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Longitudinal adjuster for a vehicle seat, and vehicle seat

Abstract

A longitudinal adjuster may have one pair of rails and a drive device for the pair of rails. The pair of rails has a first rail and a second rail, on which the first rail is guided displaceably. The drive device has a geared motor with an output shaft, a motor, a gear unit, a spindle, and a coupling arrangement for coupling the spindle and the output shaft. The spindle is mounted rotatably about a spindle axis. The coupling arrangement may have a flexible coupling which is connected in a form-fitting and/or force-fitting manner on the one hand to a spindle end and on the other hand to a shaft end of the output shaft and is designed to damp vibrations and/or to compensate for an offset between the spindle end and the shaft end. A vehicle seat may have the longitudinal adjuster.

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Background/Summary

FIELD

(1) The invention relates to a longitudinal adjuster for a vehicle seat, in particular motor vehicle seat, wherein the longitudinal adjuster comprises at least one pair of rails and a drive device for the pair of rails, wherein the pair of rails has a first rail and a second rail, on which the first rail is

guided displaceably, wherein the drive device has at least one motor with an output shaft, a gear unit, a spindle, which can be driven by the output shaft of the motor via the gear unit, and a coupling arrangement for coupling the spindle and the output shaft of the motor, wherein the spindle is mounted rotatably about a spindle axis. The invention furthermore relates to a vehicle seat.

BACKGROUND

(2) DE 10 2017 218 492 A1 discloses a longitudinal adjuster, in particular for a vehicle seat. The longitudinal adjuster has at least one pair of rails which is formed from a first rail and a second rail, which is displaceable in the longitudinal direction relative to the first rail, wherein the rails engage alternatingly around one another forming an inner channel. A spindle nut, which is mounted on the second rail, and a spindle, which is operatively connected to the spindle nut, are arranged in the inner channel, wherein a gear which can be driven by a motor and interacts with the spindle is arranged at one end of the first rail. The spindle is mounted at a front end portion of the spindle in the gear and at a rear end portion of the spindle in a rotary bearing of the first rail.

SUMMARY

(3) The invention is based on the problem of improving a longitudinal adjuster of the type mentioned at the beginning, in particular of improving same in respect of acoustic requirements, and of providing a corresponding vehicle seat.

(4) This problem is solved according to the invention by a longitudinal adjuster and a vehicle seat, having the features of the claims.

(5) Advantageous refinements which can be used individually or in combination with one another are the subject matter of the dependent claims.

(6) The longitudinal adjuster according to the invention comprises at least one pair of rails and a drive device for the pair of rails, wherein the pair of rails has a first rail and a second rail, on which the first rail is guided displaceably, wherein the drive device has at least one geared motor with an output shaft, a motor, a gear unit, a spindle, which can be driven by the output shaft of the geared motor via the gear unit, and a coupling arrangement for coupling the spindle and the output shaft of the geared motor, in particular of the gear unit, wherein the spindle is mounted rotatably about a spindle axis, and wherein the coupling arrangement comprises a flexible coupling which is connected in a form-fitting and/or force-fitting manner on the one hand to a spindle end and on the other hand to a shaft end of the output shaft of the gear unit and which connects the spindle end and the shaft end flexibly to each other, in particular directly to each other.

(7) A flexible coupling is understood as meaning in particular an elastic or pliable coupling.

(8) For example, the flexible coupling can connect the spindle end and the shaft end flexibly to each other in such a manner that these two ends are connected pliably and/or compressibly to each other. For example, the spindle end and the shaft end can move flexibly towards each other or move away from each other or move relative to each other compensating for an angular offset using the flexible coupling.

(9) In particular, the flexible coupling can connect the spindle end and the shaft end flexibly to each other in such a manner that the spindle and the output shaft are separated from each other in terms of vibration. In other words: vibrations occurring at the spindle or the shaft are not transmitted. Said vibrations which occur can be absorbed and damped, in particular reduced or completely absorbed, by the flexible coupling.

(10) For example, the flexible coupling can connect the spindle end and the shaft end flexibly to each other in such a manner that said ends are mounted movably relative to each other in at least two degrees of freedom. For example, the spindle end and the shaft end can be mounted movably with respect to each other in a plane with respect to the spindle axis and in a plane perpendicular to the spindle axis, and compensating for an angular offset.

(11) In particular, the flexible coupling connects the spindle end and the shaft end flexibly to each other and is designed to damp vibrations and/or to compensate for an offset between the spindle

end and shaft end.

(12) Owing to the fact that the coupling arrangement comprises a flexible coupling, vibration transmission can be reduced to a minimum. Such a longitudinal adjuster therefore has improved acoustic properties. Such a flexible coupling is designed to damp vibrations which occur and/or to compensate for an offset which occurs, for example a parallel offset and/or an shaft offset, in particular angular offset, of the shaft to be connected, in particular an offset of spindle and output shaft.

(13) A first embodiment provides a hose coupling as the flexible coupling. The hose coupling connects the rotatably mounted spindle and the output shaft of the geared motor. A hose coupling is understood as meaning a flexible joining connection between the rigid, rotatably mounted spindle and the rigid, rotatable output shaft of the geared motor using a flexible hose line. The flexible hose line permits a simple and secure connection of spindle and output shaft. Such a flexible coupling which is in the form of the hose coupling has good damping properties and compensates for an angular offset between the spindle and output shaft in a particularly simple manner. Such a flexible coupling makes it possible to dispense with complicated adjustment of the shafts within the pair of rails.

(14) The hose coupling can be connected in a form-fitting and/or force-fitting manner on the one hand to a spindle end of the spindle and on the other hand to a shaft end of the output shaft.

(15) For example, the hose coupling can have an inside diameter which is smaller than an outside diameter of the spindle end and of the shaft end. As a result, a force-fitting connection, in particular a frictionally locking connection, can be obtained between the hose coupling and on the one hand the spindle end and on the other hand the shaft end.

(16) Alternatively or additionally, suitable knurlings can be provided. As a result, a form-fitting connection, in particular profile connection, for example a splined shaft connection, a cross-knurling connection, a longitudinal knurling connection, can be obtained between the hose coupling and on the one hand the spindle end and on the other hand the shaft end.

(17) The hose coupling can be torsionally rigid. For example, the hose coupling can be formed from an insert-moulded fabric. In other words: a hose of the flexible coupling can be formed by a fabric, in particular a textile or plastics fabric, which is insert-moulded with a plastics material. The hose coupling can be configured as an injection-moulded part. For example, the fabric can be configured and insert-moulded in an opposite arrangement, in particular in a diagonal arrangement. Such an insert-moulded fabric as the hose coupling makes it possible to increase the torsional rigidity for transferring torques between the spindle and output shaft.

(18) The hose coupling can alternatively be formed from an elastomer material or a thermoplastic material. For example, an elastomer hose or an elastomer sleeve or a thermoplastic hose or a thermoplastic sleeve can be provided. Hoses or sleeves of this type do not have a reinforcing fabric. Furthermore, the hose coupling is formed from such a material which maintains a torque-transmitting connection between the spindle and output shaft over time and irrespective of temperature fluctuations.

(19) A second embodiment provides a claw coupling as the flexible coupling. The claw coupling can be coupled in a form-fitting manner to the spindle end and to the shaft end. In particular, the claw coupling is coupled on the one hand to the shaft end and on the other hand to the spindle end primarily via a form fit.

(20) The claw coupling can be provided, for example, with respective claws at both ends. A nut element, for example the spindle nut, can be arranged in a form-fitting manner on the spindle end with end-side claw mating elements. The nut element is arranged in a torsionally secured manner in particular on the spindle end. The claw mating element is arranged in a torsionally secured manner in particular on the shaft end.

(21) Such a flexible coupling configured as a claw coupling can be larger than the hose coupling, in particular can have a larger diameter. Owing to such larger dimensions, the claw coupling can

transmit higher torques.
(22) A third embodiment provides a compensating coupling as the flexible coupling, which is designed and configured to compensate for an angular offset and/or a parallel offset between the spindle and the output shaft. The compensating coupling can be configured as an injection-moulded part. The compensating coupling can be formed from an elastomer material or a thermoplastic material.
(23) For example, the compensating coupling can be configured as a sleeve coupling which comprises a plurality of recesses which are configured and arranged in such a manner that bending regions and/or expansion regions are alternately formed in order to permit deformations, in particular bendings and/or expansions. For example, the recesses can be configured as slots or grooves or flutes. The recesses can be arranged offset parallel and/or vertically with respect to one another. For example, the recesses can be arranged offset by 90° with respect to one another (vertically with respect to one another).
(24) The compensating coupling can be connected in a form-fitting and/or force-fitting manner on the one hand to a spindle end of the spindle and on the other hand to a shaft end of the output shaft. For example, the compensating coupling can be connected by a clamping connection, a frictionally locking connection or similar on the one hand to a spindle end of the spindle and on the other hand to a shaft end of the output shaft. Alternatively, the compensating coupling can be connected by an integrally bonded connection, for example by an adhesive connection or a welding connection, on the one hand to a spindle end of the spindle and on the other hand to a shaft end of the output shaft.
(25) The problem is furthermore solved according to the invention by a vehicle seat with a longitudinal adjuster according to the invention, in particular a longitudinal adjuster according to the description above.

Description

DESCRIPTION OF THE FIGURES
(1) The invention is explained in more detail below with reference to advantageous exemplary embodiments illustrated in the figures. However, the invention is not restricted to these exemplary embodiments. In the drawings:
(2) FIG. **1**: shows a schematic illustration of a vehicle seat with a longitudinal adjuster,
(3) FIG. **2**: shows a perspective view of a pair of rails of the longitudinal adjuster according to FIG. **1**,
(4) FIG. **3**: shows a perspective sectional illustration of the pair of rails according to FIG. **2** along the line III-III,
(5) FIG. **4**: shows schematically an enlarged sectional illustration of a coupling between geared motor and spindle of the longitudinal adjuster,
(6) FIG. **5**: shows schematically a perspective view of a first embodiment of the coupling between geared motor and spindle of the longitudinal adjuster,
(7) FIG. **6**: shows an enlarged perspective sectional illustration of the first embodiment of the coupling according to FIG. **5**,
(8) FIG. **7**: shows an enlarged perspective sectional illustration of the first embodiment of the coupling according to FIG. **5** with an alternative shaft connection,
(9) FIG. **8**: shows schematically a perspective view of the first embodiment of the coupling with the alternative shaft connection according to FIG. **7**,
(10) FIG. **9**: shows schematically a perspective view of a second embodiment of the coupling between geared motor and spindle of the longitudinal adjuster,
(11) FIG. **10**: shows an enlarged perspective and partially transparent sectional illustration of the second embodiment of the coupling according to FIG. **9**,

(12) FIG. **11**: shows an enlarged perspective and partially transparent illustration of the second embodiment of the coupling according to FIG. **9**,
(13) FIG. **12**: shows a further enlarged perspective and partially transparent sectional illustration of the second embodiment of the coupling according to FIG. **9**,
(14) FIG. **13**: shows a perspective illustration of a third embodiment of the coupling between geared motor and spindle of the longitudinal adjuster, and
(15) FIG. **14**: shows an enlarged perspective and partially transparent sectional illustration of the third embodiment of the coupling according to FIG. **13**.

DETAILED DESCRIPTION

(16) Mutually corresponding parts are provided with the same reference signs throughout the figures.

(17) A vehicle seat **100** which is illustrated schematically in FIG. **1** in relation to the prior art will be described below using three spatial directions running perpendicularly to one another. With a vehicle seat **100** installed in the vehicle, a longitudinal direction x runs substantially horizontally and preferably parallel to a vehicle longitudinal direction which corresponds to the customary direction of travel of the vehicle. A transverse direction y running perpendicularly to the longitudinal direction x is likewise oriented horizontally in the vehicle and runs parallel to a vehicle transverse direction. A vertical direction z runs perpendicularly to the longitudinal direction x and perpendicularly to the transverse direction y. With a vehicle seat **100** installed in the vehicle, the vertical direction z preferably runs parallel to a vehicle vertical axis.

(18) The position specifications and direction specifications used, such as for example, front, rear, top and bottom, relate to a viewing direction of an occupant seated in the vehicle seat **100** in a normal seat position, wherein the vehicle seat **100** is installed in the vehicle and is oriented in a use position suitable for passenger transport, with an upright backrest **104** and in the direction of travel as customary. However, the vehicle seat **100** may also be installed or moved in a different orientation, for example transversely with respect to the direction of travel. Unless described differently, the vehicle seat **100** is constructed mirror-symmetrically with respect to a plane running perpendicularly to the transverse direction y.

(19) The backrest **104** can be arranged pivotably on a seat part **102** of the vehicle seat **100**. For this purpose, the vehicle seat **100** can optionally comprise a fitting **106**, in particular an adjustment fitting, rotary fitting, latching fitting or tumble fitting.

(20) The position specifications and direction specifications used, such as for example, radially, axially and in the circumferential direction, relate to an axis of rotation **108** of the fitting **106**. Radially means perpendicular to the axis of rotation **108**. Axially means in the direction of or parallel to the axis of rotation **108**.

(21) The vehicle seat **100** comprises a longitudinal adjuster **110**. The longitudinal adjuster **110** comprises, for example, a rail arrangement **112** with a first rail element **114** and a second rail element **116**. The first rail element **114** is adjustable in the longitudinal direction x relative to the second rail element **116**. The first rail element **114** is fastened to the seat part **102**. The second rail element **116** is fastened to a structural element of a vehicle, for example to a vehicle floor. Conventionally, the longitudinal adjuster **110** comprises two rail arrangements **112** arranged parallel to each other. The two rail arrangements **112** can be adjustable, in particular electronically, in synchronism with each other. Only one of the two structurally identical rail arrangements **112** is described below.

(22) For better clarity, the first rail element **114** is referred to in the description below as a top rail **114**. Said top rail **114** (also called running rail or slide) is assigned to the vehicle seat **100** and designed to carry said vehicle seat **100**. The second rail element **116** is referred to below as a bottom rail **116**. The bottom rail **116** is connected fixedly and for example to the floor of a vehicle.

(23) FIG. **2** shows a perspective view of a rail arrangement **112** of the longitudinal adjuster **110** according to FIG. **1**, the rail arrangement also being referred to as a pair of rails **118**.

(24) The longitudinal adjuster **110** has a drive device **120** for adjusting the seat rail or top rail **114** relative to the floor rail or bottom rail **116**. The drive device **120** has a geared motor **122**. The geared motor **122** comprises at least one motor **124** and a gear unit **126**. In other words: the motor **124** and the gear unit **126** form a unit.
(25) The gear unit **126** and the motor **124** are at least partially arranged in an internal space or cavity **128** formed between the top rail **114** and the bottom rail **116**. Alternatively, the geared motor **122** can be arranged completely within the rail arrangement **112**, in particular within the bottom rail **116**, in particular within the cavity **128**, as illustrated.
(26) The motor **124** projects here on the end face at least partially into the top rail **114** at one end thereof. Alternatively, the motor **124** can project out of the top rail upward in the vertical direction z in a manner not illustrated through a recess in the top rail **114**, or through the latter.
(27) The gear unit **126** is arranged here completely in the cavity **128** formed between the top rail **114** and the bottom rail **116**. The motor **124** and the gear unit **126** are attached here together in an end region of the pair of rails **118**. This permits easy accessibility of the motor **124** and of the gear unit **126**, and therefore these components may be possibly easily exchangeable or repairable even when a longitudinal adjuster **110** is installed in a vehicle.
(28) The gear unit **126** is connectable to the top rail **114**, in particular in a force-fitting and form-fitting manner, for example screwed, or in an integrally bonded manner, for example welded with a seam, and/or in a form-fitting manner, for example pressed, in order to be able to transmit high forces.
(29) FIG. **3** shows a sectioned longitudinal illustration of one of the pairs of rails **118** of the longitudinal adjuster **110**.
(30) The drive device **120** is configured, for example, as a spindle drive. The drive device **120** comprises at least the motor **124**, the gear unit **126**, a spindle block **130**, which is fixed with respect to the bottom rail **116** and has an internal thread **127**, and a spindle **132**, which has an external thread **134**. The spindle **132**, which is driveable by the motor **124**, is mounted rotatably and in a longitudinally movable manner in the spindle block **130**, which is fastened to the bottom rail **116**.
(31) The spindle **132** is mounted rotatably and supported axially at least via a spindle nut **138**. In the example, two spindle nuts **138** are provided. The respective spindle nut **138** is fixedly connected to the top rail **114**. The respective spindle nut **138** is positioned in a torsionally secured manner on the spindle **132** and is supported axially on a bearing plate **133**, which is connected fixedly to the top rail **114**.
(32) The spindle **132** is mounted in the spindle block **130** and the spindle nut **138** on the bearing plate **133** so as to be rotatable about a spindle axis **142**. The geared motor **122**, the coupling arrangement **136** and the spindle **132** are arranged on a common axis **150** within the pair of rails **118**. For example, the common axis **150** is arranged in the cavity **128** of the pair of rails **118**. The common axis **150** is surrounded by the top rail **114** and the bottom rail **116**.
(33) In the case of a fixed spindle block **130**, the spindle **132** is mounted in a longitudinally movable manner in the spindle block **130** along the spindle axis **142** for the longitudinal adjustment of the vehicle seat **100** (illustrated in FIG. **1**). The spindle **132** which is mounted in a longitudinally movable manner and rotatably in the fixed spindle block **130** realizes a longitudinal adjustment of the vehicle seat **100** (illustrated in FIG. **1**) here. An internal thread **130**.**1** of the spindle block **130** is configured in particular as a movement thread. The internal thread **130**.**1** converts a rotational movement of the spindle **132** into a linear movement of the spindle **132** relative to the spindle block **130** (illustrated in FIG. **3**). For this purpose, the internal thread **130**.**1** is configured, for example, as a sliding thread, a trapezoidal thread or a deep lead angle thread.
(34) The drive device **120** furthermore comprises the coupling arrangement **136** for coupling the geared motor **122**, in particular the gear unit **126**, to the spindle **132**. The coupling arrangement **136** is arranged in particular between the spindle **132** and an output shaft **140** of the geared motor **122**. The coupling arrangement **136** is configured for damping vibrations and/or for compensating for

tolerances, in particular positional tolerances.
(35) FIG. **4** shows a schematic sectional illustration of an end-face end of the longitudinal adjuster **110** from FIG. **2**, in particular an enlarged sectional illustration of the coupling arrangement **136** between geared motor **122** and spindle **132** of the longitudinal adjuster **110**.
(36) FIG. **4** shows the same end-face end of the longitudinal adjuster **110** in which, for example, two spindle nuts **138**, the coupling arrangement **136**, the gear unit **126** and the motor **124** are arranged.
(37) The two spindle nuts **138**, the coupling arrangement **136** and the gear unit **126**, at least in part, are arranged completely in the cavity **128** of the pair of rails **118**. The motor **124** protrudes axially from the cavity **128**. A spindle bearing **146** arranged between the two spindle nuts **138** is connected to the top rail **114** by a connecting bolt **148** and a connecting nut **152**.
(38) The spindle **132** is driveable by the output shaft **140** of the geared motor **122**. At least the output shaft **140** acting as the output shaft of the geared motor **122**, an axis of rotation **154** of the rotatable coupling arrangement **136** and the spindle axis **142** of the spindle **132** are arranged substantially in axial alignment. Substantially in axial alignment means that the output shaft **140**, the axis of rotation **154** of the rotatable coupling arrangement **136** and the spindle axis **142** can lie in alignment, with angular deviations and/or an axial offset.
(39) In order to couple the spindle **132** to the output shaft **140** and therefore for the transmission of torque, the coupling arrangement **136** is provided.
(40) The coupling arrangement **136** comprises a flexible coupling **156**. The flexible coupling **156** is connected in a form-fitting and/or force-fitting manner on the one hand to a spindle end **132.1** and on the other hand to a shaft end **140.1** of the output shaft **140**. The flexible coupling **156** can connect here the spindle end **132.1** and the shaft end **140.1** directly flexibly to each other.
(41) For example, the flexible coupling **156** can connect the spindle end **132.1** and the shaft end **140.1** flexibly to each other in such a manner that these two ends **132.1**, **140.1** are connected pliably and/or compressibly to each other. For example, using the flexible coupling **156**, the spindle end **132.1** and the shaft end **140.1** can move flexibly towards each other or move away from each other or can move relative to each other compensating for an angular offset.
(42) In particular, the flexible coupling **156** can connect the spindle end **132.1** and the shaft end **140.1** flexibly to each other in such a manner that the spindle **132** and the output shaft **140** are separated from each other in terms of vibration. In other words: vibrations which occur at the spindle **132** or the shaft **140** are not transmitted. Said vibrations which occur can be absorbed and damped, in particular reduced or completely absorbed, by the flexible coupling **156**.
(43) For example, the flexible coupling **156** can connect the spindle end **132.1** and the shaft end **140.1** flexibly to each other in such a manner that these ends **132.1**, **140.1** are mounted movably relative to each other in at least two degrees of freedom, in particular in the longitudinal direction x, in the transverse direction y and/or in the vertical direction z or in an intermediate position. For example, the spindle end **132.1** and the shaft end **140.1** can be mounted movably with respect to each other at least in a plane with respect to the spindle axis and in a plane perpendicular to the spindle axis **142** and/or compensating for an angular offset.
(44) The flexible coupling **156** is designed to damp vibrations and/or to compensate for an offset **157**, in particular an angular offset and/or a parallel offset, between spindle end **132.1** and shaft end **140.1**.
(45) Various embodiments of the flexible coupling **156** will be described below. All of the other components of the gear unit **126** and of the drive device **120** are constructed identically for all of the embodiments described below, and are described by the same reference signs.
(46) FIG. **5** shows schematically a perspective view of a first embodiment of the flexible coupling **156**, which is configured as a hose coupling **256**.
(47) The hose coupling **256** connects the rotatably mounted spindle **132** and the output shaft **140** of the geared motor **122**. The hose coupling **256** can be connected in a form-fitting and/or force-fitting

manner on the one hand to the spindle end **132.1** of the spindle **132** and on the other hand to the shaft end **140.1** of the output shaft **140**.

(48) The hose coupling **256** can be torsionally rigid. For example, the hose coupling **256** can be formed from an insert-moulded fabric **256.1**. The hose coupling **256** can be configured as an injection-moulded part. For example, the fabric **256.1** can be configured as a cross fabric with a thread arrangement woven crossways, or a diagonal fabric with a thread arrangement woven diagonally, and can be insert-moulded with a plastics material, in particular an elastomer material or a thermoplastic material. Such an insert-moulded fabric **256.1** as the hose coupling **256** enables the torsional rigidity for transmitting torques between spindle **132** and output shaft **140** to be increased.

(49) Alternatively, use may also be made of a different form of geometries and profiles, for example intermeshing toothings, which permit a form-fitting connection or force-fitting connection or integrally bonded connection between hose coupling **256** and spindle end **132.1** on the one hand and shaft end **140.1** on the other hand.

(50) FIG. **6** shows an enlarged perspective sectional illustration of the first embodiment of the flexible coupling **156**, which is configured as a hose coupling **256**, according to FIG. **5**.

(51) The hose coupling **256** can have an inside diameter **256.2** which is smaller than an outside diameter **132.2** of the spindle end **132.1** and an outside diameter **140.2** of the shaft end **140.1**. As a result, a force-fitting connection, in particular a frictionally locking connection, can be obtained between the hose coupling **256** and, on the one hand, the spindle end **132.1** and, on the other hand, the shaft end **140.1**.

(52) In the example shown, two spindle nuts **138** are connected to the spindle **132** in a torsionally secured manner.

(53) The spindle nut **138** arranged in the direction of the geared motor **122** is connected to the spindle **132** in a torsion-proof manner by a press-fit bushing **158**, for example. The press-fit bushing **158** can be plugged onto the spindle end **132.1** and can be press-fitted in a collar **138.1** of the spindle nut **138**. The collar **138.1** has a larger inside diameter **138.2** than the outside diameter **132.2** of the spindle end **132.1**. The press-fit bushing **158** has a larger outside diameter **158.1** than the inside diameter **138.2**, and therefore the press-fit bushing **158** can be press-fitted into the collar **138.1** and is connectable to the collar **138.1** in a force-fitting, in particular frictionally locking manner. In addition, the press-fit bushing **158** has an inside diameter **158.2** which is smaller than the outside diameter **132.2** of the spindle end **132.1**, and therefore the press-fit bushing **158** is connectable to the spindle end **132.1** in a force-fitting, in particular frictionally locking manner.

(54) The press-fit bushing **158** can additionally be configured and arranged on the spindle **132** in such a manner that said press-fit bushing **158** serves in the longitudinal direction x as a longitudinal limitation for the hose coupling **256**.

(55) The respective spindle nut **138** can additionally be connected in sections to the spindle **132**, for example by a form-fitting connection and/or a force-fitting connection, in particular a frictionally locking connection. For example, the respective spindle nut **138** can be provided with an internal thread **138.0**. The internal thread **138.0** is connected in a form-fitting manner to the external thread **134** of the spindle **132**.

(56) Alternatively or additionally (not illustrated specifically), at least one of the spindle nuts **138** can have an inside diameter **138.2** which is smaller than the outside diameter **132.2** of the spindle **132**.

(57) The spindle bearing **146** can comprise, for example, a ball bearing or a roller bearing or an axial ball bearing **146.1** for absorbing axial forces in a first load direction and/or a bearing bushing **146.2** for the radial mounting of the spindle **132** and for absorbing axial forces in a second load direction and can be arranged between the two spindle nuts **138**.

(58) Vibration transmissions can be reduced or avoided, and shaft offsets, in particular angular offsets, compensated for by such a simple hose coupling **256** according to FIGS. **5** to **8**. In addition,

a complicated adjustment of spindle **132** and output shaft **140** can be omitted.
(59) FIG. **7** shows an enlarged perspective sectional illustration of the first embodiment of the coupling **156**, which is configured as a hose coupling **256**, with an alternative shaft connection. Instead of a direct force-fitting connection of the hose coupling **256** on the spindle **132** and the output shaft **140** according to FIGS. **5** and **6**, the hose coupling **256** according to FIG. **7** has a larger diameter, in particular a larger inside diameter **256.2**. The hose coupling **256** according to FIG. **7** is arranged on the shaft end **140.1** via a coupling element **258** and is, in particular, pressed onto the output shaft **140** by a form-fitting connection and/or force-fitting connection. In particular, the coupling element **258** is pressed onto the shaft end **140.1** of the output shaft **140**. A contact diameter with respect to the hose coupling **256** is enlarged by the coupling element **258**.
(60) For the form-fitting connection, the coupling element **258** can have a knurled edge **258.1** or the like, for example a diamond knurl edge.
(61) In addition, the coupling element **258** can have a collar **258.2**. The collar **258.2** is designed to fix the hose coupling **256** in the longitudinal direction x and therefore axially, or to position the same at a defined position. This ensures that the hose coupling **256** does not enter into contact with a fixed housing **122.1** of the geared motor **122**.
(62) On the spindle side, the hose coupling **256** is pressed onto the spindle nut **138**, in particular onto the enlarged collar **138.1** of the drive-side spindle nut **138**.
(63) The collar **138.1** is configured in the longitudinal direction x in such a manner that it serves at the same time as a longitudinal limitation for the hose coupling **256**.
(64) The drive-side spindle nut **138** is in turn connected in a torsionally secured manner to the spindle **132**, as described previously with reference to FIGS. **5** to **6**. For this purpose, in an analoguous manner for all of the exemplary embodiments described here, the press-fit bushing **158** is pressed onto the spindle **132**.
(65) The drive-side spindle nut **138** can have, on the outer circumference, a stop ring **138.3**, in particular a peripheral collar, which serves as a longitudinal limitation or axial limitation for the hose installation of the hose coupling **256**.
(66) Also, in addition, knurled edges **258.1** and/or diamond knurl edges can be provided analogously to the additional part or coupling element **258** on the collar **138.1** of the spindle nut **138** and/or on the outer circumference of the coupling element **258** for the form-fitting connection and/or transmission of torque.
(67) FIG. **8** shows schematically a perspective view of the first embodiment of the coupling **156**, which is configured as a hose coupling **256**, with the alternative shaft connection according to FIG. **7**. The hose coupling **256** is not shown transparently.
(68) The knurled edge **258.1** of the hose coupling **256** can be configured as a separate unit, in particular as a knurled disc or a knurled ring, and can be arranged between the hose coupling **256** and the housing **122.1** of the geared motor **122**.
(69) The spindle nut **138** can have the stop ring **138.3** which protrudes vertically from the collar **138.1** (illustrated in FIG. **7**). The stop ring **138.3** and the separate knurled edge **258.1** serve as a longitudinal limitation of the hose coupling **256**, arranged between them, during the installation.
(70) In addition, the stop ring **138.3** for the form fit and transmission of torque can be knurled or crimped (not illustrated specifically).
(71) FIG. **9** shows schematically a perspective view of a second embodiment of the flexible coupling **156**, which is configured as a claw coupling **356**, between the geared motor **122** and spindle **132** of the longitudinal adjuster **110** (illustrated in FIGS. **1** and **2**).
(72) The claw coupling **356** is coupled in a form-fitting manner to the spindle end **132.1** and to the shaft end **140.1**. The claw coupling **356** comprises claws **358**, for example, at its longitudinal-side ends. A nut element **360** with claw mating elements **362** is arranged on the spindle end **132.1**.
(73) The nut element **360** is arranged on the spindle **132** in a torsionally secured manner by a form-fitting connection and/or a force-fitting connection.

(74) In addition, the shaft end **140.1** can be provided with claw mating elements **362** (not illustrated).
(75) The claw coupling **356** is sleeve-shaped or cylindrical. The claw coupling **356** is formed, for example, from an elastomer material or a thermoplastic material. In addition, the claw coupling **356** can comprise fabric reinforcements analogously to the flexible coupling **156** (illustrated in FIG. **5**).
(76) The claw coupling **356** is configured in particular as an injection-moulded part. The claw coupling **356** can be connected, primarily by a form-fitting connection, for example, on the one hand to the output shaft **140**, in particular to the shaft end **140.1**, and on the other hand to the nut element **360**, which for example is pressed onto the spindle **132** and is torsion-proof in relation to the spindle **132**.
(77) FIGS. **10** to **12** each show an enlarged, perspective and partially transparent sectional illustration of the second embodiment of the flexible coupling **156**, which is configured as a claw coupling **356** according to FIG. **9**.
(78) Instead of the claws **358** and the claw mating elements **362**, an external toothing **364** is provided on the output shaft on the drive side, in the region of the output shaft **140**, in particular of the shaft end **140.1** thereof. Alternatively, an additional element **366** (not illustrated specifically), in particular a gearwheel or toothed ring, can be provided with such an external toothing **364**. The external toothing **364** projects into a cavity of the claw coupling **356**. The additional element **366** (also called pressed-on driver) can have a flange **366.1** in order to press the claw coupling **356** axially into the cutouts of the claw mating elements **362** during installation.
(79) The claw coupling **356** can have a carry-along contour **368**, for example a corresponding internal toothing or a carry-along tongue or a carry-along tooth, in an overlapping region with the external toothing **364** of the output shaft **140**. Alternatively, the claw coupling **356** can be connected on the drive side, in the overlapping region with the shaft end **140.1**, in a form-fitting manner, for example by being pressed on, to the output shaft **140**, as described previously with reference to FIGS. **5** and **6**.
(80) The exemplary claw coupling **356** according to FIGS. **9** and **10** can comprise, on both ends, as an inner contour, the carry-along contour **368** for coupling to the external toothing **364**, configured as a drive toothing, of the output shaft **140** and also the claws **358** for the claw mating elements **362** for coupling to the nut element **360**.
(81) The nut element **360** can also be formed by the spindle nut **138**, as shown in FIG. **12**. In this case, the collar **138.1** of the spindle nut **138** is provided with the claw mating elements **362**. The spindle nut **138** is arranged on the spindle **132** in a torsionally secured manner by the press-fit bushing **158**.
(82) FIG. **13** shows a perspective illustration of a third embodiment of the flexible coupling **156** between the geared motor **122** and spindle **132**. The flexible coupling **156** according to FIGS. **13** and **14** is configured as a compensating coupling **456**.
(83) The compensating coupling **456** is configured and designed to compensate for an offset **157** (illustrated in FIG. **4**), in particular an angular offset and/or a parallel offset, between the spindle **132** and the output shaft **140**. The compensating coupling **456** can be configured as an injection-moulded part. The compensating coupling **456** can be formed from an elastomer material or a thermoplastic material or from metal.
(84) For example, the compensating coupling **456** can be configured as a sleeve coupling **458** which comprises a plurality of recesses **460**. The recesses **460** are configured and arranged in particular in such a manner that bending regions and/or expansion regions for the compensating coupling **456** are alternately formed in order to permit deformations, in particular bendings and/or expansions. For example, the recesses **460** can be configured as slots or grooves or flutes. The recesses **460** can be arranged offset parallel and/or perpendicularly to one another. For example, the recesses **460** can be arranged offset with respect to one another by 90°.
(85) Angular offsets and/or parallel offsets can therefore be compensated for by the recesses **460**,

which are arranged offset and in relation to one another by 90°, in the form of slots since bending regions thus defined alternately permit a deformation, irrespective of how the angle of rotation of the output shaft **140** is with respect to an angular deviation of the connected axes of rotation.

(86) The compensating coupling **456** can be connected in a form-fitting and/or force-fitting manner on the one hand to the spindle end **132.1** of the spindle **132** and on the other hand to the shaft end **140.1** of the output shaft **140**.

(87) For example, the compensating coupling **456** can be connected on the one hand to the spindle end **132.1** and on the other hand to the shaft end **140.1** by a clamping connection, a frictionally locking connection or the like. Alternatively, the compensating coupling **456** can be connected on the one hand to the spindle end **132.1** and on the other hand to the shaft end **140.1** by an integrally bonded connection, for example by an adhesive connection or a welding connection.

(88) Said compensating coupling **456** is fastened, for example, on the output shaft **140** and the spindle **132** either by a clamping force, produced for example via screws at engagement points **462**, or by an adhesive connection. Pressing on is also conceivable. Further known forms of connection are also possible.

LIST OF REFERENCE SIGNS

(89) **100** vehicle seat **102** seat part **104** backrest **106** fitting **108** axis of rotation **110** longitudinal adjuster **112** rail arrangement **114** first rail (top rail) **116** second rail (bottom rail) **118** pair of rails **120** drive device **122** geared motor **122.1** housing **124** motor **126** gear unit **127** internal thread **128** cavity **130** spindle block **130.1** internal thread **132** spindle **132.1** spindle end **132.2** external diameter **133** bearing plate **134** external thread **136** coupling arrangement **138** spindle nut **138.0** internal thread **138.1** collar **138.2** inside diameter **138.3** stop ring **140** output shaft **140.1** shaft end **140.2** outside diameter **142** spindle axis **146** spindle bearing **146.1** axial ball bearing **146.2** bearing bushing **148** connecting bolt **150** common axis **152** connecting nut **154** axis of rotation of the coupling arrangement **156** flexible coupling **157** offset **158** press-fit bushing **158.1** outside diameter **158.2** inside diameter **256** hose coupling **256.1** fabric **256.2** inside diameter **258** coupling element **258.1** knurled edge **258.2** collar **356** claw coupling **358** claws **360** nut element **362** claw mating element **364** external toothing **366** additional element **366.1** flange **368** carry-along contour **456** compensating coupling **458** sleeve coupling **460** recess **462** engagement point x longitudinal direction y transverse direction z vertical direction

Claims

1. A longitudinal adjuster, comprising: one pair of rails and a drive device for the pair of rails, wherein the pair of rails has a first rail and a second rail, on which the first rail is guided displaceably, wherein the drive device has at least one geared motor with an output shaft, a motor, a gear unit, a spindle, which can be driven by the output shaft via the gear unit, and a coupling arrangement for coupling the spindle and the output shaft, wherein the spindle is mounted rotatably about a spindle axis, wherein the coupling arrangement comprises a flexible coupling which is connected in a form-fitting and/or force-fitting manner on the one hand to a spindle end and on the other hand to a shaft end of the output shaft and which connects the spindle end and the shaft end flexibly to each other, wherein the flexible coupling is configured as a claw coupling, wherein the claw coupling is provided with respective claws at both ends, and a nut element arranged in a form-fitting manner on the spindle end is provided with claw mating elements.

2. The longitudinal adjuster according to claim 1, wherein the flexible coupling connects the spindle end and the shaft end flexibly to each other in such a manner that these ends are connected pliably and/or compressibly to each other and move flexibly towards each other or move away from each other or move relative to each other compensating for an angular offset.

3. The longitudinal adjuster according to claim 1, wherein the flexible coupling connects the spindle end and the shaft end flexibly to each other in such a manner that the spindle and the output

shaft are separated from each other in terms of vibration.

4. The longitudinal adjuster according to claim 1, wherein the flexible coupling connects the spindle end and the shaft end flexibly to each other in such a manner that they are mounted movably with respect to each other in at least two degrees of freedom in a plane with respect to the spindle axis and in a plane perpendicular to the spindle axis.

5. The longitudinal adjuster according to claim 1, wherein the flexible coupling connects the spindle end and the shaft end flexibly to each other and is designed to damp vibrations and/or to compensate for an offset between the spindle end and shaft end.

6. The longitudinal adjuster according to claim 1, wherein the flexible coupling is configured as a hose coupling.

7. The longitudinal adjuster according to claim 6, wherein the hose coupling has an inside diameter which is smaller than an outside diameter of the spindle end and of the shaft end.

8. The longitudinal adjuster according to claim 6, wherein the hose coupling is torsionally rigid.

9. The longitudinal adjuster according to claim 1, wherein the claw coupling is coupled in a form-fitting manner to the spindle end and to the shaft end.

10. The longitudinal adjuster according to one of claim 1, wherein the flexible coupling is configured as a compensating coupling and is designed to compensate for an angular offset and/or a parallel offset, between the spindle and the output shaft.

11. The longitudinal adjuster according to claim 10, wherein the compensating coupling is configured as a sleeve coupling which comprises a plurality of recesses which are configured and arranged in such a manner that bending regions are alternately formed.

12. A vehicle seat with the longitudinal adjuster according to claim 1.

13. A longitudinal adjuster, comprising: one pair of rails and a drive device for the pair of rails, wherein the pair of rails has a first rail and a second rail, on which the first rail is guided displaceably, wherein the drive device has at least one geared motor with an output shaft, a motor, a gear unit, a spindle, which can be driven by the output shaft via the gear unit, and a coupling arrangement for coupling the spindle and the output shaft, wherein the spindle is mounted rotatably about a spindle axis, wherein the coupling arrangement comprises a flexible coupling which is connected in a form-fitting and/or force-fitting manner on the one hand to a spindle end and on the other hand to a shaft end of the output shaft and which connects the spindle end and the shaft end flexibly to each other, wherein the flexible coupling is configured as a compensating coupling and is designed to compensate for an angular offset and/or a parallel offset, between the spindle and the output shaft.