

# TECHNICAL AREA

The invention relates to an articulated fitment for vehicle seats according to the preamble of patent claim 1.

5

## PRIOR ART

Articulated fitments for vehicle seats are mass produced parts of which several million are made every year. Assembling these parts is nowadays carried out fully automatically with one hundred percent final control and takes about an hour with the machines and assembly devices working to optimum capacity. With this situation when designing an articulated fitment great trouble is taken from the beginning to ensure that the assembly can be carried out fully automatically easily, quickly and above all reliably without breakdown. This high reliability can be achieved relatively easily by allowing a correspondingly large amount of play in the placing of the individual parts. With an articulated fitment for vehicle seats however narrow limits are set since the sum of all the plays of the articulated fitment manifests itself as considerable unacceptable play on the upper edge of the backrest. Since the requirement is for keeping the backrest play as small as possible the designer of the articulated fitment is therefore forced to achieve the smallest possible tolerances. This produces a clear conflict of aims with the reliability, termed processing reliability, in the automatic production of mass-produced parts.

30

With an articulated fitment of the kind presumed known (DE 27 24 637) the bearing of the eccentric is statically over-determined. The statically over-determined bearing has the disadvantage that a satisfactory adjustment is only possible when the bearing plates of the backrest fitment

35

provided on the different sides of the eccentric are arranged so that the bearing bores are in precise alignment with each other. This condition cannot be observed to the desired extent in mass production. When there are faults in alignment the swivel axis is set crooked resulting in difficult adjustment with severe comfort restrictions. To bring this design into practice it is necessary to make the bearing plays in the two bearing bores correspondingly large. This does indeed guarantee the desired easily operated adjustment but has the disadvantage that an undesirably large backrest play must be set.

There is also another articulated fitment of the known kind (DE 32 26 714 C2) wherein the eccentric is mounted statically determinated. Only one bearing point is provided per articulated part. The strain on the backrest tends to restrict the two articulated parts in their movement relative to each other. The resulting forces are transferred through the bearing points to the swivel axis bearing areas of the eccentric. This produces a torque which causes a distortion of the axis. This distortion leads to canting in the bearing points and thus to difficulty when making an adjustment. The problem is particularly serious when the bearing points are formed by steel/steel bearings with grease lubrication.

#### THE INVENTION

Starting from the prior art mentioned above the object of the invention is to design an articulated fitment of the kind already known which overcomes the drawbacks of the known relevant articulated fitments. An articulated fitment is to be provided which is easy to operate even when the

tolerances in the bearing points are kept comparatively small. It is thereby to be possible to observe very narrow bearing air tolerances with comparatively low manufacturing expense and to achieve a high processing reliability when manufacturing and assembling the individual parts.

This is achieved with the features of the characteristic part of patent claim 1. Suitable developments of the articulated fitment are described in the sub-claims.

10

Forming the rotary bearing by the slide bearing bushes inserted in the articulated parts together with the arrangement and plastic compressibility produces the following advantages:

15

The use of slide bearing bushes in conjunction with stamped sheet metal parts which can be manufactured cost-effectively is particularly advantageous. Arranging the slide bearing bushes so that each larger slide bearing encloses each smaller slide bearing at a distance and a common plane runs through the slide bearing bushes as well as through the interacting teeth rules out any canting in the eccentric drive. It also produces a small axial structural width and a high inner stability of the articulated fitment even against the high forces which can occur in the event of accidents.

25

The slide bearings or slide bearing bushes can be calibrated by means of a calibrating pin. This leads on one hand to the desired very restricted bearing tolerances with a simultaneously cost-effective production and on the other hand to the high processing reliability required.

30

The slide bearing bushes can interact with non-hardened slide partners. By dispensing with hardening the faults

35

which arise from the hardening delays are avoided altogether. Also the use of non-hardened individual parts increases the required high processing reliability.

- 5 The slide bearing sleeves normally used consist of a preferably slit steel ring which occupy about 90% of the bearing volume. A bronze layer with about 9% of the bearing volume is placed on the steel ring and an anti-friction layer of about 1% of PTFE (polytetrafluoroethylene) and lead
- 10 is applied to the bronze layer. The volume of the slide bearing not made up of steel allows the slide bearing to be calibrated within certain limits. After assembly and calibration a defined bearing diameter is guaranteed with a precision of few thousandths millimetres. If the
- 15 calibrating pin were pierced through the bearing in the fully automatic assembly process it is ensured that the minimum amount required by the production is guaranteed. The eccentric can then also be fitted with the desired minimum bearing play and can turn particularly easily.
- 20 Since the bearing can be calibrated it is possible in the manufacturing process to increase the precision which can be used to reduce the play and at the same time to improve the processing reliability.
- 25 A subsequent improvement in the precision of the bearing points during the assembly process is not known in the relevant prior art relating to articulated fitments. Rather in the prior art the precision of the bearing points has up until now solely been determined by the precision of the
- 30 bearings used themselves and of the associated bearing holders. The precision of the calibrated bearing points has the result that the operating moment of the fitment is lower than would be necessary for ergonomic reasons. Thus there is a reserve which can be used for a braking moment to be
- 35 produced artificially by means of a built-in friction brake.

Preferred embodiments of the invention are explained in the sub-claims and in the following description of the drawings.

DESCRIPTION OF THE DRAWINGS:

- 5
- Figure 1 shows a diagrammatic perspective view of a vehicle seat with diagrammatic illustration of an articulated fitment;
- 10
- Figure 2 is a cross-section through a first embodiment of an articulated fitment;
- Figure 3 is a cross-section through a second embodiment of the articulated fitment;
- Figure 4 is a cross-section through a third embodiment of the articulated fitment;
- 15
- Figure 5 is a cross-section through a fourth embodiment of the articulated fitment;
- Figure 6 shows parts of the first and second articulated fitments in section also showing the calibrating pins;
- 20
- Figure 7 shows a fifth embodiment in a view similar to Figure 5;
- Figure 8 shows parts of two articulated parts in section, with two calibrating pins, in a view similar to Figure 6;
- 25
- Figure 9 shows an alternative embodiment, partly in section, of an entrainment member for the eccentric according to Figure 7;
- Figure 10 shows a further embodiment of an entrainment member for an electric drive;
- 30
- Figure 11 shows a further embodiment of an entrainment member which can be equipped selectively for an electric drive or for a hand wheel drive;
- Figure 12 illustrates two articulated fitments which are provided on the same seat and are turned together
- 35
- through a connecting rod.

# BEST WAY FOR DESIGNING THE INVENTION

5 In the various drawings the same or corresponding parts are marked with the same reference numerals or with reference numerals which are distinguished from each other by the number of apostrophes or have a number increased by 100.

10 In the embodiment according to Figures 1 to 4 one articulated part 2 is connected with the seat part 212 of the vehicle seat whilst one articulated part 1 is connected to the backrest part 213 of the vehicle seat. In the  
15 embodiments according to Figures 5 to 12 the articulated part fixedly connected to the seat is marked 102 and the articulated part connected to the backrest 213 is marked 101. The articulated part 2 or 102 fixed on the seat is fixedly attached to a fitment part 210 which is adapted to swivel about the swivel axis 214 for the purpose of folding the backrest 213 forwards. Locking the backrest 213 is carried out by means of a pawl 211.

20

The handwheel 209 serves to turn the eccentric.

25 The definitive construction of the articulated fitment can be seen more accurately from the various sectional drawings.

30

First in relation to the embodiment according to Figures 2 to 4:

35 The two articulated parts 1 and 2 each have two gearings which are each arranged staggered. The articulated part 1 has the staggered rows of teeth 1a and 1b, wherein the row of teeth 1a has a smaller pitch circle diameter than the row of teeth 1b. The articulated part 2 has correspondingly staggered teeth with different pitch circle diameters which are marked by reference numerals 2a and 2b.

5 In the illustrated embodiments 2 to 4 the rows of teeth 1a and 1b in the upper area are in engagement with the rows of teeth 2a and 2b, whilst they are out of engagement in the lower area. The rows of teeth which are in active connection form the cogged part of a tumbler gearing which is already known in articulated fitments for vehicle seats.

10 The articulated part 1 has a passage 7 with a through bore 7a. On the outer edge of the passage 7 there is a slide bearing bush 5 which runs concentric with the through bore 7a and the rotary axis 20.

15 An eccentric 4 is mounted rotatable on the slide bearing bush 5 and its rotation is produced through a central square by means of a drive shaft (not shown). The eccentric 4 in turn lies with its outer eccentric surface all round against a slide bearing bush 6 which is fixed in the articulated part 2. The slide bearing bushes 5 and 6 are off-set eccentrically from each other. The arrangement of the slide bearing bushes 5 and 6 is selected so that both the slide bearing bushes and the rows of teeth 1a and 1b lie in the area of a common plane running at right angles to the axis of rotation 20.

25 A pot-shaped security plate 3 is fixed on the articulated part 2 and serves as a stop element. Between the inwardly pointing flat side of the security plate 3 and an opposing parallel recessed area of the eccentric 4 is a brake disc 10. The eccentric 4 is pushed axially against the circumferential rib 7b of the passage 7, namely by the brake disc 10. When the articulated parts are turned relative to each other which is produced by the drive of the eccentric 4 the flat end sides of the brake disc 10 come into effect.

35 The eccentric 4 has a shaft-like area 8a which is guided

with play in the through bore 7a. This design has a very flat construction.

5 In the embodiment according to Figure 3 the basic construction of the articulated parts 1 and 2, rows of teeth 1a and 2a, slide bearing bushes 5 and 6 is practically the same as with the first embodiment. The difference is primarily in the design of the eccentric 4' which has a shaft-like area 8a. At the end of this shaft-like area 8a  
10 there is a gearing 11, furthermore an inner square 9'. The drive of the shaft-like area 8' can be produced by a drive motor or by hand.

The shaft-like area 8' is mounted in the through bore 7a.  
15 The shaft-like area 8' is connected in keyed engagement with the eccentric area 4' by a square. The eccentric area 4' runs with its outer face in the slide bearing 6 and with its inner face in the slide bearing 5. On its end side the shaft-like area 8' of the eccentric has a ball-like  
20 projection 12 which adjoins the pot-shaped security plate 3' which is fixedly connected to the articulated part 2. Between the end side of the eccentric 4' pointing towards the security plate 3' and the inside of the security plate 3' itself there is a wavy disc 10' which serves as a brake  
25 disc. The brake disc 10' presses the end side 13 of the eccentric 4' against the articulated part 1.

The embodiment according to Figure 4 corresponds substantially to the embodiment according to Figure 2. The  
30 difference is mainly in the design of the eccentric, the design of the articulated part 1' and the arrangement of the brake disc 10''.

The articulated part 1' has a fixed hub area 14. The  
35 eccentric 4'' is mounted inwards on a slide bearing 5 which

is concentric with the axis of rotation 20. The eccentric outer area of the eccentric 4'' runs in the slide bearing 6 which is fixed in the articulated part 2.

5 A security plate 3'' fixed to the articulated part 2 presses the eccentric 4'' with its end side towards the brake disc 10''. The drive of the eccentric is produced in the same way as with the embodiment according to Figure 2 by an inner square 9 in the eccentric 4''.

10

Re Figures 5 to 12:

The articulated fitment has two articulated parts 101 and 102. The articulated part 102 is connected to the fixed  
15 seat part on the vehicle seat whilst the articulated part 101 is fixedly connected to the swivel backrest of the vehicle seat.

Both articulated parts have two gearings which are each  
20 arranged staggered. The articulated part 101 has the staggered rows of teeth 101a and 101b wherein the row of teeth 101a has a smaller pitch circle diameter than the row of teeth 101b. The articulated part 102 has corresponding staggered gearings with different pitch circle diameters  
25 which are marked 102a and 102b.

In the illustrated embodiments the rows of teeth 101a and 101b in the upper area are in engagement with the rows of teeth 102a and 102b whilst in the lower area they are out of  
30 engagement. The rows of teeth which are in active connection form a part of a tumbler gear as known in articulated fitments for vehicle seats.

The articulated part 101 has a collar or passage 107 with a  
35 through bore 107a. A slide bearing bush 105 is inserted in

the through bore 107a and runs concentric with the through bore 107a and the axis of rotation 120 of the movable articulated part 101. The collar 107 has an outer diameter 107b.

5.

A substantially disc-shaped eccentric 104 is mounted rotatable in the slide bearing bush 105. The eccentric is turned through a central square bore 109 by means of a drive shaft (not shown). The eccentric 104 lies in turn with its outer eccentric surface all round in a slide bearing bush 106 which is seated in a centre bore 126 of the articulated part 102. The slide bearing bushes 105 and 106 are off-set eccentrically relative to each other. The arrangement of the slide bearing bushes 105 and 106 is selected so that both the slide bearing bushes and the rows of teeth 1a and 1b lie in the area of a common plane running at right angles to the axis of rotation 20.

The axis of the centre bore 126 or slide bearing bush 106 is marked 121.

A bearing plate 103 is fixed on the articulated part 101. Between the flat inner face of the bearing plate 103 and the opposing flat area of the eccentric 104 is a ring-like brake disc 110.

108 marks a cylindrical area of the eccentric 104 which encloses the outer diameter of the collar 107 with a slight play. The centre axis of the cylindrical area 108 coincides with the axis of rotation 120.

Figure 6 of the drawings shows the two articulated parts 101 and 102 in detail wherein calibrating pins 122 and 123 are shown. The slide bearing bush 6 is inserted in the centre bore 125 of the articulated part 102 and is then calibrated

with the calibrating pin 123. Calibration is carried out accordingly of the small slide bearing bush 105 which is first inserted in the through bore 7a before it is calibrated by the calibrating pin 122. Assembly devices  
5 exist where the insertion and subsequent calibration of the slide bearing bushes 105 and 106 are carried out in a single work step.

In the embodiment according to Figure 7 the fitment parts  
10 each only have one row of teeth and the eccentric 104' is here designed in a ring. The counter face for the small slide bearing bush 105 is here the outer diameter 107b of the collar 107. The ring-shape eccentric 104' can be made as a fine-punched or sintered part. It has entrainment  
15 studs 104a which engage in corresponding bores 125 of an entrainment member 124. The drive is produced through a connecting rod (not shown) via the square 109' in the entrainment member 124.

Figure 8 of the drawings shows the eccentric ring 104' with associated calibration pin 122' and the articulated part 102 with inserted slide bearing 106 and calibrating pin 123. With the calibrating pin 122' a calibrated bearing diameter 105a is produced, and with the calibrating pin 123 a  
20 calibrated bearing diameter 106a of the slide bearing 106 is produced.  
25

Figures 9 to 11 show different designs of the entrainment members 124', 124'' and 124''' which interact with the  
30 eccentric ring 104'.

The entrainment member in its various designs can be constructed very variable for example as a pressure cast zinc part or even as a plastics part. In the embodiment  
35 according to Figure 9 an entrainment member 124' is shown

which has on the inside the square bore 109' for holding a connecting rod 111 (cf Figure 8). Furthermore it has a flattened area 130 for connecting with a hand wheel. The corresponding fitment on the other side of the backrest has only the simple entrainment member 124 as apparent from Figure 12.

Figure 10 shows an entrainment 124'' which has for an electric drive a gearing 127 in which a pinion of a gearbox motor can engage. Furthermore an inner square bore 109' for holding a connecting rod 111 is also provided.

In the embodiment according to Figure 11 an entrainment member 124''' is shown which can be made up differently. It has on both sides socket bores with a multi-wedge section 128 and 128'. Different components can be pressed into same or fixed in same in a different way, eg can be clipped in. Thus for example a hand wheel holder 130' with multi-wedge profiled stud 29 is shown on the left hand side and a toothed belt hub 131 with toothed profile 132 is shown on the right hand side. The drive can be carried out through the toothed profile 132 by means of a toothed belt via an off-set handwheel.

The embodiment according to Figure 11 allows the fitment to be fitted with the integrated entrainment member 124''' after assembly to meet various customer requirements. The manufacture of a single standard fitment is sufficient.

Finally Figure 12 shows a right and left hand design of the fitment. Each of the backrest struts (not shown) is connected to the movable articulated part 101 of a fitment. A connecting rod 111 is seated in the square bores 109 of the eccentric 104 or in the square bores 109' of the entrainment member 124. The left square 111b is longer so

that the handwheel for the adjustment can be fitted thereon. Through the connecting rod 111 it is ensured that the adjustment process runs synchronously in both fitments and thus the backrest can be swivelled completely uniformly.



PATENT CLAIMS:

1. Articulated fitment for vehicle seats with adjustable backrest, wherein a fixed articulated part associated with the seat and a swivel articulated part associated with the backrest are connected by an eccentric and both articulated parts have gearings forming interengaging parts of a tumbler gear, wherein the eccentric can swivel about a first swivel axis in a first rotary bearing opposite one articulated part and about a second swivel axis in a second rotary bearing opposite the other articulated part, and both rotary bearings are mounted eccentric relative to each other characterised in that the rotary bearings are formed by slide bearing bushes (6; 5; 106; 105) inserted in the articulated parts (1; 2; 101; 102) and/or the eccentrics (4; 4'; 4'') wherein the track faces of the bushes each have the smallest distance from the associated axis of the articulated fitment part holding the relevant slide bearing bush wherein the slide bearing bushes can be plastically compressed for calibration by means of a calibrating pin.
2. Articulated fitment according to claim 1 characterised in that about 10% of the volume of the slide bearing bushes (6; 5; 106; 105) can be plastically compressed.
3. Articulated fitment according to claim 1 or 2 characterised in that a common plane runs through the slide bearing bushes (6; 5; 106; 105) and the interacting gearings (1a/2a; 101a/102a).
4. Articulated fitment according to one or more of claims 1 to 3 characterised in that the inner slide bearing bush (5; 105)



is seated inside a collar (7; 107) of a through bore (7a; 107a) of the one articulated part (1; 101).

5      5.    Articulated fitment according to one or more of claims  
1 to 4

characterised in that the track faces of the slide bearing bushes (6; 5; 106; 105) interact with non-hardened slide bearing faces of the articulated parts (2 ; 1).

10     6.    Articulated fitment according to one or more of claims  
1 to 5

characterised in that a friction brake (10; 110) is integrated in the articulated fitment.

15     7.    Articulated fitment according to claim 6  
characterised in that the friction brake (10; 110) is a disc brake.

20     8.    Articulated fitment according to one or more of claims  
1 to 7

characterised in that the friction brake (10; 110; 10'') on one side adjoins one articulated part (2; 102) and on the other side the other articulated part (1') or an area (3; 3'; 103) fixedly connected to the other articulated part (1; 101).

25     9.    Articulated fitment according to one or more of claims  
1 to 7

30     characterised in that the friction brake (10; 10'; 110) on one side adjoins one articulated part or an area fixedly connected to one articulated part (2; 102), and on the other side the eccentric (4; 4'; 104).

35     10.   Articulated fitment according to one or more of claims  
1 to 9



characterised in that the outer diameter of the eccentric (4; 104) runs on the track face of the outer slide bearing bush (6; 106) and that a further outer diameter formed in the inner area of the eccentric (4; 104) runs on the track face of the inner slide bearing bush (15; 105).

11. Articulated fitment according to one or more of claims 1 to 10

characterised in that on the eccentric (4; 4'; 104) there is a cylindrical area (8; 8'; 108) whose centre axis coincides with the swivel axis (20, 120) and which engages with slight play in a through bore (7a; 107a) of the articulated part (1) engaging round the cylindrical area (8; 8'; 108).

15