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(54) Switch arrangement for the adjustment of a vehicle seat

(57) Several variations are described for the integration of a switch for the adjustment of the seat depth (i.e. the distance between the front edge of the seat surface and the backrest) in a vehicle seat adjustment switch group, the elements of which are spatially arranged so as to correspond in an obvious way to the adjustable parts of the actual seat.

In one arrangement, Fig. 1, the switch (4) for the seat cushion is divided into two parts (5, 6). Part (5) can be displaced horizontally independently of part (6) to adjust seat depth. In a variation, Fig 5, the switch (3) which is rotated to adjust the angle of the backrest is also displaceable horizontally to adjust seat depth.

Fig.1

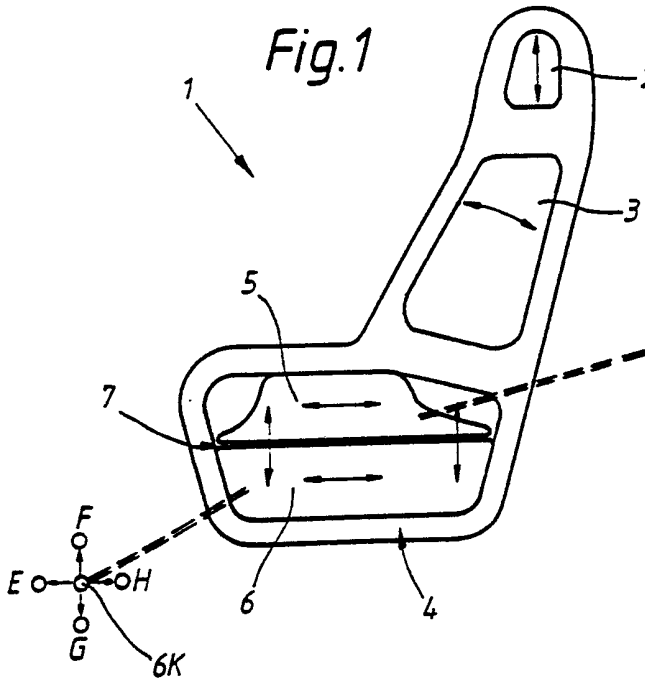

Fig. 5

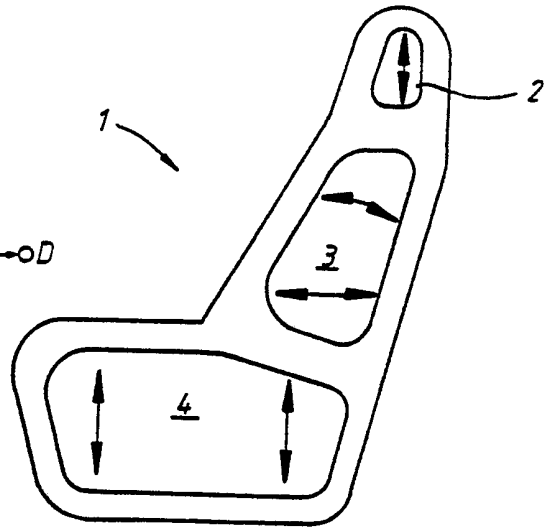

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Fig.1

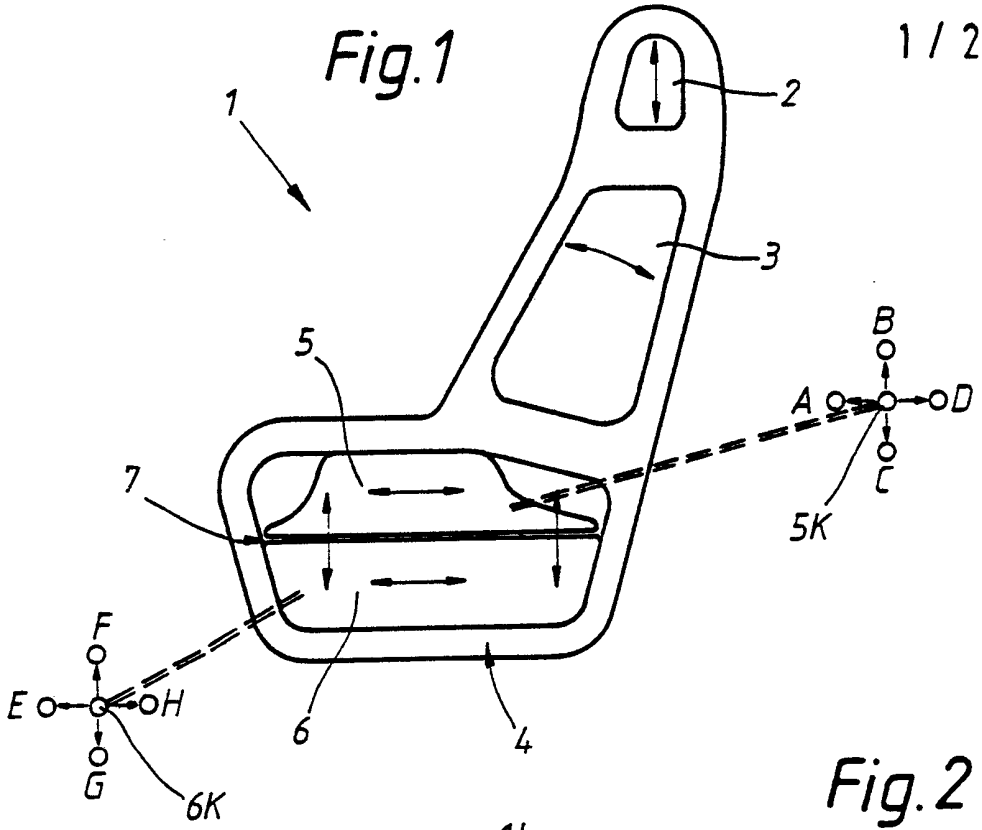


Fig.2

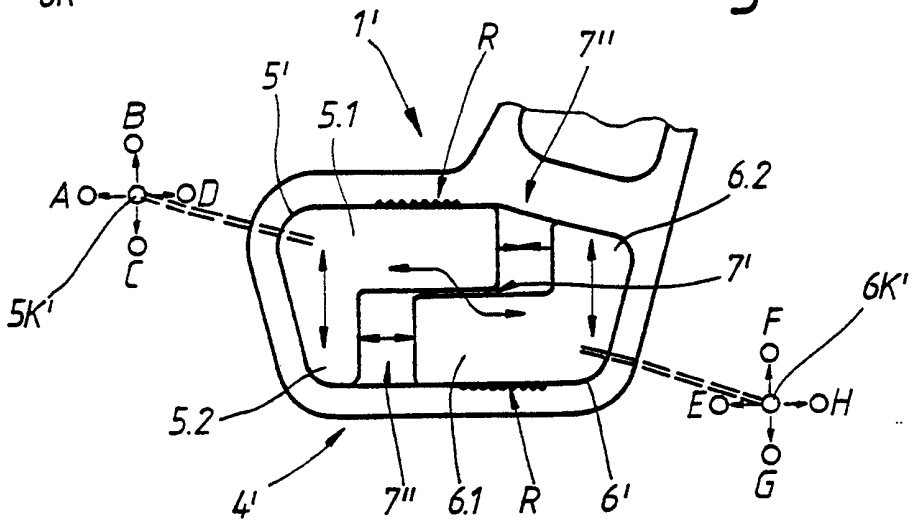


Fig.3

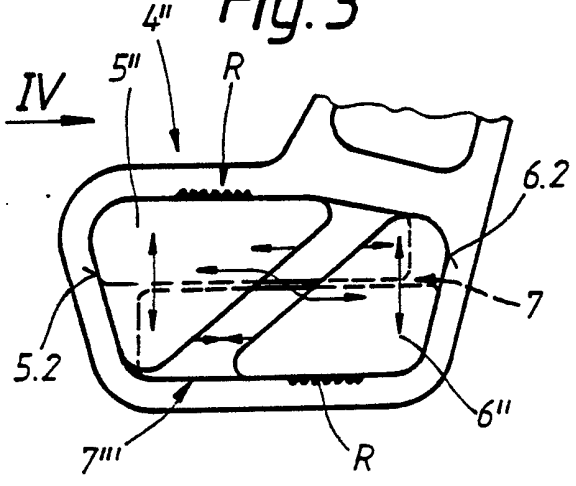


Fig.4

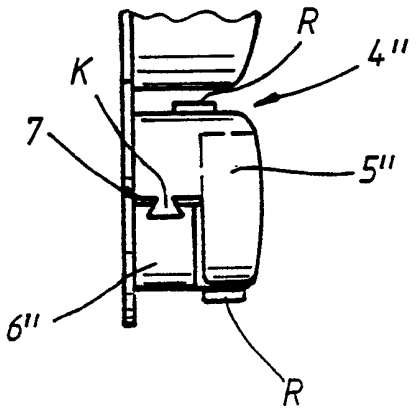


Fig. 5

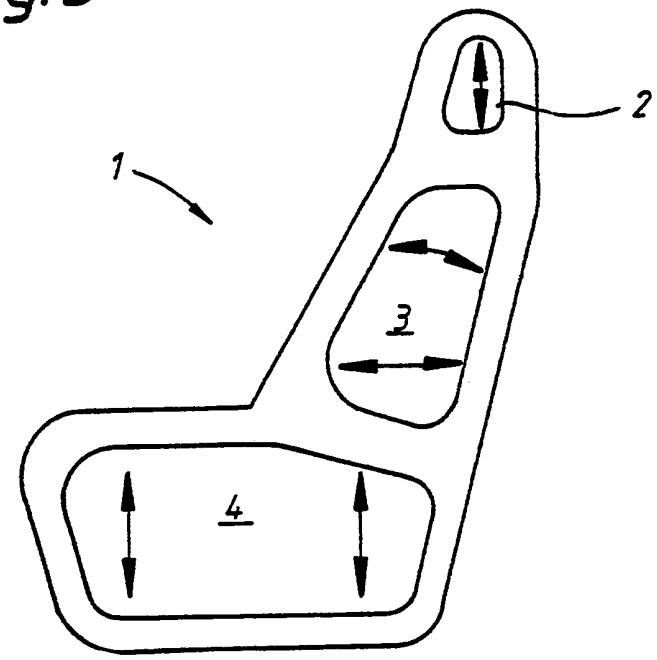
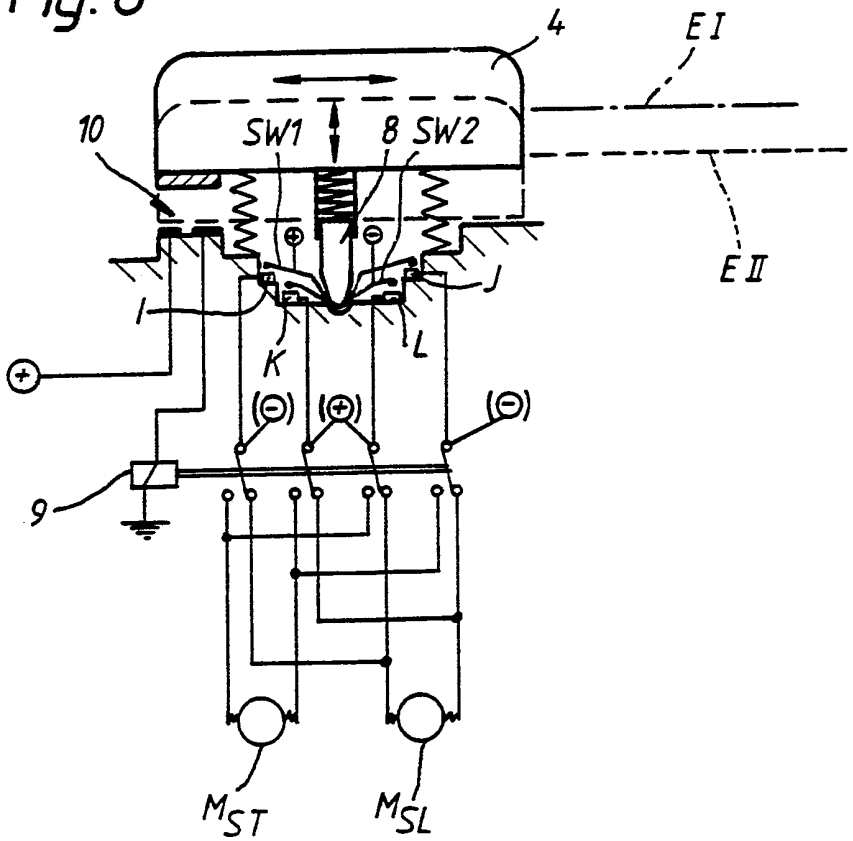


Fig. 6



Control device for the control of stepping motors for the adjustment of a motor vehicle seat

The invention relates to a control device for the control of stepping motors for the adjustment of a motor vehicle seat containing

- at least one switching element having an actuating element which is displaceable at least for the longitudinal adjustment of the entire motor vehicle seat in the passenger compartment in such an arrangement that its direction of displacement corresponds obviously to the desired direction of adjustment of the motor vehicle seat.

A control device of this type is known (DE 2,836,004 C2). In addition to a tiltable switch actuating element for the backrest adjustment, said known control device contains a switch actuating element for seat height adjustment and longitudinal adjustment of the seat, which switch actuating element

- can be displaced in the horizontal direction in order to move the complete vehicle seat forwards or backwards,
- can be displaced in the vertical direction in order to change the seat height, and
- can be swivelled about a horizontal axis in order to change the relative height position between the front edge and the rear edge of the seat cushion.

The switch actuating elements are arranged in such a way that, in the plan view, they represent symbols of the outlines of a seat with backrest and seat cushion.

A possible arrangement of the electric switching means in the control device is described in DE 2,839,367 C2.

Another known control device (DE 3,513,050 A1) likewise has symbols for backrest and seat cushion which,

in that case however, are not movable and in which separate switch actuating elements are arranged which are movable in obvious directions relative to the symbols in order to actuate electric switching means.

An arrangement of switch actuating elements of a seat adjustment switch is also known (EP 0,260,213 A2), in which the outlines of backrest and seat cushion are likewise reflected symbolically by the switch actuating elements, the seat cushion being represented by a total of four switch actuating elements arranged quadrantally. To actuate the electric switching elements, the switch actuating elements must be pressed, it being possible for different setting functions to be controlled by simultaneous operation of two actuating elements and by operation of individual actuating elements.

A fourth known control device for seat adjustment (DE 8,516,069 U1) likewise has a frame-like switch actuating element symbolizing a seat cushion, which switch actuating element is displaceable in an obvious direction for the longitudinal adjustment of the seat as a whole. Two further, depressable switch actuating elements are sunk into said switch actuating element, of which one serves for raising and the other for lowering the seat. The latter arrangement - which is no longer operable in an obvious sense - forms in function a single change-over contact with a central position and two different actuating elements.

With the control devices described in the latter three publications, only the same seat adjustment functions can be controlled as with the control device forming the generic type described at the beginning.

Furthermore, a vehicle seat is known (DE 3,631,872 C1), the seat depth of which, that is to say the distance between the front edge of the seat and the backrest, can be changed electromotively or by hand to adapt to different thigh lengths of the respective passengers. In addition to the mechanical alternative of

a "handwheel", in this publication, however, no device is disclosed for the manual control of the electromotive seat depth change. In another known vehicle seat (DE 3,018,323 C2), the seat depth can likewise be adjusted electromotively or hydraulically; in the latter publication, however, again no means are disclosed for the manual control of the adjustment drives.

The present invention seeks to develop further a control device in such a way that the further function "adjust seat depth" can be implemented whilst retaining its obvious operability.

According to one aspect of the present invention there is provided a control device for the control of stepping motors for the adjustment of a motor vehicle seat, containing

- at least one switching element having an actuating element which is displaceable at least for the longitudinal adjustment of the entire motor vehicle seat in the passenger compartment in such an arrangement that its direction of displacement corresponds obviously to the desired direction of adjustment of the motor vehicle seat,

characterized by

- division of the actuating element by a partial joint into two parts which are displaceable independently of each other,
- assignment of switching means for adjustment of the distance between the front edge of the seat and the backrest (seat depth) of the motor vehicle seat at least to one part of the actuating element, and
- assignment of switching means for the longitudinal adjustment of the entire motor vehicle seat at least to the other part of the actuating element.

By division of the actuating element for the seat cushion adjustment, the operation of the seat adjustment switch, whilst retaining the directly obvious assignment, is differentiated still further because it is now pos-

sible either - as also hitherto - to push the complete seat forwards or backwards by displacing at least the one part of the actuating element or to change the seat depth by displacing at least the other part of the actuating element. The adjustment possibilities already mentioned and already hitherto available are, of course, also maintained by means of the two-part switch actuating element according to the invention.

The characterizing features of subclaims 2 to 18 disclose advantageous further developments of the control device according to this first aspect of the invention.

The purpose of the switch actuating element, which is preferably subdivided horizontally in the installation position, becomes evident to any operator if the seat depth adjustment is allocated to the top part of the switch actuating element and the longitudinal adjustment of the seat is allocated to its bottom part because the operator can readily associate the seat cushion surface facing him/her - which he/she can lengthen or shorten - to the top part and can associate the chassis of the entire seat to the bottom part.

It can also be advantageous in terms of user-friendliness to design the two parts of the actuating element for the control of the adjustment of the seat depth so as to be displaceable at the same time, but in opposite directions, with appropriate contact assignment in order to be able to select the seat depth change obviously with the switch actuating element.
In a further preferred shaping of the actuating element parts, this opposite displacement of the parts can result in a lengthening or a shortening of the overall length of the actuating element from a neutral basic position, which at the moment of operation likewise corresponds exactly to the desired adjustment function. This operation in opposite directions can readily be effected by a "shearing movement" of the thumb and one finger of the operator's hand. It also largely prevents both parts of

the actuating element from being inadvertently displaced upwards or downwards during the seat depth adjustment and thus prevents unintentional upward or downward seat adjustment from being triggered.

The customary longitudinal adjustment of the seat in the passenger compartment can again be advantageously controlled in the previously mentioned embodiments by displacing the entire actuating element, that is to say displacement of both actuating element parts simultaneously and in opposite directions, if the electric switching means for the longitudinal adjustment are also assigned to both actuating element parts.

According to a second aspect of the invention there is provided a control device for the control of stepping motors for the adjustment of a motor vehicle seat, containing

- a first switching element having a first actuating element provided at least for the longitudinal adjustment of the entire motor vehicle seat in the passenger compartment,
- a second switching element having a second actuating element at least for the adjustment of the inclination of a backrest with regard to the seat surface, which second actuating element can be swivelled about an axis relative to the first actuating element, in such an arrangement that its swivel movement corresponds obviously to the desired swivel direction of the back rest,

characterized by

- displaceable guiding of the second actuating element relative to the first actuating element,
- assignment of switching means for adjustment of the distance between the front edge of the seat and the back rest (seat depth) of the motor vehicle seat to displacement movements of the second actuating element.

With the control device proposed in the second

aspect, the seat depth adjustment is interpreted starting from another aspect. Since the change in seat depth, as already defined, relates in any case to the distance between the front edge of the seat and the backrest, it can also be considered as a relative displacement of the backrest in relation to the seat cushion or its front edge, irrespective of whether the backrest is fixed and the seat cushion is completely or partially displaced, as corresponds to the customary implementation, or whether the seat cushion is fixed and the backrest is displaced. According to this consideration, a surprisingly simple extension of the control device for seat depth adjustment is found in the fact that the actuating element symbolizing the backrest, which could hitherto only be swivelled, is now additionally arranged or guided so as to be displaceable and the switching means for the seat depth adjustment are assigned to the displacement movement of this actuating element. Preferably, but not compulsorily, the displacement movement of this actuating element is naturally guided along the longitudinal extension of the single-part actuating element symbolizing the seat cushion in order to achieve, in this case too, an obvious operation and control of the desired adjustment movement of the seat.

Yet another design of the possibility for seat depth adjustment consists according to a third aspect of the invention which provides a control device for the control of stepping motors for the adjustment of a motor vehicle seat, containing

- at least one switching element having a displaceable actuating element at least for the longitudinal adjustment in one plane of the entire motor vehicle seat in the passenger compartment from a basic position in such an arrangement that its direction of displacement corresponds obviously to the desired direction of adjustment of the motor vehicle seat,
- switching means assigned to the actuating element for

the longitudinal adjustment of the entire motor vehicle seat,

characterized by

- assignment of switching means for adjustment of the distance between the front edge of the seat and the backrest (seat depth) of the motor vehicle seat to the same actuating element, the actuating element
- being displaceable in a further plane deviating from the plane of its basic position and
- being movable only in the deviating plane for loading the switching means for the adjustment of the seat depth corresponding to the directions of operation of the longitudinal adjustment of the seat starting from its basic position.

This aspect provides a second function level, a double assignment so to speak, is assigned to a single-part actuating element for the longitudinal adjustment of the seat by the fact that the switching means for the seat depth adjustment are also directly assigned to said actuating element. In this case it is particularly advantageous to provide for both adjustments only one set of electric switching means which can be switched over via a change-over device, which is actuated at the same time, by depressing or pulling out the actuating element from the basic position - in which it preferably controls the longitudinal adjustment of the seat.

Further details and advantages of the control device according to the invention emerge from the drawing of five exemplary embodiments of the control device and the following detailed description of said exemplary embodiments.

In the drawing,

Figure 1 shows a first embodiment of a control device, in which the switch actuating element for the longitudinal adjustment of the seat and the seat depth adjustment is divided by a partial joint extending horizontally in a straight line,

Figure 2 shows a second embodiment of a control device, in which the switch actuating element for the longitudinal adjustment of the seat and the seat depth adjustment is divided into two parts of angular construction, the overall outline of which, in turn, symbolizes a seat cushion,

Figure 3 shows a third embodiment of a divided actuating element for the longitudinal adjustment of the seat and the seat depth adjustment, in which a partial joint section, visible on the surface, forms a wide, obliquely increasing gap,

Figure 4 shows a view of the actuating element which, in relation to Figure 3, has been pulled out of its plane by 90°,

Figure 5 shows a fourth variation of the control device, in which a swivellable actuating element for the adjustment of the backrest inclination is additionally displaceable relative to the actuating element for the longitudinal adjustment of the seat in order to control the change in the seat depth, and

Figure 6 shows a fifth variation of the control device, in which a second function level for the seat depth adjustment is assigned to the actuating element for the longitudinal adjustment of the seat.

By means of the embodiment of a control device 1 shown in Figure 1, which control device has a switch actuating element 2 symbolizing a headrest, a switch actuating element 3 symbolizing a seat backrest and a switch actuating element 4, which is divided into a top part 5 and a bottom part 6 by a partial joint 7 extending horizontally in a straight line, symbolizing a seat cushion of a motor vehicle seat (not illustrated) which can be adjusted by means of external force, an operator can displace the switch actuating elements 2 and 4 with parts 5 and 6 in the directions respectively designated

by double arrows or can swivel the switch actuating element 3 and thus control adjustment movements of the respectively symbolized seat components. The actuating element parts 5 and 6 are only jointly displaceable in the vertical direction, but are displaceable both jointly and individually in the horizontal direction, as is indicated by the horizontal double arrows drawn in both parts. For this purpose, all the actuating elements or parts are each guided in a known manner in suitable connecting links and are returned preferably resiliently to their illustrated starting positions.

In the case of the displacement direction indications mentioned, it is assumed that the control device is installed inside the vehicle in an at least approximately vertical plane (door panelling or lateral seat wing) so that the part 5 is then also located at the top and the part 6 at the bottom.

Electric fixed contacts A, B, C, D or E, F, G, H are indicated diagrammatically which correspond in each case to a switching contact 5K or 6K assigned to the actuating element parts 5 or 6. The respective mechanical connection between the actuating element part and the switching contact is indicated by a dashed double line. Whenever one of the switching contacts 5K or 6K is electrically contacted by one of the fixed contacts A - D or E - H assigned to it by displacement of one of the actuating element parts 5 or 6 in the corresponding direction, due to the electric potential present at the switching contact an electric signal occurs on a control or evaluation circuit connected to the fixed contacts, which signal is used at least indirectly for a corresponding control of a setting element arranged in the motor vehicle seat. A control or evaluation circuit of this type is always present, for example, when a memory circuit is also provided for programmable and recallable seat positions.

For this exemplary embodiment the arrangement of

the switching contacts 5K and 6K was selected such that the switching contact 5K is assigned to the rear end of the actuating element part 5 and the switching contact 6K to the front end of the actuating element part 6. Each switching contact 5K or 6K can be switched from the illustrated resting position in four directions - indicated by small arrows - to which directions one of the fixed contacts A to D or E to H is assigned in each case. The possible or required seat adjustment functions are thus controllable according to the following Table I:

	Switching contact 5K	Switching contact 6K	Seat movement
to fixed contact:			
a)	-	E	push forwards completely
b)	B	F	raise completely
c)	C	G	lower completely
d)	-	H	push backwards completely
e)	-	F	raise at the front
f)	-	G	lower at the front
g)	B	-	raise at the rear
h)	C	-	lower at the rear
i)	B	G	raise at the rear, lower at the front
j)	C	F	raise at the front, lower at the rear
k)	A	-	lengthen seat cushion
l)	D	-	shorten seat cushion

It is clear that the operation cases a) to j) of this table reflect the seat adjustment functions already possible hitherto while the cases k) and l) reflect the newly added functions for changing the seat depth. In this case, the cases i) and j) respectively are simply superpositions of the cases f) and g) or e) and h). They correspond to a swivel movement of the actuating element 4 about a horizontal axis in anticlockwise or clockwise

direction (in the plane of the drawing). In this case, the starting point is the arrangement of the adjustment drives on the seat shown in DE 2,836,004 C2 forming the generic type.

Considered together, the fixed contacts A, D, E and H, that is to say the contacts loaded in each case on horizontal displacement of the actuating element 4 or its parts 5 and 6, are used in each case alone for the control of an adjustment operation while the fixed contacts B, C, F and G can be loaded both alone and jointly with one other fixed contact in each case for control purposes. It may be expedient for the displacement paths of part 5 of the actuating element 4 which are necessary for loading the fixed contacts A and B to be made longer than the displacement paths of part 6 of the actuating element 4 which are necessary for loading the fixed contacts E and H; this prevents inadvertent false operation which occurs when the two parts 5 and 6 are displaced simultaneously for the longitudinal adjustment of the seat. Of course, this displacement path ratio could also be reversed.

Setting out from the mentioned known switch arrangement in an actuating element of this type, the fixed contacts located respectively opposite each other A/D, B/C, E/H, F/G are parts of change-over feelers, switching contact of which, having a neutral central position, is formed in each case by the switching contact 5K or 6K, two change-over feelers in each case having a common switching contact.

A switch arrangement of this type can be implemented, for example, by a cross-shaped rocker switch at electric potential having four switching arms, which rocker switch forms the respective switching contact 5K or 6K, the individual actuating element displacing operations guided in the connecting link pressing down one of the switching arms in each case and bringing it into contact with the fixed contact respectively assigned to said switching arm.

The variation 1′ of the control device according to the invention shown in Figure 2 differs from the embodiment described first purely externally only in the bottom part by an actuating element 4′ which is divided into two angularly shaped actuating element parts 5′ and 6′ which, in turn, in the overall outline symbolize a seat cushion. The angular shape of the actuating element parts is formed in each case by a long limb 5.1 or 6.1 and a short limb 5.2 or 6.2, which limbs are located mutually in parallel opposite each other. The horizontally arranged long limbs 5.1 and 6.1 are separated from one another in the illustrated resting position by a narrow partial joint section 7′ which cannot be narrowed further. The vertically extending short limbs 5.2 or 6.2 are each separated from the ends of the long legs 6.1 or 5.1 located opposite them in each case by a wide partial joint section 7′′. Double arrows drawn vertically in the short legs 5.2 or 6.2 indicate their displaceability in the directions of the arrows. The wide partial joint sections 7′′ allow a mutual approach of the two partial actuating elements 5′ and 6′ in the horizontal direction - indicated by small arrows pointing towards each other in the top partial joint section 7′′ - and, by this means, a shortening of the overall length of the actuating element 4′ which can be associated obviously with a shortening of the available seat depth. An operator can grip and squeeze the actuating element 4′ from above with the thumb and index finger of one hand at its front edge - on the left in the figure - and rear edge - on the right in the figure - or at the short legs 5.2 and 6.2 of the parts 5′ and 6′ forming these edges, which results in the simultaneous displacement in opposite directions of both actuating element parts 5′ and 6′. In the design of the connecting link guides for said actuating element parts, attention must be given to the fact that each part cannot be displaced towards the respective other actuating element

part by more than half the width of the wide partial joint section 7'' in order to guarantee a necessary simultaneous loading of the fixed contact - more details of which will be given later. The horizontal displacement stroke of the actuating element parts 5' or 6', which is then still possible, must naturally be sufficiently large for the reliable actuation of the electric switching means (in particular fixed contacts D and E).
In the opposite direction, by a shearing movement of the thumb and finger of one hand, which act in each case on the top side and underside - this shearing movement advantageously being supported by a surface structure moulded onto these sides, e.g. an indicated grooving R -, a simultaneous displacement in opposite directions of both actuating element parts 5' and 6' is possible - indicated by small arrows pointing away from one another in the bottom partial joint section 7'' - which displacement enlarges the overall length of the switch actuating element 4' shown and can therefore be obviously associated with a lengthening of the available seat depth. With this displacement movement in opposite directions, the two actuating element parts are also supported on one another so that a superimposed tilting movement is avoided. The common displaceability of the two parts is indicated by a double arrow extending essentially horizontally and stretching in a curved manner over both actuating element parts 5' and 6'.

Assigned once again to each actuating element 5' or 6' is a switching contact 5K' or 6K' which, in turn, correspond in each case to fixed contacts A to D or E to H. The possible or required seat adjustment functions of the two variations are thus controllable, for example according to the following Table II:

Switching contact		Seat movement
5K'	6K'	
		to fixed contact:

a)	A	E	push forwards completely
b)	B	F	raise completely
c)	C	G	lower completely
d)	D	H	push backwards completely
e)	B	-	raise at the front
f)	C	-	lower at the front
g)	-	F	raise at the rear
h)	-	G	lower at the rear
i)	B	G	raise at the front, lower at the rear
j)	C	F	raise at the rear, lower at the front
k)	A	H	lengthen seat cushion
l)	D	E	shorten seat cushion

It is clear that the signal combinations of the above Table II deviate in relation to those of Table I; loadings of individual fixed contacts lead to adjustment movements only in the separate adjustment of the front edge or rear edge of the seat while for all other adjustment movements two fixed contacts are loaded simultaneously. This has the advantage, inter alia, that an operator no longer has to pay attention to which of the actuating element parts 5' or 6' he/she must operate both in the case of longitudinal adjustment of the complete seat and in the change of the seat depth. The switching means for the longitudinal adjustment of the entire motor vehicle seat and for the seat depth adjustment of the same seat are thus in this case assigned to both actuating element parts 5' and 6'.

AND operations necessary according to the second table are implemented, for example, by logical AND gates which generate an output signal to activate the respective seat adjustment drive only when both fixed contacts - which are connected at the inputs of the respective AND gate - are loaded simultaneously. In a simple embodiment, however, AND operations are necessary

only in the adjustment of the seat depth; in this case, the fixed contacts A and H (to enlarge the seat depth) or D and E (to shorten the seat depth) are to be switched in each case to inputs of AND gates. The cases a) and d) from Table II, in which both actuating element parts 5′ and 6′ are in each case displaced horizontally in opposite directions, just as in the corresponding cases from the first table, can also be implemented by evaluation of the loading of individual fixed contacts, in case a) the fixed contact E, for example, then being in "blank actuation" and in case d) the fixed contact H. Furthermore, it is possible with the sketched arrangement of the switches in case d) to evaluate only the signal from fixed contact H - instead of fixed contact D - for the control of the operation "push backwards completely" because its only other loading (case K) only triggers an adjustment operation in AND operation with the loading of fixed contact A.

As shown in Figure 3, instead of the angular shaping of both actuating element parts 5′ and 6′, a stylistically more pleasing, obliquely increasing contour of a partial joint section 7′′′ of the partial joint 7 separating two actuating element parts 5′′ and 6′′ can of course also be provided at least on the surface perceptible as the seat cushion symbol, attention again needing to be given to the fact that its dimensions, in particular its width projected onto the direction of the mutual approach of the two actuating element parts 5′′ and 6′′, enable their mutual approach. In the embodiment shown, the actual partial joint 7 again extends horizontally as in the variation shown in Figure 1; however, the manual operation corresponds to the variation from Figure 2. In analogy to the designations in Figure 2, the front edge - on the left in the figure - of the actuating element 4′′ is again formed by (end) section 5.2 of the actuating element part 5′′, the rear edge - on the right in the figure - of the actuating

element 4'' in turn by (end) section 6.2 of the actuating element part 6''. If required, the contour of the partial joint sections 7'' shown in Figure 2 can also naturally only be provided in the visible surface while the actual partial joint extends horizontally.

Finally, Figure 4 shows a view, which is pulled out of its plane by 90° in relation to Figure 3, of the actuating element 4'' from the direction of the arrow IV entered in Figure 3, which view depicts the partial covering of the two parts 5'' and 6'' and also shows an embodiment possibility for a positive-fit coupling K of the two parts 5'' and 6''.

The mutual support of both actuating element parts - in all embodiment variations - can in particular be implemented by a positive-fit coupling or connection of both parts of the actuating element 4, 4' or 4'', for example by the dovetail guiding shown or another groove/tongue connection, which may allow in one direction the displacement of the two parts in opposite directions, but prevents expansion of the partial joint 7.

In all embodiments shown hitherto and other conceivable embodiments of the divided actuating element, the switching means for the adjustment of the seat depth of the motor vehicle seat are preferably assigned at least to that part of the actuating element which forms a boundary of the edge part of the actuating element which is situated at the front at the top in installation position and which represents in symbolic form the front edge of the seat surface. In any case, the operator will thus also readily be able to associate a relative movement of the front edge of the seat in relation to the seat frame obviously with the relative movement, already effected manually by him/her, of this actuating element part in relation to the other actuating element part assigned at least to the longitudinal adjustment of the complete seat.

On the electric side of the control device, in all exemplary embodiments at least those fixed contacts which are loaded both individually and jointly with one other fixed contact (cases b), c), i), j) in Tables I and II) can be assigned electric retarders which have the effect that a seat adjustment begins with only a slight delay after loading of an individual fixed contact; if a further fixed contact for the control of a superimposed adjustment is loaded within the time lag, the latter adjustment is executed instead of the adjustment which can be controlled by the individually loaded fixed contact.

Figure 5 represents a variation of the control device according to the first subordinate Claim 19, which control device likewise represents an obvious integration of the seat depth adjustment in the control device forming the generic type. The control device 1 now has a form which, purely externally, is unchanged in relation to the prior art forming the generic type, that is to say it has a single-part switch actuating element 4 as a symbol for a seat cushion, which switch actuating element is displaceable in the directions designated in each case with double arrows. However, the switch actuating element 3 - the symbol for the seat backrest - is now, in contrast to the embodiment shown in Figure 1, displaceable in the directions designated by a double arrow extending horizontally in Figure 5 in the direction of longitudinal extension of the switch actuating element 4, in addition to its swivellability. Consequently an operator can control the change in seat depth via assigned electric switching means. Again the actuating elements 2, 3 and 4 are each guided in a known manner in suitable connecting links and are returned preferably resiliently to their illustrated starting positions. Since the actuating element 3 is arranged in a known manner at an angle to the actuating element 4, by which means in total a two-part seat symbol results, the

shortening of the seat depth is associated with its displacement movement to the left from the illustrated position and the lengthening of the seat depth is associated with its displacement movement to the right from the illustrated position since in each case displacement movements of the backrest in relation to the stationary seat cushion are determined.

The electric switching means for this variation need to be supplemented in relation to the known arrangement mentioned at the beginning only by a two-pole change-over contact with a central position assigned to the displacement movement of the actuating element 3, which change-over contact at least indirectly controls an adjustment drive assigned to the seat depth adjustment.

Other operating possibilities are naturally also conceivable in the latter variation described, such as for example the fact that both actuating elements 3 and 4 have to be displaced simultaneously in opposite directions, away from each other for shortening, towards each other for lengthening, the seat depth.

Deviating from the illustrated arrangements of the electric switch contacts, any of the variations shown can, of course, also be fitted with conventional pole-changing switches if no electronic control or evaluation circuit is to be installed. Assigned to each direction of movement of an actuating element there is then a switching axis which can only be swivelled to and fro in the respective direction of movement. For example, in the case of the divided actuating element 4 in Figure 1, a switching axis of this type is assigned to each of the four double arrows drawn there. Assigned to each of the four switching axes is a two-pole change-over switching contact (rocker switch), the one pole of which conducts positive potential and the other pole of which conducts earth potential. Assigned to each of the two deflection directions of the two-pole rocker switch from its resting position are two fixed contacts which are each directly

connected to the stepping motor to be controlled in each case.

Finally, Figure 6 shows in very simplified form another advantageous possibility to extend the control device of the generic type by a seat depth adjustment according to the second subordinate Claim 21. In this embodiment, the actuating element 4 for the longitudinal adjustment of the seat has a basic position (drawn in uninterrupted lines), from which it is displaceable in a plane EI in the direction of the horizontal double arrow. In each case one electric motor M_{SL} is provided for the longitudinal adjustment of the seat and one electric motor M_{ST} is provided for the seat depth adjustment. For the reversing control of these two motors, the actuating element 4 is assigned two rocker switches SW1 and SW2, one (SW1) of which is connected (in a manner not shown in detail) to positive potential and the other (SW2) of which is connected to earth potential. Both rocker switches are actuated simultaneously by means of the actuating element 4 via a ram 8 which is resilient in the vertical direction when said actuating element is displaced in the horizontal direction. One fixed contact I corresponds to the left switching contact of the rocker switch SW1 and one fixed contact J to the right switching contact of the same rocker switch. One fixed contact K corresponds to the left switching contact of the rocker switch SW2 and one fixed contact L to the right switching contact of the same rocker switch. Each of the four fixed contacts I, J, K and L is connected fixedly to one switching contact in each case of a change-over relay 9. The change-over relay 9, in turn, is switched via a pushbutton 10. The latter is likewise assigned to the actuating element 4 and is actuated when said actuating element is pushed out of its basic position in plane EI - which is set by indicated springs and further suitable guide means (not illustrated) - vertically downwards into a deviating plane EII, in which it assumes the position

drawn in dashed lines.
In reverse in relation to the illustrated embodiment, the pushbutton 10 could naturally also be designed in such a way that it would be switched upwards out of its basic position by the actuating element 4 being pulled out vertically.
It is evident per se that this pushbutton is designed in such a way that it remains closed when the switching element 11 is set into the deviating plane even at its greatest displacement for the seat adjustment.

The two rocker switches SW1 and SW2 form, in conjunction with the fixed contacts I, J, K and L, a pole change-over switch of the type already specified above. To clarify its electric function, symbols for the electric potentials present there when operating the rocker switches are again drawn in brackets on the four switching contacts of the change-over relay 9. Connected in a generally known manner to the fixed contacts of the change-over relay 9 are the terminals of the two electric motors M_{SL} and M_{ST}, in its illustrated basic position - exciting coil without current - the motor M_{SL} for the longitudinal adjustment of the seat being connected to the pole change-over switch which can be switched by the actuating element 4. For the seat depth adjustment, the operator must thus firstly adjust the actuating element into the deviating plane EII against resilient resetting forces and then displace it in a customary manner into the desired direction of adjustment of the seat. For the seat depth adjustment a slightly greater operating effort is thus required which, however, also increases the attention value of this adjustment. A certain safeguard against unintended adjustment of the seat depth can be guaranteed by providing a catch, which cannot be overcome too easily, in the direction in which the actuating element 4 has to be pushed for operation of the push-button 10.

An embodiment of the latter variatior shown is

conceivable, but evidently more complicated, in which the actuating element is assigned in each case separate switching means for the longitudinal adjustment of the seat and for the seat depth adjustment, which switching means are set in function depending on the plane EI or EII assumed by the actuating element. A change-over device would no longer be required in an embodiment of this type.

Claims

1. A control device for the control of stepping motors for the adjustment of a motor vehicle seat, containing

- at least one switching element having an actuating element which is displaceable at least for the longitudinal adjustment of the entire motor vehicle seat in the passenger compartment in such an arrangement that its direction of displacement corresponds obviously to the desired direction of adjustment of the motor vehicle seat,

characterized by

- division of the actuating element by a partial joint into two parts which are displaceable independently of each other,
- assignment of switching means for adjustment of the distance between the front edge of the seat and the backrest (seat depth) of the motor vehicle seat at least to one part of the actuating element, and
- assignment of switching means for the longitudinal adjustment of the entire motor vehicle seat at least to the other part of the actuating element.

2. A control device according to Claim 1, characterized by straight-line contour of the partial joint through the actuating element, the two parts of the actuating element being displaceable along the partial joint both jointly and individually and always remaining aligned parallel to each other.

3. A control device according to Claim 1 or 2, characterized by

- assignment of the switching means for the adjustment of the seat depth of the motor vehicle seat at least to the part of the actuating element situated at the

top in the installation position and

- assignment of the switching means for the adjustment of the seat depth of the motor vehicle seat at least to the part of the actuating element located at the bottom in the installation position.

4. A control device according to Claim 1 or 3, characterized by

- assignment of the switching means for the adjustment of the seat depth of the motor vehicle seat at least to the part of the actuating element which symbolically represents the front edge of the seat.

5. A control device according to Claim 1 or 3 or 4, characterized by different displacement paths of the two actuating element parts, which displacement paths are required for the loading of the respectively assigned switching means.

6. A control device according to Claim 1 or 2, characterized by assignment of the switching means for the longitudinal adjustment of the entire motor vehicle seat and for the seat depth adjustment of the motor vehicle seat to both parts of the actuating element,

- it being possible for the switching means for the longitudinal adjustment to be loaded by displacement in the same direction of both parts of the actuating element, and
- it being possible for the switching means for the seat depth adjustment to be loaded by displacement in opposite directions of the two parts of the actuating element.

7. A control device according to Claim 6, in which the actuating element in the unoperated state has an overall length defined by a front edge and a rear edge, characterized by

- formation of the front edge of the actuating element by a section of one of the actuating element parts and formation of the rear edge of the actuating element by a section of the other actuating element part,
- construction of at least one section of the partial joint extending between the actuating element parts in a width which allows displacement in opposite directions of the two actuating element parts with shortening or lengthening of the overall length of the actuating element,
- it being possible for the switching means to be loaded in the sense of reducing the seat depth by displacement in opposite directions in the shortening sense and
- it being possible for the switching means to be loaded in the sense of enlarging the seat depth by displacement in opposite directions in the lengthening sense.

8. A control device according to Claim 7, characterized by angular construction of the two parts of the actuating element, the two limbs of each part being arranged parallel to the corresponding limb of the respective other part, and subdivision of the partial joint into a narrow partial joint section, extending between two of the limbs in the direction of the relative displaceability of the two parts, with invariable width and into two wide, extending partial joint sections, extending at an angle to the latter direction at least on the visible surface of the actuating element, with variable width on displacing the two parts in opposite directions.

9. A control device according to Claim 7, characterized by a contour of a wide partial joint section of the partial joint, which contour increases obliquely in a

straight line at least on the visible surface of the actuating element with variable width on displacing the two parts in opposite directions.

10. A control device according to Claim 8 or 9, characterized by limitation of the displacement stroke of each actuating element part in the approaching sense of the two parts to a maximum of half the width, projected onto the direction of approaching displacement, of the wide partial joint section, it being possible for switching means assigned to each actuating element part for this direction of displacement to be loaded within this displacement stroke.

11. A control device according to Claim 1, in which switching means for the adjustment of the seat height in the vehicle can furthermore be switched by means of the actuating element, characterized by
assignment of the switching means for the adjustment of the seat height to both parts of the actuating element so that said parts have to be displaced vertically simultaneously in order to change the seat height.

12. A control device according to Claim 11, in which switching means for the adjustment of the seat inclination in the vehicle can furthermore be switched by means of the actuating element, characterized by
assignment of the switching means for the adjustment of the seat inclination to both parts of the actuating element so that said parts can be swivelled simultaneously in order to change the seat inclination.

13. A control device according to Claim 1, in which switching contacts are actuated directly by the actuating element and thereby load fixed contacts assigned to them, characterized by
- assignment of one switching contact in each case to

each part of the actuating element and
- assignment of four fixed contacts in each case to each switching contact.

14. A control device according to Claim 13, characterized by logical AND operation of such fixed contacts which have to be loaded simultaneously to activate certain adjustment movements.

15. A control device according to Claim 13 or 14, characterized by switching contacts constructed as a cross-shaped rocker switch having four switching arms which are assigned in each case to one of the fixed contacts.

16. A control device according to Claim 1, 2 or 7, characterized by positive-fit coupling of the two parts of the actuating element.

17. A control device according to any one of the preceding claims in combination with a separate actuating element for the adjustment of the inclination of a backrest of the motor vehicle seat, in particular the divided actuating element, being arranged at an angle to the separate actuating element and both actuating elements together symbolizing a seat with seat cushion and backrest.

18. A control device according to any one of the preceding claims, characterized by combination with a further actuating element for the adjustment of the height of the headrest of the motor vehicle seat.

19. A control device for the control of stepping motors for the adjustment of a motor vehicle seat, containing
- a first switching element having a first actuating

element provided at least for the longitudinal adjustment of the entire motor vehicle seat in the passenger compartment,

- a second switching element having a second actuating element at least for the adjustment of the inclination of a backrest with regard to the seat surface, which second actuating element can be swivelled about an axis relative to the first actuating element, in such an arrangement that its swivel movement corresponds obviously to the desired swivel direction of the back rest,

characterized by

- displaceable guiding of the second actuating element relative to the first actuating element,
- assignment of switching means for adjustment of the distance between the front edge of the seat and the back rest (seat depth) of the motor vehicle seat to displacement movements of the second actuating element.

20. A control device according to Claim 19, in which the first and the second switch actuating elements are arranged at an angle to each other and, together, symbolize a seat with seat cushion and backrest, characterized by guiding of the displacement movements of the second switch actuating element in the direction of the longitudinal extension of the first switch actuating element.

21. A control device for the control of stepping motors for the adjustment of a motor vehicle seat, containing

- at least one switching element having a displaceable actuating element at least for the longitudinal adjustment in one plane of the entire motor vehicle seat in the passenger compartment from a basic position in such an arrangement that its direction of

displacement corresponds obviously to the desired direction of adjustment of the motor vehicle seat,

- switching means assigned to the actuating element for the longitudinal adjustment of the entire motor vehicle seat,

characterized by

- assignment of switching means for adjustment of the distance between the front edge of the seat and the backrest (seat depth) of the motor vehicle seat to the same actuating element,

the actuating element

- being displaceable in a further plane deviating from the plane of its basic position and
- being movable only in the deviating plane for loading the switching means for the adjustment of the seat depth corresponding to the directions of operation of the longitudinal adjustment of the seat starting from its basic position.

22. A control device according to Claim 21, characterized by

- a change-over device which can be switched into the deviating plane by displacement of the actuating element,
- correspondence of the switching means for the longitudinal adjustment of the seat and for the seat depth adjustment and
- change-over of the switching means for the control of the stepping motor to be activated for the respectively desired adjustment (seat longitudinal/seat depth) by means of the change-over device.

23. A control device according to Claim 21, characterized by an arrangement of the deviating plane extending parallel to the plane of the basic position of the actuating element, the deviating plane being

attainable by displacement of the actuating element perpendicular to the plane of its basic position.

24. A control device according to Claim 22 or 23, characterized by

- spring prestress of the actuating element in the plane of its basic position and
- control of the change-over device by a pushbutton which can be switched by means of the actuating element during the displacement of the latter into the deviating plane.

25. A control device according to Claim 24, characterized by change-over of the pushbutton during pulling operation of the actuating element to be changed over into the deviating plane.

26. A control device according to Claim 24, characterized by changeover of the pushbutton during depression operation of the actuating element to be changed over into the deviating plane.

27. A control device according to Claim 25 or 26, characterized by a catch slightly hindering the displacement of the actuating element to be changed over into the deviating plane, which catch can be overcome.

28. A control device according to one of Claims 21 to 27 in combination with a separate actuating element for the adjustment of the inclination of a backrest of the motor vehicle seat, in particular the actuating element being arranged at an angle to the separate actuating element and both actuating elements together symbolizing a seat with seat cushion and backrest.

29. A control device for the control of stepping motors for the adjustment of a motor vehicle seat, substantially as described herein, with reference to, and as illustrated in, the accompanying drawings.

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