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DE 196 04 160 C1

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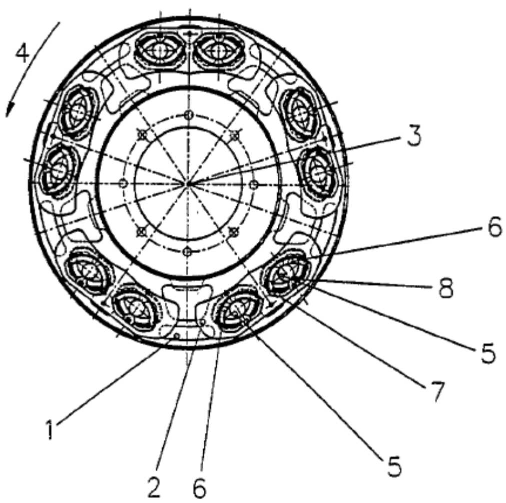
GB 5 98 811

54 Rotational-speed-adaptive absorber

57 A rotational-speed-adaptive absorber, comprising a hub part (1) capable of rotating around an axis of rotation, as well as several inertial masses (2), which are able to swivel around swivel axes spaced apart from the axis of rotation (3) in a manner following the rotational movement (4), wherein each inertial mass (2) is mounted on two pins (5), which in the hub part (1) are spaced apart in circumferential direction and extend parallel to the axis of rotation (3), and wherein the pins (5) are capable of rolling on curved tracks (6), which in the region of the hub part (1) have a profile that is open in U-shaped manner in the direction of the axis of rotation (3) and in the region of the inertial masses (2) have a profile that is open in U-shaped manner in the opposite direction, and wherein the pins (5) are guided on the sides facing away from the respective curved tracks (6) by a guide track (7).



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Description

The invention relates to a rotational-speed-adaptive absorber, comprising a hub part capable of rotating around an axis of rotation, as well as several inertial masses, which are able to swivel in the direction of the rotational movement around swivel axes spaced apart from the axis of rotation, wherein each inertial mass is mounted by two pins, which in the hub part are spaced apart in circumferential direction and extend parallel to the axis of rotation, and wherein the pins are capable of rolling on curved tracks, which in the region of the hub part have a profile that is open in U-shaped manner in the direction of the axis of rotation and in the region of the inertial masses have a profile that is open in U-shaped manner in the opposite direction.

Such an absorber is known from GB Patent 598811. Therein the curved tracks are formed by partial regions of the wall of bores having a considerably larger diameter than that of the pins. Upon introduction of torsional vibrations into such a torsional vibration absorber, the pins roll over the walls that bound the bores and form the curved tracks, with the result that the distance between each inertial mass and the axis of rotation changes constantly in the course of each individual vibration. Such an absorber has a natural frequency proportion to the rotational speed, and so torsional oscillations with frequencies proportional to the rotational speed can be absorbed in the entire rotational-speed range. Such frequencies proportional to the rotational speed occur in all periodically operating machines, such as the combustion engines of motor vehicles.

In the known rotational-speed-adaptive absorber, the pins and the curved tracks are pressed against one another only when the shaft is rotating. While the shaft is rotating uniformly, all inertial masses orbit the axis of rotation always at the greatest possible distance. This condition is perturbed, however, when the rotational movement comes to a standstill. Under the influence of gravity, all parts are then displaced to a position in which they have the smallest possible distance from the center of the earth. In this condition, the inertial masses and pins distributed in circumferential direction of the rotational-speed-adaptive absorber therefore have distances from the axis of rotation that differ from one another.

In rotational-speed-adaptive absorbers that are occasionally in rotating motion and occasionally in a stationary state, the transition from the rotating to the stationary state is unpleasantly noticeable, because precisely the inertial masses located on the side of the axis of rotation facing away from the center of the earth suddenly fall down, while the pins in the bore

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suddenly strike the respective opposite metallic wall. This produces metallic impact noises. The same effect can be observed at the onset of rotational movement after a preceding standstill.

The object of the invention is to further develop a rotational-speed-adaptive absorber of the type mentioned in the introduction to the effect that the mounting of the inertial masses at the beginning and at the end of a rotational movement can no longer lead to unacceptable noise generation.

This object is achieved according to the invention in a rotational-speed-adaptive absorber of the type mentioned in the introduction by the fact that the pins on the sides facing away from the respective curved tracks are guided by a guide track. The pins are already braced by the guide tracks on the side facing away from the curved tracks after overcoming a small clearance before a large relative velocity develops. Thereby the occurrence of impact noises can be limited to acceptable values under all conceivable operating conditions.

In order to improve the safety against operation-related impact noises even more, it has proved advantageous when the guide tracks consist of polymer material, for example of polyurethane or polyamide.

It is also possible to use an elastomeric material. By virtue of the elastic properties, particularly efficient damping of impact noises is achieved in such a construction.

In circumferential direction, the damping layers may end on both sides in stop surfaces, by which the circumferential mobility of the pins is limited to a fixed value. The resulting aperture in which each pin is movable has a kidney-shaped contour. It is bounded in a first partial region by the curved track over which the pins are able to roll, and in a second partial region by the guide tracks, by which the pins can be braced when the torsional-vibration absorber is not rotation, and in circumferential direction on both sides by the stop surfaces, which limit the circumferential mobility of the pin. Ideally, all partial surfaces merge continuously into one another, thus avoiding sudden changes of direction.

The curved tracks and the guide tracks may form components of insert parts, which can be clipped into recesses of the hub part and/or of the inertial masses. Their size and dimensioning may be modified as a function of the respective application, thus permitting the respective absorber to be adapted selectively to a specified application. Assembly is very simple. It may also be achieved by simple insertion into the recesses and the additional use of adhesives, threaded couplings and/or rivets.

It has proved particularly advantageous when the damping layer is joined to the insert pieces and recesses supporting the curved tracks by molding the body of material forming it

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directly onto them and curing it. This permits the secondary advantage of mutual bonding, of equalization of the tolerances between the insert pieces and recesses and of wobble-free fixation of the insert pieces in the recesses. The mounting and curing of the body of material forming the damping layer can be achieved, for example, in the course of an injection-molding process.

The subject matter of the invention will be further illustrated hereinafter on the basis of the drawings, wherein:

Fig. 1 shows a structural shape of a rotational-speed-adaptive absorber in a frontal view,

Fig. 2 shows an insert part for fitting into the hub part or the absorber masses of the rotational-speed-adaptive absorber according to **Fig. 1**,

Fig. 3 shows a rotational-speed-adaptive absorber in cross-sectional view.

The rotational-speed-adaptive absorber reproduced in the drawings comprises a hub part **1** capable of rotating around an axis of rotation as well as several inertial masses **2**, which are able to swivel around swivel axes spaced apart from axis of rotation **3** in a manner that more or less follows rotational movement **4**, wherein each inertial mass **2** is mounted on two pins **5**, in the hub part are spaced apart in circumferential direction and extend parallel to the axis of rotation **3**, and wherein pins **5** are capable of rolling on curved tracks **6**, which in the region of hub part **1** have a profile that is open in U-shaped manner in the direction of axis of rotation **3** and in the region of inertial masses **2** have a profile that is open in U-shaped manner in the opposite direction. Pins **5** are guided on the sides facing away from the respective curved tracks **6** by a guide track **7**. This consists of a guide layer **8** of polymer material, for example of rubber. Guide tracks **7** are bounded on both sides by stop surfaces **9**, which at the same time limit the circumferential mobility of the respective pin **5** to a fixed value. The diameter of the pin **5** is so matched to the radial distance between the respective curved track **6** and the associated guide track **7** that no or at least no noteworthy clearance is present.

Curved tracks **6** and guide tracks **7** form components of insert parts, which are received captively in recesses **10** of hub part **1** and of inertial masses **2**, for example by being clipped therein. The periphery of recesses **10** in inertial masses (2) according to **Fig. 2** is indicated by a broken line. Inertial masses **2** may also have a contour differing from that of **Fig. 2**, for example a rectangularly bounded contour. The manufacture of such a structure is indeed simpler, but it necessarily involves a certain loss with respect to the magnitude of the theoretically attainable absorber mass.

Insert pieces **6.1/6.2** forming curved tracks **6** may also be fitted loosely into recesses **10** then bonded with recesses **10** and insert pieces **6.1** by subsequent molding in place of damping

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