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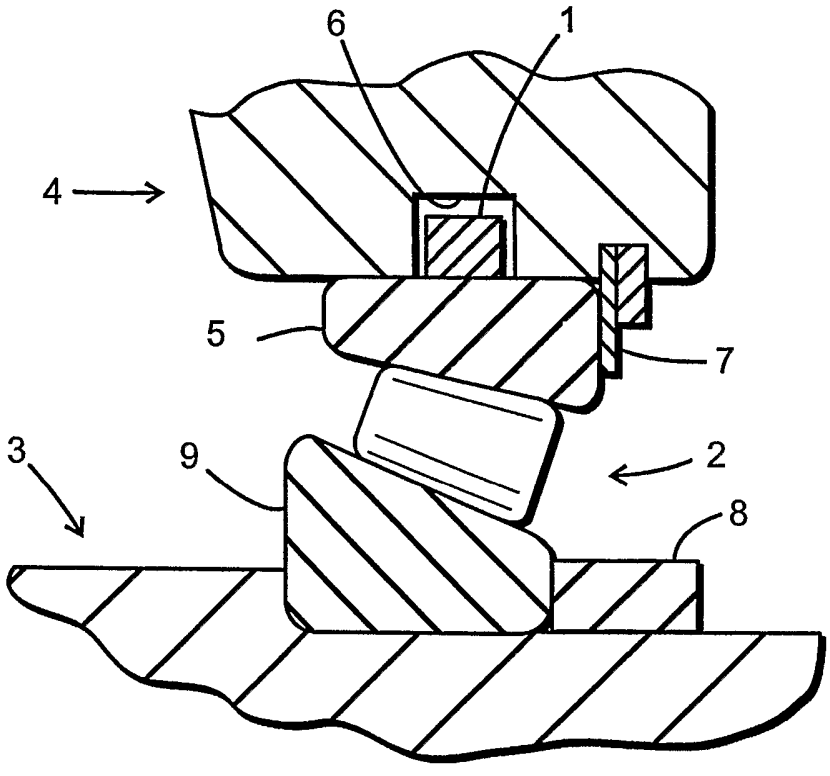
For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: VIBRATION DAMPING DEVICE FOR BEARINGS



(57) Abstract: The present invention relates to a vibration damping device for a bearing (2) arranged between a rotating shaft (3) and a bearing seat (4). The device comprises at least one solid body (1) which is arranged on or closely adjacent to an outer side of an outer bearing ring (5) forming part of the bearing (2) and which is so designed as to eliminate all or some of the vibrations propagated from the shaft (3) to the bearing seat (4) via the bearing (2) during operation. The invention also relates to a bearing device with such a vibration damping device, and methods for interruption of undesirable vibration transmission from a rotating shaft (3) to a bearing seat (4) via a bearing device supporting a shaft (2) by adaptation of the characteristics of the solid body (1). The present invention improves the possibility of dealing with vibrations which are propagated from a rotating shaft (3) to a machine body via a bearing (2).

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Vibration damping device for bearings

Background to the invention

The present invention relates to a vibration damping device for a bearing arranged between a rotating shaft and a bearing seat, to a bearing device which comprises an outer bearing ring, a bearing seat retaining the bearing ring in a radial position and fixing means for retaining the bearing ring in an axial position, and to a method for interruption of undesirable vibration transmission from a rotating shaft to a bearing seat via a bearing device supporting the shaft.

In the use of bearings to support rotating shafts in various contexts, the occurrence in the shaft of vibrations resulting from imbalance is virtually unavoidable. Such vibrations cause undesirable noise nuisance problems.

The propagation of such vibrations can to some extent be prevented by using for the fastening of the bearing in a bearing seat a softer material to eliminate the natural frequencies of the structure. In most applications, such an arrangement cannot be used because it does not cope with the loads which occur. Another possibility is to use a stronger and more rigid material which copes with even heavy loads. In most cases this means materials such as titanium etc., which are ruled out for cost reasons in most industrial contexts, e.g. the vehicle industry.

Instead of preventing the amplification of natural frequencies of the structure as described above, the idea of the invention is to try to cancel out the vibrations which occur by imparting oscillations in counterphase to them.

Summary of the invention

One object of the present invention is to improve the possibility of dealing with vibrations which are propagated from a rotating shaft to a machine body via a bearing.

According to invention, this object is achieved by what is indicated by the characterising part of claim 1. Other advantageous embodiments are indicated by the characterising parts of claims 2-10.

Description of the drawing

Fig. 1 depicts in axial section a bearing device with a vibration damping device according to the invention.

The present invention is described below with reference to special embodiments without being not limited to them, but only being limited by the claims.

Detailed description of the invention

A vibration damping device 1 for a bearing 2 arranged between a rotating shaft 3 and a bearing seat 4 comprises a solid body 1 which may take a wide variety of forms within the scope of the invention. The solid body 1 is arranged on or closely adjacent to a radial outer side of an outer bearing ring 5 which forms part of the bearing 2. The outer bearing ring 5 is clamped in and radially fixed by the bearing seat. A fixing means 7 on at least one side of the outer bearing ring 5 fixes the latter axially. The bearing also has an inner bearing ring 9 which is fixed axially to the shaft 3 by a fixing means 8. In a particularly preferred embodiment depicted in Fig. 1, the solid body 1 is arranged in a recess 6 in the inner surface of the bearing seat 4 which is deeper than the thickness t of the solid body 1. The solid body 1 is a ring and the recess 6 is annular and arranged along an inner periphery of the bearing seat 4. The ring is loosely tensioned round the shaft 3 and its fitting is preferably facilitated by its being provided with a slit aperture.

The solid body 1 may be homogeneous but may also exhibit along its circumference physical differences such as regions of different width, thickness, material or density or a combination of one or more of these characteristics. These parameters are used for adapting the characteristics of the solid body 1 in order to achieve the oscillatory characteristics appropriate in the relevant vibration situation for cancelling out undesirable vibrations in the structure of the bearing. Physical differences may be provided regularly along the circumference or irregularly depending on the prevailing vibration situation. The density of the material of the solid body 1 may correspond to or be greater than that of steel.

In addition, the tensioning of the solid body 1 round the outer bearing ring 5 may be adapted in order to achieve the oscillatory characteristics appropriate in the relevant vibration situation for cancelling out undesirable vibrations in the structure of the bearing.

Instead of one annular solid body 1, two or more solid bodies may be arranged along, and be suitably applied to, the radial outer side of the outer bearing ring 5. They may be of similar configuration or exhibit mutually different characteristics as regards width, thickness, material or density or a combination of one or more of these characteristics. Such a solid body 1 may instead exhibit along its extent along the

periphery of the outer bearing ring 5 varying characteristics as regards width, thickness, material or density or a combination of one or more of these characteristics.

Alternatively, two or more annular solid bodies may be arranged each parallel in its respective recess in the bearing seat 4. In such cases these solid bodies may present similar or dissimilar characteristics as regards width, thickness, material or density or a combination of one or more of these characteristics. In accordance with the foregoing paragraph, such an annular solid body may of course be replaced by two or more separate solid bodies arranged along, and be suitable applied to, the radial outer side of the outer bearing ring 5.

If the fastening of the outer bearing ring 5 to the bearing seat 4 is such that the bearing ring 5 partly protrudes from the bearing seat 4, the solid body or bodies may be arranged on such a portion of the bearing ring 5, in which case the solid body may for example abut against a surface of the bearing seat which is perpendicular to the shaft 3.

Claims

1. A vibration damping device for a bearing (2) arranged between a rotating shaft (3) and a bearing seat (4), characterised in that it comprises at least one solid body (1) which is arranged on or closely adjacent to an outer side of an outer bearing ring (5) forming part of the bearing (2) and which is so designed as to cancel out all or some of the vibrations propagated from the shaft (3) to the bearing seat (4) via the bearing (2) during operation.

2. A vibration damping device according to claim 1, characterised in that the solid body (1) is arranged in a recess (6) in the inner surface of the bearing seat (4), which recess (6) is deeper than the thickness t of the solid body (1).

3. A vibration damping device according to claim 2, characterised in that the solid body (1) is a loosely tensioned ring running in the recess (6) which is annular and arranged along the inner periphery of the bearing seat (4).

4. A vibration damping device according any one of the foregoing claims, characterised in that the solid body (1) exhibits along the inner periphery of the bearing seat (4) regions of different width, thickness, material or density or a combination of any of these characteristics which are so adapted that the device cancels out all or some of the vibrations propagated from the shaft (3) to the bearing seat (4) via the bearing (2) during operation.

5. A bearing device which comprises an outer bearing ring (5), a bearing seat (4) retaining the bearing ring (5) in a radial position and fixing means (7) for retaining the bearing ring (5) in an axial position, characterised in that it also comprises at least one solid body (1) arranged on or closely adjacent to the outer side of the outer bearing ring (5) and so designed as to cancel out all or some of the vibrations propagated from the shaft (3) to the bearing seat (4) via the bearing (2) during operation.

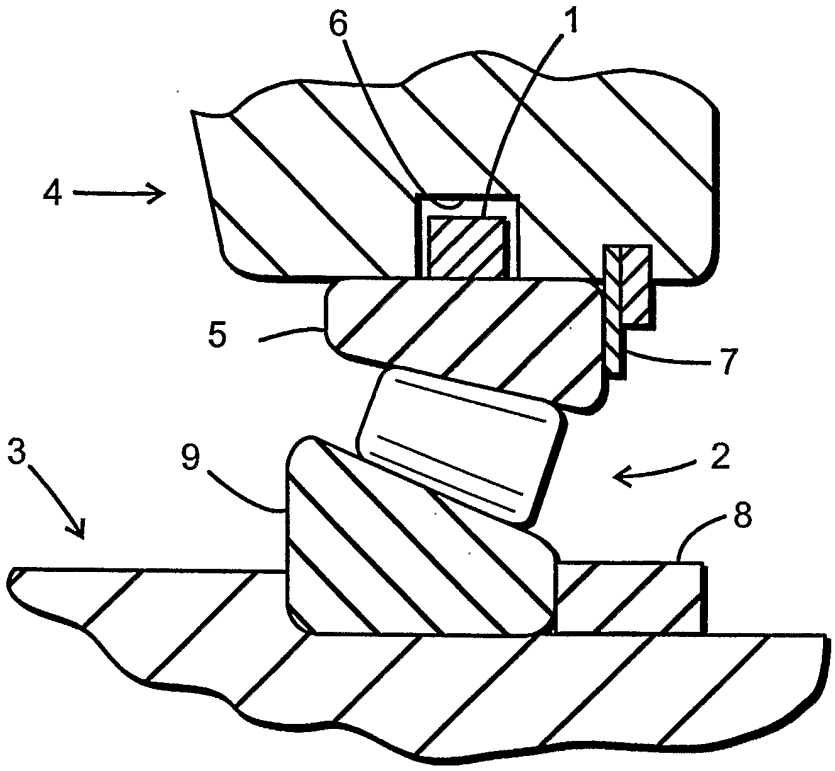
6. A bearing device according to claim 5, characterised in that the solid body (1) is arranged in a recess (6) in the inner surface of the bearing seat (4), which recess (6) is deeper than the thickness t of the solid body (1).

7. A bearing device according to claim 6, characterised in that the solid body (1) is a loosely tensioned ring arranged on the outer side of the outer bearing ring (5) and running in the recess (6) which is annular and arranged along the inner periphery of the bearing seat (4).

8. A bearing device according to any one of claims 5-7, characterised in that the solid body (1) exhibits along the inner periphery of the bearing seat (4) regions of different width, thickness, material or density or a combination of any of these characteristics which are so adapted that the device cancels out all or some of the vibrations propagated from the shaft (3) to the bearing seat (4) via the bearing (2) during operation.

9. A method for damping of undesirable vibration transmission from a rotating shaft (3) to a bearing seat (4) via a bearing device (2) supporting the shaft (3) according to any one of claims 5-8, characterised in that the solid body (1) is so designed that its width, thickness, material or density or a combination of any of these characteristics is/are such that all or some of the vibrations propagated from the shaft (3) to the bearing seat (4) via the bearing (2) are cancelled out.

10. A method for damping of undesirable vibration transmission from a rotating shaft (3) to a bearing seat (4) via a bearing device supporting the shaft (3) according to either of claims 7-8, characterised in that the tensioning of the solid body (1) on the outer side of the bearing ring (5) is such that some or all of the vibrations propagated from the shaft (3) to the bearing seat (4) via the bearing (2) during operation are cancelled out.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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 2004/000610

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: F16C 27/04
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: F16C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 02061296 A1 (LUK LAMELLEN UND KUPPLUNGSBAU BETEILUNGS KG), 8 August 2002 (08.08.2002), figures 2,7,8, details 120,320 -- --------	1-10

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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				FR	2820178	A,B	02/08/2002
				US	2003099417	A	29/05/2003