(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 943 736 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
22.09.1999 Bulletin 1999/38

(51) Int Cl.[6]: **E01D 19/04**

(21) Application number: **99200622.1**

(22) Date of filing: **04.03.1999**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **17.03.1998 NL 1008614**

(71) Applicant: **Bouwdienst Rijkswaterstaat**
3502 LA Utrecht (NL)

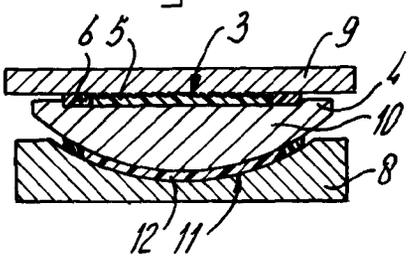
(72) Inventors:
- **Leendertz, Johan Sebastiaan**
  3055 HA Rotterdam (NL)
- **Heine, Govert Willem**
  1509 JL Zaandam (NL)

(74) Representative: **de Bruijn, Leendert C. et al**
Nederlandsch Octrooibureau
P.O. Box 29720
2502 LS Den Haag (NL)

(54) Bearing

(57) A bearing for a bridge comprises a bottom saddle (8) and a top saddle (9), between which there is a friction member (3) which has a relatively low coefficient of friction compared to the saddles. The friction member comprises a central sheet section (5) and an edge section (6) which is situated on the periphery of the said sheet section. An intermediate saddle (10) is situated between the bottom saddle (8) and the top saddle (9), which intermediate saddle (10) interacts with the bottom saddle (8) by means of a bottom friction member (12) and interacts with the top saddle (9) by means of a top friction member (3).

fig - 1



EP 0 943 736 A2

Description

[0001] The invention relates to a bearing for a bridge, comprising a bottom saddle and a top saddle, between which there is a friction member which has a relatively low coefficient of friction compared to the saddles.

[0002] Bearings of this nature are incorporated in the supports of the bridge at the location of the piers, abutments and the like. The top saddle, which is attached to the superstructure of the bridge, can be displaced over a certain distance with respect to the bottom saddle, which is attached to the substructure, such as a pier, which displacements are made possible by the friction member.

[0003] Bearings of this nature allow the superstructure of the bridge to adapt to the various load conditions brought about by traffic load and temperature changes. A further advantage is that the substructure is subjected to reduced loads and can therefore be of more lightweight design.

[0004] Therefore, during the lifespan of the bridge, a large number of displacement movements take place at the location of the bearings, while at the same time a high load is exerted in the vertical direction. Despite the fact that high-grade materials are used in the bearings, such as for example polytetrafluoroethylene, which provides a low frictional resistance, in practice it has been found that problems nevertheless arise. Permanent deformation, such as creep, occurs under the influence of the constant high loads, and consequently the bearing has to be replaced earlier than expected.

[0005] Such a situation is undesirable, since replacing bearings entails high costs. Moreover, work of this nature represents a considerable disruption to traffic.

[0006] Therefore, the object of the invention is to provide a bearing which is more satisfactory and, in particular, has a longer service life. This object is achieved by the fact that the friction member comprises a central sheet section and an edge section which is situated on the periphery of the said sheet section.

[0007] In particular, an intermediate saddle may be situated between the bottom saddle and the top saddle, which intermediate saddle interacts with the bottom saddle by means of a bottom friction member and interacts with the top saddle by means of a top friction member.

[0008] The friction member can now be designed in such a manner that, on the one hand, the desired low coefficient of friction can be maintained and, on the other hand, it is possible to avoid the risk of damage caused by permanent deformation due to creep. Consequently, the total service life of the bearing can be considerably prolonged.

[0009] The bearing is preferably designed in such a way that the edge section extends around the entire periphery of the sheet section.

[0010] In this case, the edge section comprises a material which has a higher resistance to deformation and/or creep caused by compressive loads than the material of the sheet section, in such a manner that the said sheet section is supported by the said edge section so as to prevent deformation and/or flow.

[0011] The sheet section, which comprises a material with a low coefficient of friction, is now enclosed in the edge section. The said edge section provides enough support for the sheet section for the latter to be prevented from being plastically deformed (creep).

[0012] According to a first possibility, on both sides of the friction member the surfaces of the sheet section and the edge section lie in a common plane. In this case, the bearing forces are exerted directly on both surfaces of the friction member, providing simple, reliable support.

[0013] According to a second possibility, on one side of the friction member the surface of the sheet section is recessed with respect to the surface of the edge section. A medium such as oil can be held in the space defined between the recessed surface of the sheet section and the opposite surface of the saddle. A support of this nature provides a very low frictional resistance.

[0014] Furthermore, in order to reduce the frictional resistance at least one of the surfaces of the sheet section may contain hollows in which a lubricant can be held.

[0015] According to a preferred embodiment, the sheet section comprises polytetrafluoroethylene, while the edge section comprises ultrahigh molecular weight polyethylene (UHMWPE). Other suitable combinations of materials are also possible.

[0016] The friction body may have all kinds of shapes, for example a planar shape or the shape of a segment of a sphere.

[0017] The invention will now be explained in more detail with reference to a number of exemplary embodiments which are illustrated in the figures.

[0018] Figure 1 shows a first embodiment of the bearing according to the invention.

[0019] Figure 2 shows a second embodiment.

[0020] Figures 3 and 4 show a third embodiment.

[0021] Figure 5 shows a fourth embodiment.

[0022] The bearing (sphere-segment bearing) illustrated in Figures 1 and 2 comprises a bottom saddle 8, a top saddle 9 and an intermediate saddle 10. Bottom saddle 8 and top saddle 9 are each provided with attachment means (not shown), by means of which they can be attached to the substructure, such as a pier, and the superstructure, respectively, of a bridge.

[0023] The bottom saddle 8, top saddle 9 and intermediate saddle 10 can be displaced slightly with respect to one another. To this end, the friction member 11 is arranged between the bottom saddle 8 and the intermediate saddle 10 and the friction member 3 is arranged between the intermediate saddle 10 and the top saddle 9. The friction member 3 is secured between the projecting rim 4 of the bottom saddle 1. The top saddle 2 rests displaceably on the top surface of a friction member 3.

[0024] The friction member 3 according to the invention comprises a central sheet section 5, as well as an edge section 6. The central sheet section may comprise polytetrafluoroethylene. The problem of known bearings is that the polytetrafluoroethylene material begins to creep under the influence of time and high load forces, with the result that, in particular at the edges of the friction member, the thickness decreases and the material is pressed outwards.

[0025] According to the invention, the polytetrafluoroethylene material is now stabilized by the annular edge section 6. This annular edge section 6 comprises material which has a greater resistance to creep and may, for example, comprise UHMWPE. Although this material has a slightly higher coefficient of friction, because most of the surface of the friction member 3 comprises the surface of the central sheet section 5, which is made from polytetrafluoroethylene, the total frictional resistance is sufficiently low.

[0026] Wells 7, in which a lubricant may be held, may be provided on that side of the central sheet section 5 which faces towards the top saddle 2.

[0027] A friction member 11, which is in the form of a segment of a sphere, is arranged between the intermediate saddle 10 and the bottom saddle 9. This friction member 11 comprises a central sheet member 12 which is in the form of a segment of a sphere and is made from polytetrafluoroethylene, and a ring made from UHMWPE. The friction member 11 is of similar design to friction member 3.

[0028] The embodiment shown in Figure 2 relates to a so-called neoprene pot bearing. This bearing too comprises a bottom saddle 14, a top saddle 15 and an intermediate saddle 16. A friction member 3, which is similar to the friction member 3 shown in Figures 1 and 2 and comprises a sheet-like section 5 made from polytetrafluoroethylene and an annular section 6 made from UHMWPE, is again situated between the top saddle 15 and the intermediate saddle 16.

[0029] The bottom saddle 14 and the top saddle 15 are supported with respect to one another by neoprene sheet 17 and neoprene ring 18, in such a manner that the top saddle 15 can tilt slightly with respect to the bottom saddle 14.

[0030] The embodiment shown in Figures 3 and 4 relates to a tension-compression bearing. This bearing comprises a bottom saddle 19 and a top saddle 20. The bottom saddle comprises two flanges 21, held together by shaft 22 around which the bronze block 23 is arranged.

[0031] The bronze block itself is arranged in the space 24 which has been cut out of the top saddle 20. The top saddle is supported with respect to the bottom saddle by means of two friction members 25, composed of a central sheet section and a ring section arranged around it.

[0032] A tension-compression bearing can be used to absorb upwardly and downwardly directed vertical forces, such as those which are found, for example, in cable-stayed bridges. Also, the tension-compression bearing allows movements such as those illustrated by the arrows in Figures 3 and 4.

[0033] In the embodiment shown in Figure 5, a friction member 26, which comprises a central sheet section 27 which has a slightly smaller thickness than the ring section 28, is used between the bottom saddle 1 and the top saddle 2. A space which is filled with oil in order to reduce the frictional resistance still further remains between the top saddle 2 and the central sheet section 27. The ring section 28 provides a seal with respect to the top saddle 2 which is such that the oil can be held enclosed, resulting in a hydrostatic support.

Claims

1. Bearing for a bridge, comprising a bottom saddle (1, 8, 14, 19) and a top saddle (2, 9, 15, 20), between which there is a friction member (3, 25, 26) which has a relatively low coefficient of friction compared to the saddles, characterized in that the friction member (3, 25, 26) comprises a central sheet section (5) and an edge section (6, 28) which is situated on the periphery of the said sheet section (5, 27).

2. Bearing according to Claim 1, in which an intermediate saddle (10) is situated between the bottom saddle (1, 8, 14, 19) and the top saddle (2, 9, 15, 20), which intermediate saddle (10) interacts with the bottom saddle (8) by means of a bottom friction member (11) and interacts with the top saddle (9) by means of a top friction member (3).

3. Bearing according to Claim 1 or 2, in which the edge section (6) extends around the entire periphery of the sheet section (5, 27).

4. Bearing according to one of the preceding claims, in which the edge section (6, 28) comprises a material which has a higher resistance to deformation and/or creep caused by compressive loads than the material of the sheet section (5), in such a manner that the said sheet section (5, 27) is supported by the said edge section (6, 28) so as to prevent deformation and/or flow.

5. Bearing according to one of the preceding claims, in which on at least one side of the friction member (3, 25, 26) the surfaces of the sheet section (5, 27) and the edge section (6, 28) lie in a common plane.

6. Bearing according to one of the preceding claims, in which on one side of the friction member (26) the surface of the sheet section (27) is recessed with respect to the surface of the edge section (28).

7. Bearing according to Claim 6, in which a medium such as oil (29) can be held in the space defined between the recessed surface of the sheet section (27) and the opposite surface of the saddle (2).

8. Bearing according to one of the preceding claims, in which at least one of the surfaces of the sheet section (5, 27) contains hollows (7) in which a lubricant can be held.

9. Bearing according to one of the preceding claims, in which the sheet section (5, 27) comprises polytetrafluoroethylene.

10. Bearing according to one of the preceding claims, in which the edge section (6, 28) comprises ultra-high molecular weight polyethylene (UHMWPE).

11. Bearing according to one of the preceding claims, in which the sheet section (5, 27) has a circular periphery and the edge section (6, 28) is in a corresponding ring form.

12. Bearing according to one of the preceding claims, in which the friction member (3, 27) is planar.

13. Bearing according to one of the preceding claims, in which the friction member (11) is in the form of a segment of a sphere.

Fig - 1

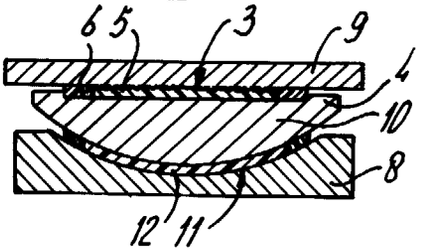


Fig - 2

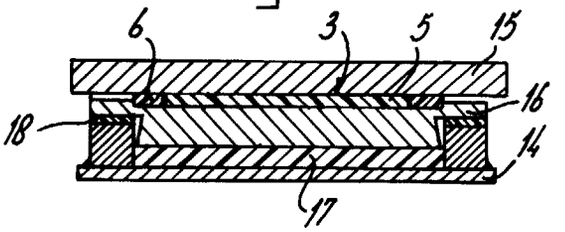


Fig - 3

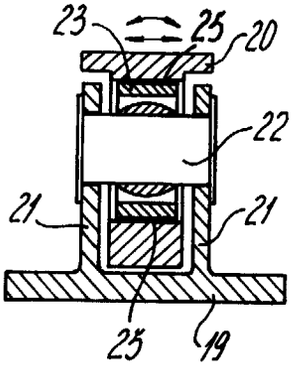


Fig - 4

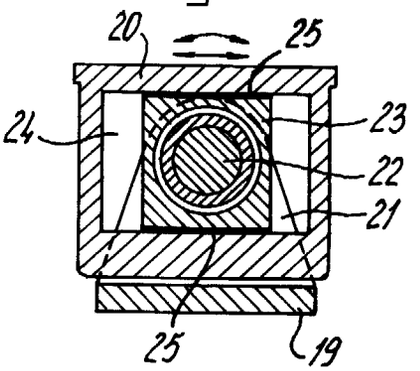


Fig - 5