(12) UK Patent Application (19) GB (11) 2 115 080 A

(21) Application No **8303262**
(22) Date of filing **7 Feb 1983**
(30) Priority data
(31) **3205716**
(32) **18 Feb 1982**
(33) **Fed. Rep of Germany (DE)**
(43) Application published
1 Sep 1983
(51) **INT CL³**
F16C 11/00 35/00 39/02
(52) Domestic classification
F2A 6E1A D30
E2F 608 620 PC
F2U 12
(56) Documents cited
None
(58) Field of search
F2A
E2F
F2U

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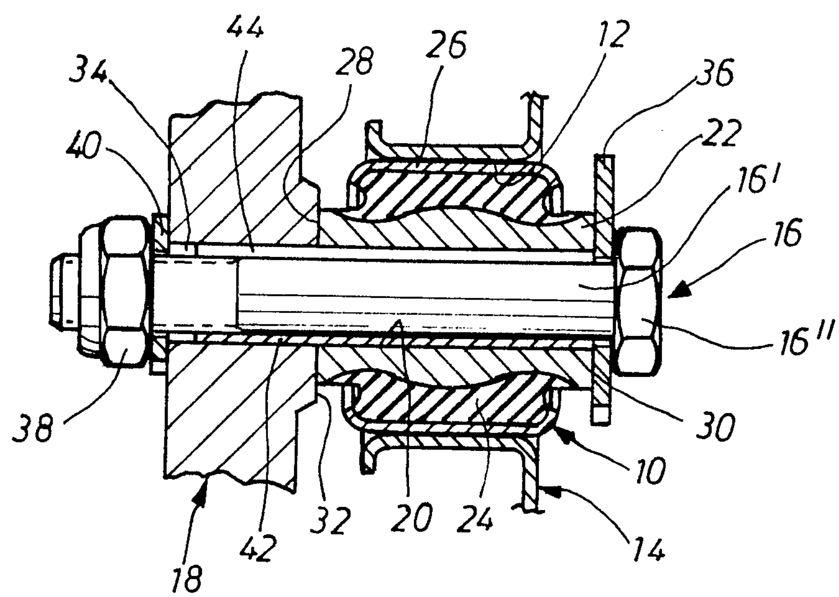
(54) An elastically flexible pivot bearing mounting

(57) The invention relates to an elastically flexible pivot mounting for the mutual pivotable connection of parts 14, 18 of a motor vehicle, for example a wheel carrier to a wheel guide member. It possesses a screw bolt 16 which carries a bearing body 10 which may be shock-absorbing in a radial direction and which receives the part 14. This bearing body 10 is attached by means of a cylindrical bore of an inner sleeve 22 onto a radially prestressed steel sleeve 42 which is slotted over its entire length and is arranged on the screw bolt 16 with a slight radial play and which projects into a cylindrical bore 34 in the part 18. When the screw bolt 16 is in the tensioned state, the inner sleeve 42 of the bearing body 10 rests frictionally by means of one of its end faces 28 against a bearing face of part 18.

The steel sleeve 42 forms a resilient intermediate member which is located between the inner sleeve 22 and the screw bolt 16 and which, as a result of the radial clearance existing between it and the screw bolt, is capable of absorbing a bending moment proportionally.



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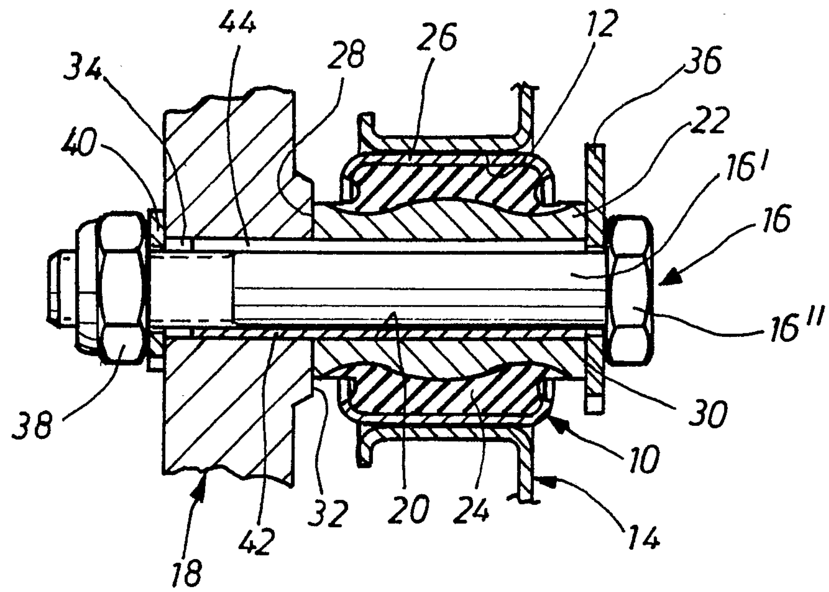

SPECIFICATION

An elastically flexible pivot bearing mounting

The invention relates to an elastically flexible pivot bearing mounting for the mutual pivotable connection of a supporting part and a pivotable part of a motor vehicle, for example a wheel carrier to a wheel guide member. A known pivot mounting has a screw bolt which penetrates by means of a shank end through a cylindrical recess in the supporting part and extends freely away from this part and which is retained therein as a result of axial tensioning, and with a bearing body arranged by means of an inner sleeve on the screw shank and receiving the pivotable part, whilst when the screw bolt is in the tensioned state the inner sleeve rests under pressure by means of its end faces again corresponding opposing faces, at least one of which is provided on the supporting part.

In the known pivot bearing mountings of the type described above, the inner sleeve of the bearing body sits directly on the screw bolt and rests frictionally by means of one of its end faces against a bearing face of the part supporting the screw bolt (see Fahrwerktechnik Running gear technology I, by Reimpell, page 398, Figure 3.9.12).

Insofar as, here, the screw bolt is arranged with radial play centrally in the inner sleeve of the bearing body and in the cylindrical recess in the support part (wheel carrier) holding it, on the one hand the total bending movement is introduced half as a bending moment via the screw bolt into the part holding it, and on the other hand the bending movement is half supported as a longitudinal force in the screw bolt and against the bearing face of the wheel carrier. The transverse force is then transmitted by means of a frictional connection.

However, when the screw bolt rests against the shell surface of the inner sleeve and the cylindrical recess, the screw bolt is subjected to greater bending stress because force is introduced into the screw bolt no longer solely via the end face of the inner sleeve, but also partially via the contact face between the periphery of the screw bolt and the periphery of the inner-sleeve bore.

In the event of alternating forces, the transverse force is also transmitted by means of a frictional connection.

At the same time, the cross-sections of the screw bolt and inner sleeve must be given appropriately large dimensions, so that the stresses arising cannot lead to overloading. However, large cross-sections result in a high degree of rigidity and correspondingly small deformations.

The object on which the invention is based is, therefore, in pivot bearings of the type described in the introduction to reduce considerably the influence of the forces which act on the components of the pivot mounting serving for absorbing the forces, and to bring about a more elastic absorption of shocks for the purpose of reducing, in the pivot mounting, stresses arising from the loads

According to the present invention there is provided an elastically flexible mounting for the mutual pivotable connection of a supporting part and a pivotable part of a motor vehicle including a screw bolt which penetrates by means of one shank end through a cylindrical recess in the supporting part, and with a bearing body arranged by means of an inner sleeve on the screw bolt and receiving said pivotable part, wherein a metal sleeve is located between the inner sleeve of the bearing body and the screw bolt, which metal sleeve is slotted over its entire length and is retained with radial prestressing in said inner sleeve and projects into the cylindrical recess of the supporting part, the metal sleeve being arranged on the screw bolt with radial clearance and the inner sleeve being clamped between said supporting part and the head or a threaded nut of the screw bolt when the screw bolt is in the tensioned state.

In such a design of the pivot bearing mounting, the metal sleeve engaging in the supporting part forms a resilient intermediate member which is located between the inner sleeve and the screw bolt and which, as a result of the radial clearance existing between it and the screw bolt, is capable of absorbing a bending moment proportionally.

The screw bolt is therefore subjected to bending only when the bending resistance produced by the metal sleeve is overcome. Up to this moment, the screw bolt is subjected exclusively to tensile stresses.

The proportionate absorption of bending moments by the metal sleeve therefore makes it possible to select a smaller cross-section therefore makes it possible to select a smaller cross-section of the screw bolt, thus imparting greater elasticity to the latter. Under normal conditions of use, the transverse forces directed perpendicularly to the axis of the bearing shank are transmitted exclusively by means of the frictional connection between the inner sleeve of the bearing body and the bearing face of the part supporting the screw bolt. Thus, the clamping sleeve and the screw bolt together form a bearing shank for the bearing body, the two parts absorbing radially directed forces, specifically the metal sleeve earlier than the screw bolt because of the radial clearance between these parts.

The metal sleeve also affords the advantage that it maintains for a relatively long time the frictional connection between the inner sleeve and the bearing body and the bearing face when heavy or sharp shocks occur. This is because of its elasticity, by means of which it is capable of absorbing the bending moment proportionally and consequently relieving the screw bolt. At the same time, the longitudinal or tensile force activated in the screw bolt as a result of its bending, and therefore also the loss of pressing force for the frictional connection, are kept correspondingly small.

A further advantage of the invention is to be seen in the fact that the greater permissible deformation distance made possible by the metal sleeve brings about an effective reduction in impact forces. A longer deformation distance is therefore available, in the pivot mounting according to the invention, for the absorption of impact energy, in comparison with the known pivot mountings. The relative movements arising thereby between the metal sleeve, the inner sleeve of the bearing body and, for example, a wheel carrier supporting the screw bolt, generate friction on the peripheral walls of the recesses receiving the metal sleeve, because the metal sleeve rests with radial prestressing against the peripheral walls. This causes impact energy to be dissipated and therefore leads to a damping effect, as a result of which the vibration energy is converted into heat and vibrations are thereby made to die out, and this contributes to improving the driving comfort of motor vehicles and to less loading of following components.

A further advantage of the construction according to the invention arises from the radial flexibility of the prestressed metal sleeve, because the metal sleeve adapts itself to the peripheral shape of the recesses receiving it, and the forces are thereby transmitted over a large area. As a result, such pronounced deformations due to surface pressure such as occur in a radially rigid sleeve do not arise on the edges of the recesses adjacent to one another. Nevertheless, it is still considered as coming within the scope of the invention to have also a pivot mounting in which, instead of the slotted metal sleeve, there is a sleeve closed on the periphery on radially rigid or only partially slotted along a generating line, in as much as this is a relatively thin-walled sleeve which is pressed with an appropriate quality of fit into the inner sleeve of the bearing body and the recess in the part holding screw bolt and which is capable of absorbing the bending moment proportionally.

Because of the division and transmission of transverse forces and bending moments, brought about according to the invention, a substantial increase in the durability or the fatigue strength is obtained for the individual components of the pivot mounting. There is therefore the possibility of producing these components from less high-strength materials.

A further important advantage of the invention is, finally, that it enables the screw bolt to be secured against self-loosening so that the prestressing of the screw bolt is maintained. This is achieved by very largely preventing relative movements between the screw head and the inner sleeve or screw nut and the part holding the screw bolt. At the same time, the metal sleeve limits the deformation distance as a result of proportionate absorption of the bending moment or of the transverse force on the bearing face of the inner sleeve, for example on a wheel carrier, insofar as the frictional connection may have been overcome.

As a result of the relieving effect of the metal sleeve, the diameter of the screw bolt can be kept correspondingly small (low moment of inertia), that is to say the screw bolt is capable of participating in deformations which occur, the static friction remaining because the screw head or the screw nut always rest against the connecting parts.

A metal sleeve which is suitable in an especially advantageous way is a clamping sleeve made of steel which is slotted along an axial line and which, when not installed, has an outside diameter greater than the inside diameter of the recesses receiving it, so that it is retained in in these with a press fit. Clamping sleeves according to DIN 7346 (light weight design) and according to DIN 1481 (heavy-duty design) can be used here.

The invention will now be described in more detail below with reference to an embodiment illustrated diagrammatically in the accompanying drawing.

The elastically flexible pivot mounting illustrated in the drawing as an embodiment of the invention is, for example, one intended for the pivotable connection of a wheel guide member to a wheel carrier.

In the pivot mounting, which is illustrated in a longitudinal section, 10 denotes as a whole a bearing body which is arranged with a press fit in a cylindrical recess 12 in the wheel guide member denoted by 14.

The bearing body 10 is fixed laterally to a wheel carrier 18 by means of a screw bolt 16.

The bearing body 10 possesses an inner sleeve 22 through which a cylindrical bore 20 passes in an axial direction and on the outer periphery of which, for example, a rubber body 24 is attached, preferably vulcanised. An outer sleeve 26 coaxially with an inner sleeve is preferably vulcanised onto the outer periphery of this rubber body and is retained with a press fit in the recess 12 in the wheel guide member 14.

In an alternative arrangement, the rubber body 24 is attached loosely to the inner sleeve 22, and may be provided with clamping means, in order, for the purpose of mutual elastic connection of the wheel guide member 14 to the inner sleeve 22, to brace the rubber body in a radial direction between the inner sleeve 22 and the wheel guide member 14. Alternatively, this rubber body 24 could be pressed in with an appropriate oversize between the inner sleeve 22 and the outer sleeve 26.

The inner sleeve 22 has two plane-parallel end faces 28 and 30. By means of the screw bolt 16 which preferably comprises a cylindrical hexagonal shank screw, the bearing body 10 is fixed frictionally by means of the end face 28 of its inner sleeve 22 against a bearing face 32 of a wheel carrier 18. For this purpose, the wheel carrier 18 has a cylindrical bore 34 in the region of the bearing face 32 and through which the externally threaded screw shank 16′ is guided.

A washer 36 attached to the screw shank is located between the end face 30 of the inner sleeve 22 of the bearing body and the screw head 16″.

A threaded nut 38 is screwed onto the screw shank 16′ projecting from the wheel carrier 18 for bracing the bearing body 10 on the wheel. The nut supported on a washer 40 resting against the wheel carrier 18.

As may be seen from the drawing, the inside diameters of the cylindrical bores 20, 34 of the inner sleeve 22 and the wheel carrier 18 are greater than the outside diameter of the screw shank 16′. It is thereby possible to provide, between the inner sleeve 22 of the bearing body 10 and the inner periphery of the cylindrical bore 34 of the wheel carrier 18, and the screw shank 16′ of the screw bolt 16, intermediate member in the form of a cylindrical steel clamping sleeve 42 attached to the screw shank 16′, in such a way that it is retained with a radial prestress in the cylindrical bores 20, 34 and the screw shank 16′ is retained in these with slight radial clearance. For this purpose, the steel sleeve 42 is of appropriate dimensions and has a slot 44 over its entire length. In the installed position, the sleeve extends through the entire inner sleeve 22 and into the bore 34 of the wheel carrier 18, ending at a distance from the washer 40 in the bore 34.

When not installed, the slotted clamping sleeve 42 has a larger outside diameter than the bores 20, 24, so that it is retained with a press fit in the inner sleeve 22 of the bearing body 10 and in the wheel carrier 18. When the screw bolt 16 is in the tensioned state, transverse forces acting on the wheel guide member 14 are transmitted to the wheel carrier 18 as a result of a frictional connection between the faces 28, 32 of the inner sleev 22 of the bearing body and the wheel carrier 18. At the same time, because of its elasticity, the clamping sleeve 42 is capable of partially absorbing transverse forces, so that, for example in the event of heavy sharp shocks, the frictional connection is maintained for a correspond-ing long period. Likewise, bending moments are also partially absorbed by the claimping sleeve 42, so that the screw bolt is subjected to correspondingly lower bending moments than would otherwise be the case. The reduction in the bending moment on the screw bolt 16 ensures that the longitudinal forces arising as a result of bending stresses in the screw bolt are reduced correspondingly.

During the absorption of bending moments, relative moments generating friction take place between the wheel carrier 18, the clamping sleeve 42 and the inner sleeve 22 of the bearing body, with the result that impact energy is dissipated and a damping effect is achieved.

Moreover, the arrangement of the longitudinally slotted clamping sleeve 42 provides convenient corrosion protection for the screw shank 16′ of the screw bolt 16 and allows coarser tolerances in the production of the bores 20, 34. Instead of a clamping sleeve consisting of steel, this could also consist of another material, especially aluminium. The bearing body 10 could also be made rigidly radially in the form of, for example, a ball-and-socket joint.

CLAIMS

1. An elastically flexible pivot mounting for the mutual pivotable connection of a supporting part and a pivotable part of a motor vehicle including a screw bolt which penetrates by means of one shank end through a cylindrical recess in the supporting part, therein and with a bearing body arranged by means of an inner sleeve on the screw bolt and receiving said pivotable part, wherein a metal sleeve is located between the inner sleeve of the bearing body and the screw bolt, which metal sleeve is slotted over its entire length and is retained with radial prestressing in said inner sleeve and projects into the cylindrical recess of the supporting part, the metal sleeve being arranged on the screw bolt with radial clearance and the inner sleeve being clamped between said supporting part and the head or a threaded nut of the screw bolt when the screw bolt is in the tensioned state.

2. A pivot mounting according to Claim 1, the metal sleeve comprises a clamping sleeve slotted throughout its axial length and which, in the free state, has an external diameter larger than the internal diameter of the inner sleeve and the cylin-drical recess in the supporting part.

3. An elastically flexible pivot mounting for the mutual pivotable connection of parts of a motor vehicle, substantially as described herein with refer-ence to, and as illustrated in the accompanying drawing.

Printed for Her Majesty's Stationery Office, by Croydon Printing Company Limited, Croydon, Surrey, 1983.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.