

A PIVOT BEARING

This invention relates to a pivot bearing and in particular to a pivot bearing formed in a window stay or between a component of a window stay and an in-situ frame.

The adjustable mounting of a window sash in a window frame is conventionally carried out by using a pair of window stays. These stays can be so located that the sash operates as a casement or awning window. For correctness of operation of the window, especially where "pull-in" is concerned, the stays must be so constructed that they have the same geometry and thus effectively operate as a matched pair. To achieve correctness in geometry the pivot bearings must be accurately formed and clearly therefore the centres of the pivot bearings must be correctly located. If the pivot centres are not consistently positioned then differing geometry of stays will result and uniformity between stays will be lost.

As the pivot bearing in a modern window stay usually operates as a friction bearing it is also important to achieve consistent levels of friction in the bearings. The level of friction is normally established by the pressure within the bearing caused by the bearing fastening. Modern window designs can, however, place high demands on friction bearings due to large loadings caused by sashes which are heavy due to their physical size or the amount of glass being carried therein. In addition to holding the bearing components together and providing the friction pressure within the bearing the bearing fastening must also be able to withstand high shear forces created within the bearing. Design problems can consequently arise if there are physical restraints on the size of the fastening due to the requirement of compactness of stay dimensions, compactness of bearing or other factors. The restraints on size often arise from the need for a compact

stay to fit within the cavity between the window sash and frame.

In our U.S. Patent 4582435 it is therefore proposed that the pivot bearing be formed by a spigot, drawn from the parent metal, of one component to be positioned within an opening in a second component and the free end of the spigot rolled over to couple the two components together such that axial movement apart is not possible. The spigot thus not only accurately defined the centre of the bearing but also increased the load carrying capacity of the pivot bearing.

Subsequently it was proposed in U.S. Patent 4721406 that rather than roll over the end of the spigot to fasten the two components together a separate fastener in the form of a button be used. This button had the free end of the body thereof crimped under a shoulder formed in the bore of the spigot. This involved the added step of forming a shoulder in the bore of the spigot. In addition it has been found in practise that it is often difficult to obtain suitable crimping of the button for the button to maintain the components correctly fastened together especially when higher loadings are experienced. Still further when a screw is passed through the pivot bearing for fastening of the components to a third component (such as the sash or frame of a window) the button can be caused to move axially with the screw and thereby increase the friction creating pressure in the bearing. This can lead to significant problems if the friction level becomes too high or the bearings have differing friction levels which can result in a pair of window stays not being "matched".

The object of the present invention is to provide a pivot bearing which overcomes or goes some way to overcoming the

aforementioned difficulties associated with known pivot bearings.

Broadly in one aspect the invention provides a pivot bearing between first and second members the first member incorporating an annular wall extending from one face thereof said wall defining the periphery of an aperture through said first member to a second face thereof, a second member incorporating an opening therein, said wall being located within said opening, and a fastening having a head and a shank, the head being located adjacent the second member and end of the annular wall with the shank being located within the aperture and having means at its free end to prevent axial movement of the fastening to thereby retain the assembly together, said means being located at said second face, in the mouth of said aperture, there being wear resistant self lubricating material within the pivot bearing to prevent said second member contacting said first member, wall and fastening.

According to a second broad aspect the invention provides an articulate linkage comprising a first member incorporating an annular wall extending from one face, said wall defining the periphery of an aperture through said first member to a second face thereof, a second member incorporating an opening therethrough, said wall being located within said opening, a fastening located through the aperture and radially deformed at its free end to prevent axial movement of the fastening to thereby retain the assembly together, said radial deformation being located at said second face, in the mouth of said aperture, there being wear resistant self lubricating material within the pivot bearing to prevent said second member contacting said first member, wall and bearing.

In the following more detailed description of a preferred form of the pivot bearing according to the invention

reference will be made to the accompanying drawings in which:-

Figure 1 is a cross-sectional elevation of the pivot bearing according to one form of the invention,

Figure 2 is a sectioned exploded view of the components of a second form of the pivot bearing,

Figure 3 is a cross-sectional elevation of the pivot bearing of Figure 2,

Figure 4 is a cross-sectional elevation of the pivot bearing according to a third form,

Figure 5 is a cross-sectional elevation of a fourth form of bearing according to the invention and

Figure 6 is a detail view of a modification in the area where the crimped over end of the fastener engages with the surface of a third component such as the sash or frame of a window.

The pivot bearing according to the invention is designed to preferably provide a friction bearing between two components. The bearing is primarily intended for use in a window stay and thus the two components can be a pair of arms or a mounting plate and an arm. In accordance with known window stay construction the components can be formed from stainless steel or an aluminium alloy. The present pivot bearing is particularly suited for construction from stainless steel as the components are not dependent on thickness for strength. Accordingly a compact but strong pivot joint can be achieved using the present invention.

Referring firstly to Figure 1 the two components are respectively shown at 10 and 11. First component 10, which can be an arm, has an opening 12 formed therein. Likewise second component 11, which can be a mounting plate, has formed therewith a hollow cylindrical projecting portion 14 (hereinafter simply referred to as an "upstand") which defines a bore 13. It is preferred

that this upstand 14 be formed integrally with component 11 by being drawn from the parent metal. This provides an upstand 14 of good strength characteristics and, additionally, provides a means of accurately defining the centre of the bearing without needing to rely on the accurate centring of the bearing fastening 15. Thus, for example, the upstand for all bearings on a plate or arm can be formed at the same time in a tool suitable for the purpose thereby ensuring accurate control of distance between centres.

The other components of the bearing consist of the bearing fastening 15 and an insert 16. The insert 16 is preferably formed of a self-lubricating wear-resistant plastics material such as nylon. The insert 16 in one form as illustrated in Figures 1 to 3 consists of a sleeve 17 which has at one end thereof an integrally formed flange 18. In the form illustrated the sleeve 17 and flange 18 are of uniform thickness; however, this is by way of example only and as shown in Figures 4 and 5 flange 18 can be of greater or varying thickness as a result of suitable profiling thereof. As shown in Figures 4 and 5 the insert 16 can be also formed by two separate elements namely a flanged sleeve 16a and a separate rimmed washer 16b. In other unillustrated forms the insert can be formed in a variety of ways such as two washers and a separate sleeve or with a flanged sleeve and a separate rimmed washer at either 16a or 16b.

The bearing fastening 15 consists of a body 19 and a head or flange 20 at one end thereof. In the forms of fastening as shown in Figures 2, 3, 4 and 5 the body 19 is tubular. As shown in Figures 2 and 3 peripheral edge 21 of head 20 can be curved or inclined inwardly so that a shallow recess 22 is formed within the underside of the head 20. Accordingly body 19 can either be provided with

a through bore so that it is completely hollow or can be solid though generally in the latter case it will have a small hollow 19a formed in the free end thereof to permit crimping over of the free end.

To assemble the pivot bearing the insert 16 or 16a can be placed on the upstand 14 or in the opening 12 of component 10. The two components 10 and 12 are brought together so that the upstand 14 is located within opening 11 but metal to metal contact is avoided due to the presence of sleeve 17. The fastening 15 is then introduced into bore 13 of upstand 14 (though if insert 16a is used the rimmed washer 16b is firstly put in position) and the free end swaged, crimped or otherwise deformed so as to be enlarged in the mouth of bore 13 and thereby prevent axial movement of the fastening relative to upstand 14. As can be seen from Figures 1 and 3 this action results in the free end of the sleeve 17 cold flowing under the head 20 of fastening 15. As a consequence in the completed joint there is no metal to metal contact between fastening 15 and first component 10 nor between first component 10 and upstand 14.

The level of friction within the joint is established by the level of pressure in the joint caused by the fastening 15. As illustrated the fastening 15 is preferably provided with a large diameter head 20 so that a large area of nylon can be captured between the head and the surface of component 10. An equally large area of nylon formed by flange 18 exists between the interfacing surfaces of components 10 and 11. These areas of nylon and the large area of head 20 means that the nylon does not need to be under high pressure by the fastening 15 in order to achieve a required level of static friction. There is, however, a high level of dynamic friction achieved by such an arrangement and this dynamic friction results in a level of friction which controls any rapid

movement of the window. This dynamic friction therefore prevents the window from slamming shut in windy conditions. In addition the dynamic friction which can be achieved results in smooth operation of the window once the static friction has been overcome during opening or closing of the window.

In a window stay application the second component 11 would usually form a fixed component such as a frame or sash mounting plate. The first component 10 would thus be a movable arm. As a consequence fastening 15 is removed from any load carrying forces, especially shear forces, as a result of the presence of the annular upstand 14. As mentioned previously the accuracy of the centre of the pivot does not depend on the fastening 15 as this is established by the integrally formed annular upstand 14. The function of the fastening 15 is thus to secure the components together and also to establish the pressure within the joint which, in accordance with known techniques, determines the friction level.

For a window stay application the fastening 15 is preferably hollow as shown in Figures 2 to 5 as this permits a fastener 25 (see Figures 4 and 5), e.g. a screw, to pass through the bearing and into the frame or sash 26 of the window. This not only obviates the need to have separate screw holes in mounting plate 11 but the presence of the screw in the bearing assists transfer of loads to the sash/frame 26 from arm 10.

As shown in Figures 1 and 3 the free end of fastening 15 is crimped over in the mouth area 27 at the end of bore 13 such area 27 being defined by the curved transition between the peripheral wall of bore 13 and the face surface of mounting plate 11. This face surface is the

surface which in use of the stay engages against or is located adjacent to the surface of the sash/frame 26.

In the forms of the invention shown in Figures 4 and 5, however, a recess 29 is formed in the transition or mouth area 27 so as to not only accommodate the crimped over free end of fastening 15 but also to enable such crimped over end to effectively be located or sandwiched between the mounting plate 11 and sash/frame 26. This recess 29 can be formed in a number of ways two examples of which are shown in Figures 4 and 5. In Figure 4 a "punch and dimple" type method displaces metal about the upstand 14 to form the recess 29 and a projection 30. According to the arrangement in Figure 5, however, the area of metal about the upstand 14 is displaced in an inclined manner so that in this form the inclined mouth area results in the formation of recess 29.

By having recess 29 a large "flange" 31 is formed by the crimping of the free end of fastening 15 and this enables large loadings in the bearing to be withstood. Consequently the bearing is capable of carrying higher loads in a direction perpendicular to the plane of the arm, i.e. prising off loadings.

Additionally, the metal thickness in fastening 15 and in upstand 14 change smoothly from the original material thickness to that at the places where the most deformation has had to occur when forming the respective parts into their final configuration.

With the embodiments shown in Figures 4 and 5 the axial load exerted by a fastener 25 properly tightened will be directly reacted into the frame/sash 26 due to the fastening 15 "seating" with or onto the frame/sash 26. In an alternative arrangement the bottom edge of the

fastening 15 can be serrated (as at 33 in Figure 6) for increased grip with the sash/frame 26 to hold the bearing firmly in position with increased load carrying capacity. Also the serration can assist in prevention of the fastening 15 rotating under the final torque tightening of screw 25. The frame/sash 26 can likewise be serrated as at 34.

The configuration of bearing shown in Figures 4 and 5 is capable of providing, when required, a very low friction bearing which still has a very good load carrying capacity. This is achievable due to the flange 31 in recess 29 being formed flush with surface 27 so that when the fastener 25 is tightened it does not cause fastening 15 to move axially and thus result in excessive or increased friction in the bearing. However, by controlling the "degree of flushness" it may be possible to provide an effective means of varying the level of friction in the bearing.



CLAIMS

1. A pivot bearing between first and second members the first member incorporating an annular wall extending from one face thereof said wall defining the periphery of an aperture through said first member to a second face thereof, a second member incorporating an opening therein, said wall being located within said opening, and a fastening having a head and a shank, the head being located adjacent the second member and end of the annular wall with the shank being located within the aperture and having means at its free end to prevent axial movement of the fastening to thereby retain the assembly together, said means being located at said second face, in the mouth of said aperture, there being wear resistant self lubricating material within the pivot bearing to prevent said second member contacting said first member, wall and fastening.

2. An articulate linkage comprising a first member incorporating an annular wall extending from one face, said wall defining the periphery of an aperture through said first member to a second face thereof, a second member incorporating an opening therethrough, said wall being located within said opening, a fastening located through the aperture and radially deformed at its free end to prevent axial movement of the fastening to thereby retain the assembly together, said radial deformation being located at said second face, in the mouth of said aperture, there being wear resistant self lubricating material within the pivot bearing to prevent said second member contacting said first member, wall and bearing.

3. An articulate linkage according to Claim 2, wherein said fastening has a flange or head at the end thereof opposite said free end.

4. The arrangement of Claim 1 or 3 wherein the fastening



comprises a body of tubular or hollow construction having said flange or head located at one end thereof.

5. The arrangement of Claim 4 wherein the peripheral edge of the flange or head is inclined inwardly such that a shallow recess is formed within the underside of the flange or head.

6. The arrangement of Claim 4 or 5 wherein the wear resistant self lubricating material is formed as a sleeve which is located between said wall and said second member, there being a flange extending from one end of said sleeve and located between said first and second members and the other end of said sleeve being deformed during assembly of the bearing to locate between said flange or head of the fastening and said second member.

7. The arrangement of Claim 6 wherein said flange of the sleeve is a separate element and said head or flange of the fastening is separated from the second member by a washer formed of said wear resistant self lubricating material.

8. The arrangement of any one of the preceding Claims wherein the mouth of the aperture comprises a recess formed in the second face of said first member.

9. The arrangement of Claim 8 when appendant directly or indirectly to Claim 2, wherein the recess is such that when the first member is located on a surface the radially deformed portion of the fastening in the recess is sandwiched between the first member and the said surface.

10. The arrangement of Claims 8 or 9 wherein the recess is formed by an inclined transition between said first member and the annular wall.



11. The arrangement of Claim 7 or 8 wherein the mouth is formed by a displacement of the material forming the first member in the area immediately adjacent said annular wall.

12. The arrangement of Claim 9 wherein one or both of the radially expanded portion of the fastening and said surface is provided with grip enhancing means.

13. A pivot bearing substantially as herein described with reference to Figure 1 or 2 and 3 of the accompanying drawings.

14. A pivot bearing substantially as herein described with reference to Figure 4 or 5 of the accompanying drawings.
