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Szerkezet egy egység helyzetbiztosítására

Az európai szabadalom ellen, megadásának az Európai Szabadalmi Közlönyben való meghirdetésétől számított kilenc hónapon belül, felszólalást lehet benyújtani az Európai Szabadalmi Hivatalnál. (Európai Szabadalmi Egyezmény 99. cikk(1))

A fordítást a szabadalmat az 1995. évi XXXIII. törvény 84/H. §-a szerint nyújtotta be. A fordítás tartalmi helyességét a Szellemi Tulajdon Nemzeti Hivatala nem vizsgálta.

Device for locking a unit

The invention relates to a device for positional securing of a unit in a housing, in particular of a pinion in a steering gear of a motor vehicle.

Known positional securing means are effected by means of screw-type connections, e.g. steel screws, with a metric thread. The screw-type securing means, in this case, is achieved in a force-locking manner by means of a tightening torque, by means of a calking means or by means of an adhesive connection. A bearing, for example, is fixed in the case of known securing means, for example with the aid of a zinc die cast adjusting screw which, after a defined tightening torque, is fixed in its position with the aid of a calking process.

DE 39 35 753 A1, EP 1 914 430 A1 and WO 2009/001 421 A1 describe positional securing means, in which in each case one securing element engages into a bore, at least one radially outwardly prestressed latching member being provided on the securing element, which latching member is supported on a housing wall of the bore (2) for the purpose of providing an anti-rotation safeguard.

A problem, in this case, however, lies in the use of materials with different coefficients of thermal expansion, as a result of which the securing action is reduced over the service life, or play can even be generated. The setting behavior of the material of the adjusting screw in relation to the housing material also has a negative influence on a securing or fixing means. It is also disadvantageous for the adjusting screw to have to be fixed in its position in the housing by means of a separate operation. As a result of the pre-tensioning of the adjusting screw under certain circumstances being reduced to zero over its service life, a play can result between the unit to be secured, e.g. a locating bearing, and the adjusting screw or the housing. This leads to frictional wear and acoustic problems can occur.

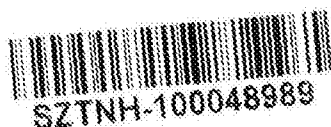
A threaded sealing means is frequently used for sealing against external media, as a result of which the production and/or assembly process also becomes more expensive.

Consequently, the object underlying the present invention is to create a cost-efficient and assembly-friendly device for securing a unit, wherein play-free fixing over the service life is to be provided.

Said object is achieved according to the invention by the features mentioned in Claim 1.

As a result of the design according to the invention of the securing device with a securing element, which is provided with at least one ratchet lever and one latching lug, wherein the securing element interacts with a toothing geometry in a bore in the housing, it is ensured that even in the case of different coefficients of thermal expansion, a freedom from play and consequently a secure fixing of the unit, e.g. of a location bearing, is achieved.

As an alternative to said solution, in a kinematic reversal, the at least one ratchet lever with the latching lug can also be arranged in the bore in the housing, e.g. on an insert ring which is inserted into the bore, in this case it being possible for the securing element to be provided with a toothing geometry, in the gaps of which the latching lug is able to latch.



In a very advantageous development of the invention, it is provided that the securing element is realized as a securing screw which is connected to an internal thread of the bore of the housing by means of an external thread, wherein the securing screw is provided with ratchet levers which are arranged distributed on the circumference thereof, and wherein the ratchet levers latch into toothing gaps of the toothing geometry of the housing in each case by way of latching lugs which are arranged on the free ends of the ratchet levers.

Further advantageous developments and further developments are produced from the sub-claims and from the exemplary embodiment which is described below in a schematic manner by way of the drawing, in which:

figure 1 shows a detail of a steering gear of a motor vehicle with the bearing and securing arrangement of the pinion according to the invention,

figure 2 shows a three-dimensional representation of the securing device according to the invention,

figure 3 shows a section through the device according to the invention,

figure 4 shows a front view of the device according to the invention,

figure 5 shows a detail of an enlargement of the front view according to figure 4,

figure 6 shows a detail of an enlargement of the toothing geometry in the housing of the steering gear for ratchet levers of the securing device.

The invention is described below, for example, for the use of the securing device in a steering gear of a motor vehicle, a pinion being mounted in a gear housing by means of a locating bearing.

Obviously, however, the securing device according to the invention can also be used in the most varied areas, a cost-efficient, secure and assembly-friendly securing device for a bearing, a guide bush, a bearing bush, a gear wheel or another gear part, an adjusting screw for a pressure piece for a gear rack in a steering gear and similar applications being desired. It is also possible to use the securing device according to the invention in a chassis of a motor vehicle.

As steering gears for motor vehicles with a pinion and a gear rack are generally known, for which purpose DE 10 2004 017 259 A1 is referred to, only the parts which are important to the invention will be gone into in detail below.

A pinion 1 is mounted in a gear housing 2 by means of a locating bearing 3. The pinion is connected in a known manner to a hand wheel (not shown) and a gear rack (not shown either) for converting the rotational movement into a linear movement. A nut 4 which is screwed onto the pinion hub serves to secure the pinion 1 to the inner ring of the locating bearing 3.

A securing screw 5, which consists of a plastics material body as a hollow screw, is provided according to the invention for securing and fixing the outer ring of the locating bearing 3.

Other materials, such as, for example, other non-metals, a sintered part or a hybrid element, are possible within the framework of the invention in place of plastics material.

A sealing ring 6 in a ring groove of the securing screw 5 assumes a sealing function.

If the securing screw 5 is produced as an injection molded part from a plastics material body, the sealing ring 6, in the case of a multi-component injection molding part, can be connected fixedly as a soft component, e.g. of silicone, to the plastics material body of the securing screw in the injection molding process. The advantage of a development of this type is that the production and also the assembly are simpler.

The external thread 8 of the securing screw 5 interacts with an internal thread in the gear housing 2. During assembly, the securing screw 5 is tightened at a certain torque to a stop. For tightening the securing screw 5, said screw is provided with several carriers 7 which extend radially in a rib-shaped manner (see figures 2 and 4 in particular).

Obviously, however, it is also possible to provide a so-called "floating" screw connection for this purpose, characterized by a tightening of the securing screw 5 in dependence on a position of angular rotation or a depth of insertion or a tightening path.

Axial forces which are created by means of the pinion 1 and the locating bearing 3, have to be absorbed in a play-free manner. The forces are then introduced into the gear housing 2 by means of the self-locking external thread 8 of the securing screw.

The screw securing means consists of a radial re-adjusting latching mechanism. To this end, the securing screw 5 is provided on the circumference thereof with several ratchet levers 9 which are connected to a center piece 11 of the securing screw by means of radial spokes 10 in each case in the region of an end of the ratchet lever 9. The radial spokes 10 can obviously also be part of the rib-shaped carriers 7. In the case of the exemplary embodiment, four ratchet levers 9 are arranged distributed over the circumference. Obviously, however, other numbers are also possible within the framework of the invention.

The ratchet levers 9 are provided with latching lugs 12 on the free ends thereof which are remote from the spokes 10. The latching lugs 12 of the ratchet levers 9 latch in a toothing geometry 13 in the gear housing 2 (see in particular the enlarged representation of the toothing geometry in figure 6). As a result of the latching of the latching lugs 12 into the toothing geometry 13 of the gear housing 2, independent loosening of the securing screw 5 is prevented.

When the securing screw 5 is tightened into the gear housing 2, the ratchet levers 9 are deflected radially by means of inclinations 18 in the gear housing 2 and, when the predetermined torque is reached, snap into toothing gaps 14 of the toothing geometry 13. The securing screw 5 is prevented from loosening by means of the serrated contour of the toothing geometry 13. The ratchet levers 9 are supported to this end on contact faces 15 in the toothing gaps 14 of the toothing geometry 13.

In place of the ratchet levers 9 deflecting in the radial direction, they can also be deflected axially if necessary and can latch in a corresponding manner in toothing gaps of the toothing geometry in the bore of the housing.

Here too, the reverse principle or the reverse solution is possible, according to which ratchet levers, which are arranged in the bore 2a, latch correspondingly in an axial manner into a toothing geometry of the securing screw 5.

In order to realize a tightening of the plastics material screw 5 which is independent of the angle of rotation in the assembly, the ratchet lever angular pitch 16 is realized in an asymmetrical manner (see figure 4). The toothing geometry 13 in the gear housing 2 is correspondingly realized with as small an angular pitch 17 as possible. In this way, secure latching-in of at least two latching lugs 12 is always ensured irrespective of the angle of rotation. Asymmetry leads to increased resolution or to a greater probability of latching in terms of a vernier effect.

Asymmetrical ratchet lever angular pitch 16 refers to the fact that the ratchet levers are not arranged distributed uniformly over the circumference. Thus, for example, with four ratchet levers, instead of precisely four times 90°, different angular pitches and different lengths can be provided. If then a small angular pitch 17 is chosen between the individual toothing gaps 14 (see figure 6) at, for example, 15°, the achievement as a result of the asymmetric ratchet lever angular pitch 16 is that secure latching-in approximately every 4° is possible in all cases (with reference to the current application).

The securing screw 5 realized from a plastics material body can be realized, for example, from a fiber-reinforced thermoplast as an injection molded part which is distinguished by temperature-resistant behavior. The expansion behavior of the plastics material body is determined by the material and the fiber alignment at a change in temperature. To this end, the fibers are laid out such that they extend in the direction of the anticipated greater expansion.

As a result of the possible long bending lengths, it is possible to use ratchet levers 9 from high-duty plastics materials with a low ductile yield.

The star-shaped arrangement of the carriers 7 and of the spokes 9 with a central injection point on the end face 19 allows for optimum flow behavior of the plastics material in the injection process to avoid shrinkage cavities and porosities. In addition to the absorbing of the torque by an assembly tool when tightening the securing screw 5, said development consequently provides a further advantage.

The thread of the plastics material body of the securing screw 5 can be realized as a metric angular thread, the flank diameter of the thread being designed such that there is only a small thread backlash.

Obviously, other thread forms, such as, for example, a conical thread, are also possible within the framework of the invention.

It is possible to finish cast the inner toothing in the gear housing 2 and equally also the toothing geometry 13. A small tolerance can also be realized where necessary by means of processing the toothing geometry 13 in the housing 2 in a controlled manner.

List of references

- 1 Pinion
- 2 Gear housing
- 2a Bore
- 3 Locating bearing
- 4 Nut
- 5 Securing element, securing screw

- 6 Sealing ring
- 7 Carriers
- 8 External thread
- 9 Ratchet lever
- 10 Spoke
- 11 Center piece
- 12 Latching lug
- 13 Tooth geometry
- 14 Tooth gaps
- 15 Contact face
- 16 Ratchet lever angular pitch
- 17 Angular pitch
- 18 Inclinations
- 19 Injection point



Szerkezet egy egység helyezbíztoztására

Szabadalmi igénypontok

1. Szerkezet egy egység bíztoztására egy házban (2), főként egy kis fogaskerék (1) fix csapágyának (3) bíztoztására egy gépjármű kormányművében, egy bíztoztóelemmel, amely egy a házban (2) kiképzett furatba (2a) van behelyezve, ahol a bíztoztóelem (5) műanyag testként van kialakítva, emellett a bíztoztóelem (5) legalább egy reteszelőkarral (9) van ellátva, ahol a legalább egy reteszelőkar (9) egy a reteszelőkar szabad végén elrendezett reteszelőorron (12) keresztül egy fogazási geometria (13) fogazathézagába (14) ugrik be a ház (2) furatában (2a) vagy ahol legalább egy reteszelőorral rendelkező reteszelőkar van a furatban (2a) elrendezve, ahol a reteszelőorr egy fogazási geometria fogazathézagába ugrik be a bíztoztóelemben (5), *azzal jellemezve*, hogy a bíztoztóelem (5) műanyag teste többkomponensű fröccsöntött alkatrészként van kialakítva, ahol egy tömítőgyűrű (6) puha összetevőként van a fröccsöntési folyamatban a műanyag testtel szilárdan összekötve.
2. Az 1. igénypont szerinti szerkezet, *azzal jellemezve*, hogy a bíztoztóelem (5) bíztoztócsavarként van kiképezve, amely egy külső meneten (8) keresztül a ház (2) furatának (2a) egy belső menetével van összekötve, ahol a bíztoztócsavar a kerületén elosztottan elrendezett reteszelőkarokkal (9) van ellátva, és ahol a reteszelőkarok (9) mindegyike a reteszelőkarok szabad végein elrendezett reteszelőorrok (12) ugrik be a ház (2) fogazási geometriájának (13) fogazathézagába (14).
3. A 2. igénypont szerinti szerkezet, *azzal jellemezve*, hogy a bíztoztócsavar (5) üreges csavarként van kiképezve.
4. A 2. vagy 3. igénypont szerinti szerkezet, *azzal jellemezve*, hogy legalább négy reteszelőkar (9) van a bíztoztócsavar (5) kerületén elosztottan elrendezve.

5. A 4. igénypont szerinti szerkezet, *azzal jellemezve*, hogy a reteszelőkarok (9) aszimmetrikus szögosztással elosztottan vannak a biztosítócsavar (5) kerületén elrendezve.
6. Az 5. igénypont szerinti szerkezet, *azzal jellemezve*, hogy a szögosztás (17) a ház (2) fogazási geometriájában (13) egy lényegesen kisebb szögosztással van megvalósítva a reteszelőkarok (9) szögosztásához (16) képest.
7. Az 1-6. igénypontok bármelyike szerinti szerkezet, *azzal jellemezve*, hogy a biztosítóelem (5) több radiálisan húzódó bordaszerű menesztővel (7) van ellátva.
8. Az 1-7. igénypontok bármelyike szerinti szerkezet, *azzal jellemezve*, hogy a biztosítóelem (5) műanyag testként, főként egy szálerősítésű hőre lágyuló műanyagból fröccsöntött alkatrészként vagy többkomponensű (kompozit) alkatrészként van kialakítva.
9. A 8. igénypont szerinti szerkezet, *azzal jellemezve*, hogy a szá irányultság a hőre lágyuló műanyagban a várható nagyobb kiterjedés irányában húzódik.
10. A 8. vagy 9. igénypont szerinti szerkezet, *azzal jellemezve*, hogy a műanyag test egy központi ráfröccsentési ponttal (19) van ellátva.
11. Az 1-10. igénypontok bármelyike szerinti szerkezet, *azzal jellemezve*, hogy a reteszelőkarok (9) reteszelőorrainak (12) mindegyike egy-egy, a házon (2) levő felfekvő felületre (15) támaszkodik.
12. A 2-11. igénypontok bármelyike szerinti szerkezet, *azzal jellemezve*, hogy a biztosítócsavar (5) külső menete (8) metrikus éles menetként van kialakítva.
13. A 2-11. igénypontok bármelyike szerinti szerkezet, *azzal jellemezve*, hogy a biztosítócsavar (5) külső menete (8) kúpos menetként van kialakítva.

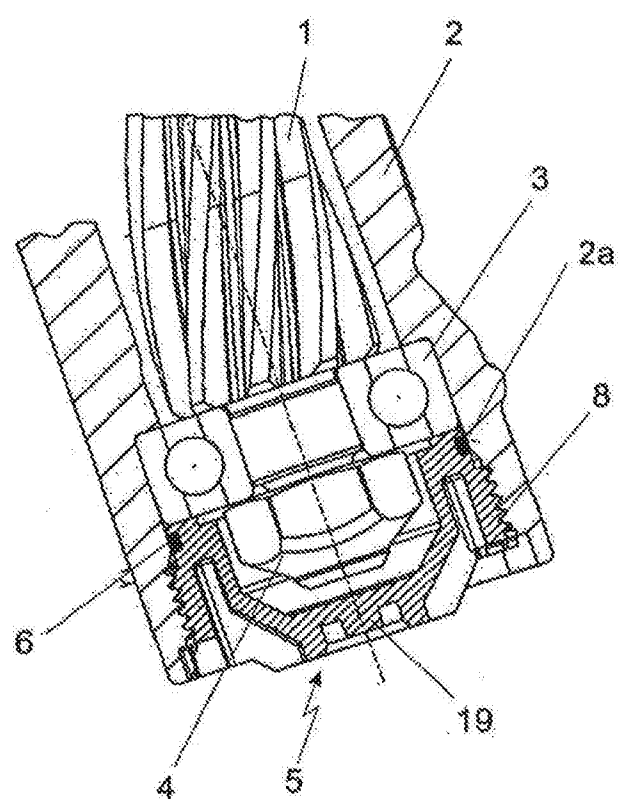


Fig. 1

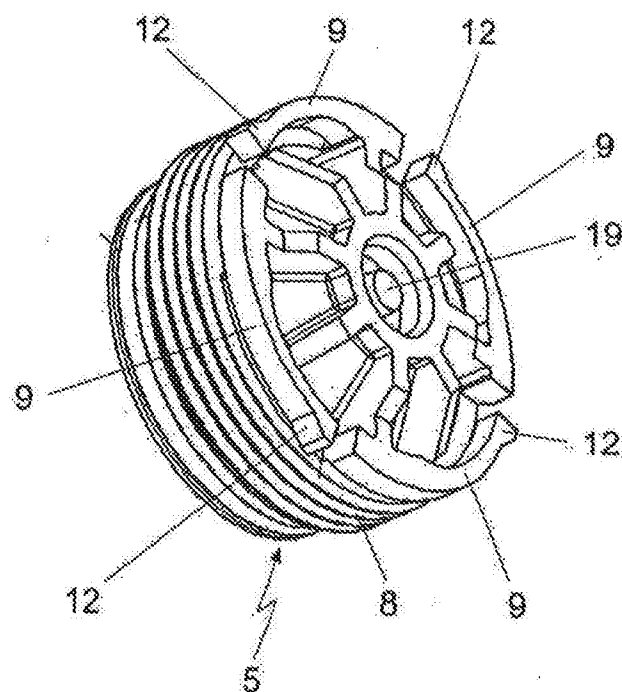
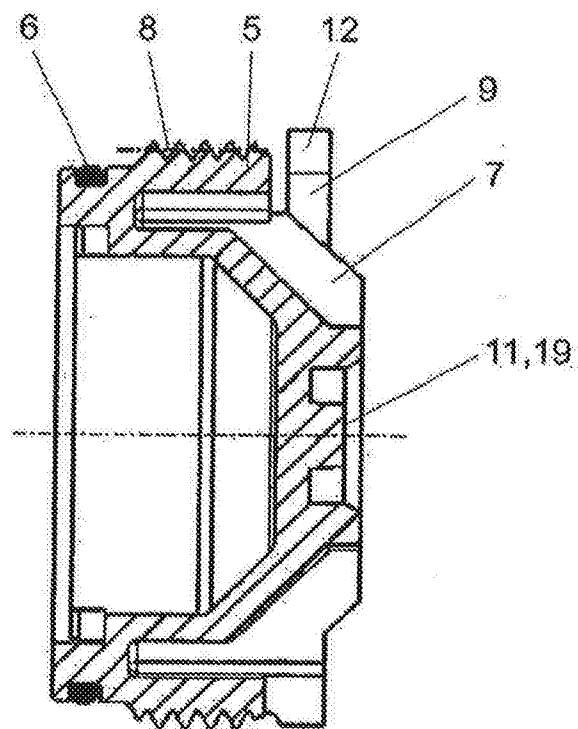
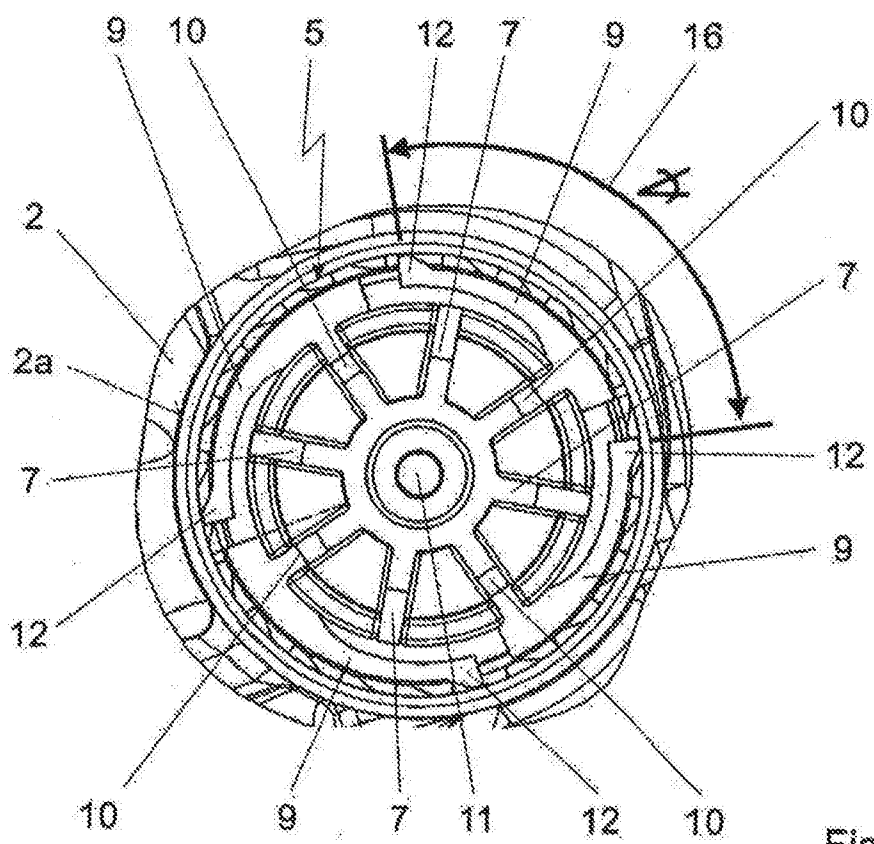
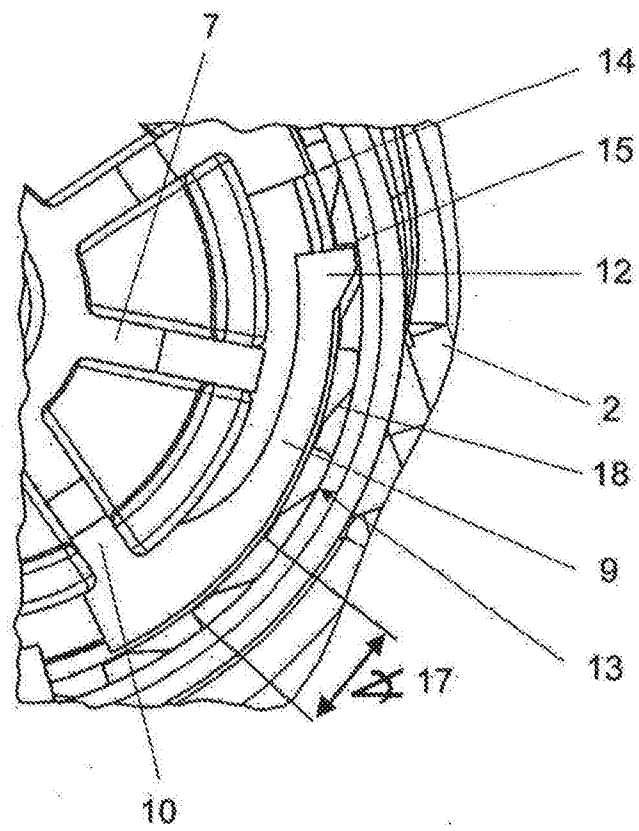
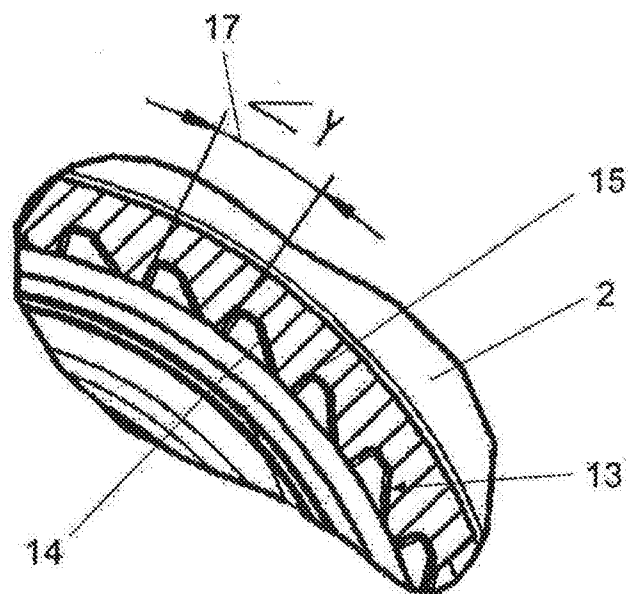


Fig. 2

Fig. 3Fig. 4

Fig. 5Fig. 6