clamping frame and the clamping and adjusting units are mounted outside the passenger compartment or within the latter
- 25 in a concealed manner, and are connected to the clamping braces outside the passenger compartment, or are connected within it to wire cables. The seat-operating system is provided with servomotors which move the clamping and moving units on the clamping
- 30 frame and with servomotors which clamp and lift the clamping braces; in addition, the clamping frame is designed as a rail and is provided with rollers which fit onto the rail and run along the latter in order to move the clamping and adjusting units on the clamping
- 35 frame. A plurality of vehicle seats are mounted one above another, said seats being mounted on a clamping frame, or each seat has a separate clamping frame and clamping and adjusting units.

The solution according to the invention is presented below with the aid of the enclosed illustrations:

5 Figures 1-4 present the adjusting system of the invention for holding frames moved in slotted guides during the conversion of the vehicle seats from sitting position into reclined position.

10 Figures 5, 6, 7 show a further possible position of the seat-adjusting system according to the invention and the adjusting phases of the vehicle seats arranged on said system.

15 Figures 8, 9, 10 show a further possible configuration of the seat-adjusting system according to the invention and the adjusting phases of the vehicle seats arranged on the latter when lifting pillars are used.

20 Figures 11-12 show the seat-adjusting system in a version which can be realized for two seats and intended for individual declining [sic] into a sitting and reclining position.

25 Figures 13-14 show the bracing variant of the seat-adjusting system with vehicle seats which can be adjusted into a sitting and reclining position using braces.

30 Figure 15 shows the bracing variant of the seat-adjusting system according to the invention in plan view, in the case of a plurality of vehicle seats situated next to one another.

35 Figures 16-17 show another variant for adjusting the seat-adjusting system according to the invention into a sitting and reclining position using braces.

Figures 18, 19, 20 illustrate the adjusting phases of three vehicle seats situated one behind another in the seat-adjusting system according to the invention using braces.

5

Figures 1-4 illustrate the seat-adjusting system according to the invention with the holding frame moving in a slotted guide during the transformation of the vehicle seats from a sitting into a reclining position. Figure 1 shows the slotted-link-adjusting apparatus in the sitting position of the vehicle seats. Figure 2 shows the slotted-link-adjusting apparatus in a partially lowered position. Figure 3 shows the the [sic] slotted-link-adjusting apparatus in a lower reclining position. Figure 4 shows the slotted-link-adjusting apparatus in the reclining position.

10
15

The vehicle seats which are arranged one behind another on a holding frame 3, comprise foot parts 5, seat surfaces 6 and backrests 7 and are interconnected by the hinges 10, 11 can be seen in Figures 1-4. In the configuration according to the illustration, further foot holders 12 are connected to the foot parts 5 by the hinges 9. In the design according to the illustration, the backrests 7 are also provided with head restraints 8. In the basic position of the vehicle seats, the holding frames 3 are in the basic position on the floor of vehicle 1. This sitting position is defined by the hinges 9, 10, 11 and by the elements connecting the parts of the seats.

20
25
30

The seats are converted into a reclining position by the raising of the holding frame 3. In addition to the raising of the holding frame 3, it can be gathered from the drawings that the vehicle seats are raised continuously. During the raising procedure, the holding frame 3 is moved on the spindle 2, which is fastened to the lower part of the vehicle 1, guided in the slotted

35

guide 4 which is formed in said frame. In this case, the holding frame 3 rotates on the spindle 2, which is mounted on the lower part 1 of the vehicle, in such a manner that in the meantime the slotted guide 4 moves forward. The adjustment of the holding frame 3 in the slotted guide 4 advantageously takes place using a toothed strip, toothed ring or by means of a pneumatic or hydraulic movement. During the adjustment or movement forward, the holding frame 3, which is directed in the slotted guide 4, is raised above the floor of the vehicle 1, and the vehicle seats, which are arranged in the holding frame 3, are transformed in the phases shown in Figures 2, 3 into seats in a reclining position.

15

In the situation which can be seen in Figure 4, the front part of the holding frame 3 together with the vehicle seat which is located thereon is already in the fully raised state. The seats are completely extended when they are advantageously parallel to the floor of the vehicle. This reclining position is also determined by the hinges 9, 10, 11 and by the elements connecting the parts of the seats.

Figures 5, 6, 7 show another possible design of the seat-adjusting system according to the invention and the adjusting phases of the vehicle seats arranged on said system. In this case, the spindles 2 are fastened fixedly to the floor of the vehicle 1. The holding frames 3, on which one or more vehicle seats are mounted, are mounted rotatably on the spindles 2. The vehicle seats comprise a plurality of parts which are flexibly interconnected and are composed of the foot parts 5, the seat surfaces 6 and the backrests 7, [lacuna] in their adjustment into a sitting or reclining position in a fixed manner, the backrest optionally being supplemented by head restraints 8. The parts of the vehicle seats are connected to one another

by the movable hinges 10, 11. During the raising procedure of the holding frames 3, the vehicle seats proceed continuously into the reclining position from the sitting position by means of rotation of the
5 spindles 2.

The holding frames 3 can be raised by hydraulic, pneumatic, electromechanical raising means. There are either pneumatic, or mechanical or electromechanical
10 moving units and shock absorbers for moving the vehicle seats between the parts connected to one another by the hinges 10, 11. The interconnected foot parts 5, seat parts 6 and spindles 2 form an articulated apparatus which is held twisted about the spindles 2 and which
15 folds together when the seat is leant back, and the seat is turned into a reclining seat.

Figures 8, 9, 10 show a further possible configuration of the seat-adjusting system according to the invention and the adjusting phases of the vehicle seats arranged
20 on said system when the lifting pillars 16 are used. This configuration differs from the solution which can be seen in Figures 5, 6, 7 in that at the bottom the spindles 2 are displaceable, and during the raising
25 procedure the pillars 16 remain in their place and in the meantime the spindles 2 slide forward in the direction of the arrow which can also be seen on the illustrations and the holding frame 3 moves ever closer to the pillar. Therefore, no more space is required to
30 adopt the back [sic] position than is required in the sitting position. The movement of the holding frame 3 takes place using hydraulic or pneumatic or mechanical or electromechanical raising means which are fitted into the lifting pillars 16. In an advantageous design,
35 the lifting pillars 16 can also be fitted into the backrests 7 of the seats.

Figures 11-12 show the seat-adjusting system according to the invention in the variant which can be realized for two seats and which can be lent back individually into a sitting and reclining position. The seat-adjusting system according to the invention also gives the option of being able to lean back the group of seats consisting of two seats separately. As long as one seat remains in the sitting position, the other seat can be folded [sic] entirely. This is an individual solution, since the passengers can use their own discretion to decide which seat is unfolded when and when they retire into a resting position.

Figures 13-14 show the realization of the seat-adjusting system according to the invention using braces with the vehicle seat being moved by the braces 13 into a sitting and reclining position. The vehicle seats are connected by multi-sectioned hinges 10, 11, which can be changed in rotational direction with respect to each other, and have foot parts 5, seat surfaces 6 and backrests 7 which are positioned in a defined manner during their movement into a sitting or reclining position. Said braces are connected to the vehicle seat at three points - to the foot point 5, expediently to the lower ends of the foot parts 5, to the seat surfaces 6 and the folding points 11 of the backrests 7 and the backrests 7, expediently to the clamping braces 13 of the upper ends of the backrests 7, said clamping braces connecting clamping and folding units 14 which position the foot parts 5, seat parts 6 and backrests 7 of the vehicle seat into a sitting and reclining position, and can be moved between these positions and are guided on clamping frames 15.

In the illustration, we marked the directions of movement of the clamping and folding units 14 on the clamping frame 15 with arrows. Moving servomotors are used to move the clamping and folding units 14; the

clamping braces 13 are provided with clamping servomotors providing the tensioning. When the seat is reclined, the clamping and folding units 14 hold the clamping braces 13 in a tensioned state until the very
5 end, and therefore ensure the stability of the seats and individual parts thereof and positioning thereof. When returning the seat from the reclining position into a sitting position, the movement of the clamping and folding units 14 takes place in an opposite
10 direction than can be seen in the drawings.

Figure 15 shows the plan view of the suspension of the vehicle seats of the system which moves the seats according to the invention using braces into a
15 reclining position and the arrangement of said seats next to one another, in the case of a plurality of vehicle seats situated next to one another. In the drawing, the arrangement of three seats next to one another can be seen, said seats being suspended by the
20 13 [sic] clamping braces between the seats. In the expedient arrangement which can be seen in the drawing, the 15 [sic] clamping frames are designed as a rail, and the 14 [sic] clamping and folding units are provided with rollers which fit onto these rails and
25 run along them for movement on the 15 [sic] clamping frames.

Figures 16-17 show another option for realizing the movement of the seat-adjusting system according to the
30 invention using braces in a sitting and reclining position of the vehicle seats moved using braces. The manner of the suspension and movement of the seats is similar to the solution presented in Figures 13-14 using the clamping braces 13. The solution involving
35 the suspension and movement of the seat parts differs in that the clamping and folding units 14 and the clamping frames 15 are mounted at two opposite ends, and the clamping braces 13 are guided onto the moving

parts of the vehicle seats on trolleys 18 which are mounted movably on the clamping frames 15. The movement of the trolleys 18 on the clamping frames 15 for the clamping and folding units 14 and the tensioning of the seat parts and the movement thereof takes place with the aid of the clamping braces 13. The movement and tensioning takes place using the servomotors situated in the clamping and folding units 14. In an expedient realization, the clamping frames 15 are designed as a rail, and the trolleys 18 are provided with rollers which fit onto the rails and run along the latter for movement on the clamping frames 15.

In the given case, Figures 18, 19, 20 illustrate the movement phases of three vehicle seats mounted one behind another in the case of the seat-adjusting system according to the invention using braces. In the solution which can be seen in the illustration, vehicle seats having the seat surfaces 6 and backrests 7 are connected by the folding connections 11 to the supporting and adjusting pillars 17; at the same time, the foot parts 5 and backrests 7 and optionally also the folding connections 11 of the seat surfaces 6 and the backrests 7 are also moved and positioned using the braces 13. The use of the supporting and moving pillars 17 serves to reinforce the stability of the seat, since during the raising procedure the seat is guided, and if appropriate the movement of the seat surfaces 6 of the seat is also more secure.

30

The raising procedure and the reforming of the sitting position into the reclining position takes place with a coordinated movement of the clamping braces 13, if appropriate with raising of the supporting and moving braces 17. The vehicle seats are either moved by the clamping and folding units 14 situated on the clamping frames, or a clamping frame 15 and a clamping and folding unit 14 are fastened to each seat.

In one specific possible configuration of the solution according to the invention we have arranged two or three seats in a reclining position one above another. If a gap between the seats are [sic] 90 cm, then we can
5 use $2 \times 90 = 180$ cm in the horizontal providing sufficient space for a passenger of normal size. The seat has to withstand 16 g, this will be endured by a person for a short time. The load-bearing capacity of the wire and of the clamping and lifting brace concurs. In the case
10 of the seat movement using the solution according to the invention which uses braces, a base is not required because the seat-holding and lifting brace is tensioned to such a degree. Thus, this is ultimately a suspended seat from which a horizontal suspended bed of tensioned
15 structure is [lacuna] with variable position. The movement and guidance of the trolleys is ensured by a solution similar to a moving cord [sic] floor.

The advantage of the solution according to the
20 invention is that it is better than other solutions used for similar aims, since the folding solution realizes the objective with great safety and a simple mechanical solution and is suitable for individual movement within groups of seats.

25

In the solution according to the invention, two or three seats are folded back if appropriate through the adjustment of a mechanical element and of the folding of the supporting framework. By folding the holding
30 frame which supports the seats forward, it can be ensured that there is sufficient space behind the seats and the space required by the folded-back seats is therefore not greater than in the sitting position. The solution to the space problem is ensured precisely by
35 the fact that the adjustment of a plurality of seats arranged one behind the other is therefore realized at the same time, with the result that there are substantially more options open for using the spaces.



PATENT CLAIMS

1. A seat-operating system for moving the individual parts of vehicle seats, especially vehicle seats which can be transformed into reclining seats, said seats comprising a plurality of foot parts, seat surfaces and backrests, optionally supplemented by a head restraint, which are rotatably interconnected and are delimited as they move out of [lacuna] into a sitting or reclining position, characterized in that the vehicle seat is fitted to the floor of the vehicle (1) on a holding frame (3) which can be adjusted about a fixed or movable spindle (2), or is mounted on an appropriately adjustable holding frame (3) in such a manner that in the lower position the holding frame (3), together with the foot part (5), the seat surface (6) and the backrest (7), forms the seat, and in the raised position the holding frame (3), together with the floor of the vehicle (1) and the foot part (5), the seat surface (6) and the backrest (7), expediently forms a reclining surface with parallel alignment designed as a foldable unit (10, 11).
2. The seat-operating system as claimed in claim 1, characterized in that a slotted guide (4) is formed in the holding frame (3) in order to guide the spindles during the folding-down procedure (2).
3. The seat-operating system as claimed in claim 1 or 2, characterized in that a hydraulic or pneumatic or mechanical or electromechanical moving apparatus which is used for raising the holding frame (3) is connected to the holding frame (3).

This Sheet Has Been Replaced.





4. The seat-operating system as claimed in claim 1, characterized in that the holding frame (3), which is mounted rotatably on the floor of the vehicle (1) on a movable spindle (2), is connected to a lifting pillar (16) which is provided with a hydraulic or mechanical or electromechanical adjusting unit.
5. The seat-operating system as claimed in claims 1 - 4, characterized in that two or three or four or five vehicle seats are mounted one behind the other on the holding frame (3).
6. The seat-operating system as claimed in claims 1 - 5, characterized in that the hydraulic or pneumatic or mechanical or electromechanical movement units or shock absorbers are mounted between those parts of the vehicle seats which are connected by flaps [sic] (9, 10, 11).
7. The seat-operating system as claimed in claims 1 - 6, characterized in that the backrest (7) or the seat surface (6) of the vehicle seat is connected to the holding frame (3) or is mounted rotatably thereon.
8. The seat-operating system for moving the individual parts of vehicle seats, especially vehicle seats which can be transformed into reclining seats, said seats comprising a plurality of foot parts, seat surfaces and backrests, optionally supplemented by a head restraint, which are rotatably interconnected and are delimited as they move out of [lacuna] into a sitting or reclining position, characterized in that clamping braces (13) are fitted to the vehicle seat at three points - the foot part (5), expediently at the lower end of the foot part (5), the seat





5 surface (6) and the folding point (11) of the backrest (7), said clamping braces being connected to the clamping and moving units (14) which position the foot part (5), the seat surface (6) and the backrest (7) in the sitting and reclining position, and move between these positions and are guided on clamping frames (15).

9. 10 The seat-operating system as claimed in claim 8, characterized in that one clamping brace (13) is fitted to the lower end of the foot part of the vehicle seat, two clamping braces (13), one lower and one upper clamping brace, are advantageously fitted to the folding point (11) of the seat part (6) and the backrest (7), and one clamping brace (13) is fitted to the upper end of the backrest (7).

10. 20 The seat-operating system as claimed in claim 8 or 9, characterized in that the vehicle seat is supported by supporting and moving pillars (17) at the point at which the seat part (6) and the backrest (7) are connected in a folding connection (11).

11. 25 The seat-operating system as claimed in claims 8 - 10, characterized in that the advantageously fastened clamping and moving units (14) and clamping braces (13) are guided onto the moving parts of the vehicle seat on trolleys (18) which are mounted movably on the clamping frames (15).

12. 35 The seat-operating system as claimed in claims 8 - 11, characterized in that the clamping frame (15) and the clamping and adjusting units (14) are mounted outside the passenger compartment or within the latter in a concealed manner, and are connected to the clamping braces (13) outside the



passenger compartment, or are connected within it to wire cables.

- 5 13. The seat-operating system as claimed in claims 8 - 12, characterized in that it is provided with servomotors which move the clamping and moving units (14) on the clamping frame (15) and with servomotors which clamp and lift the clamping braces (13); in addition, the clamping frame (15)
- 10 is designed as a rail and is provided with rollers which fit onto the rail and run along the latter in order to move the clamping and adjusting units (14) on the clamping frame (15).
- 15 14. The seat-operating system as claimed in claims 8 - 13, characterized in that a plurality of vehicle seats are mounted one above another, said seats being mounted on a clamping frame, or each seat has a separate clamping frame (15) and clamping
- 20 and adjusting units (14).