



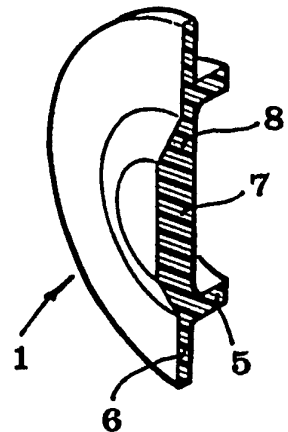
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(54) Title: GUIDE WASHER

(57) Abstract

A washer for guiding two mutually movable members has a circumferential portion including a cylindrical collar (5), of substantially the same diameter as a seat-forming aperture in one member, and a flange (6) projecting radially from the collar at one end. The central portion of washer body, spanning said one end of the cylindrical collar includes a central, thick core portion (7) proud of the flange (6) and an annular transition portion (8) extending between said core portion and said collar, the thickness of the transition portion decreasing radially from the core portion towards the collar. The annular transition portion is resilient in order to allow varying degrees of impression of the core portion (7) into the collar (5).



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GUIDE WASHER

Technical field of the invention

This invention relates to a washer for guiding two reciprocally movable members relative to each other, said washer consisting of a body of plastics material with a circumferential portion adapted to seat in one of said members and a central portion, confined by said circumferential portion, adapted to bear against the other member. A washer of this general type, serving to facilitate sliding, is previously known by US 3 445 143.

Background and prior art of the invention

In a number of various technical fields guiding problems may arise in connection with reciprocal displacement of two machine members relative to each other. As an example of such a technical field cranes may be mentioned, more specifically such cranes with an extendible jib composed of two or more sections telescopically movable relative to each other. These are usually in the form of box profiles or girders which have the same cross-sectional shape, although of different sizes so that one girder can be inserted in the next, and soon. In practice the cross-sectional shape of the girders may be rectangular or, preferably, hexagonal, the girders in the latter case including upper and lower V-shaped or angled pairs of flanges between which vertical side flanges extend. Such crane jib girders should be capable of being displaced relative to each other not only with a minimum of friction but also with a minimum of play between the members. In other words the girders should, when the jib is extended or shortened, be capable of moving as linearly as possible relative to each other without rattling. The girders of previously known cranes are provided with special wear plates of nylon or similar material having a low coefficient of friction. More specifically, at least one nylon plate or a pair of nylon plates have, as a minimum, been fixed by gluing at the top of and externally on the rear end of each interior box girder, as well as at least one plate or a pair of plates at the bottom and internally of the front end of each external box girder. Thanks to the low coefficient of friction of the nylon material these wear plates certainly facilitate the sliding between the

girders, but they do not provide any positive lateral guidance. With girders of hexagonal cross-section there is per se a certain lateral guiding of the girders, inasmuch as the nylon plates in this case are arranged in pairs on the angled flanges, but this lateral guiding may at best be maintained only as long as the plates are fresh and unworn. A particular problem is the fact that the box girders in practical production seldom or never can be manufactured with absolute accuracy, i.e. with absolute nominal measures along the entire girder length. The hexagonal type of girder is usually manufactured by bending a metal plate about five lines and welding the free edges after bringing them together. During such manufacture the size tolerance in different axial sections may vary by as much as up to about 2 mm. This means that the lateral play between the inside of each external girder and the outside of an internal girder may amount to several millimetres. As long as the crane jib is used in a loaded condition this play does not cause any great problems, since the front and rear pairs of nylon plates are, in this condition, capable of also guiding the girders laterally. But as soon as the crane becomes unloaded the girders may lose all positive lateral guidance, allowing them to move rather freely in relation to each other and give rise to a rattling noise which is now and then very annoying.

By US 3 719 403 it is previously known to provide telescoping box girders of a crane jib with resilient slide or wear plates instead of the fixed nylon plates attached by gluing. These resilient plates are each constituted by a square metal plate, one side of which is intended to bear against either the outside of an internal box girder or the inside of an external box girder, and the opposite side of which bears against a spring mounted in a retainer. In one embodiment said spring is a Belleville-spring and in another alternative embodiment the spring consists of a leaf spring bent to a special shape. Though these spring plates solve the problem of the uneven wearing that usually comes up in connection with fixed wear plates, these plates act in the same manner as the fixed nylon plates in so far as they are located on the upper side and the under side of each internal box girder without giving any lateral guidance whatsoever, i.e. between the side flanges of the girders. In comparison with the nylon plates this solution of the problem is

expensive to realize in practical production, since it not only calls for a plate as well as a spring but also a special retainer for the spring.

5 Objects and features of the invention

The present invention aims to overcome the above mentioned disadvantages and provide a simple and inexpensive solution of the problem with deficient guiding of two box girders or members whose relative movement gives rise to rattles. Therefore, a primary object of the invention is to provide a washer serving as a
10 guiding element, which is simple and cheap to produce and which easily lends itself to being fitted as a complement to existing slide or wear plates in crane jibs of the type described. It should secure an efficient lateral guidance of the various box
15 girders or profiles of the jib, even when those are manufactured with low dimensional accuracy. In a broader aspect the washer should furthermore be capable of being used for the same purpose on other reciprocally movable members than box girders of a crane jib. Irrespective of the field of application, the washer
20 should furthermore be capable of guiding the members relative to each other independently of varying clearance therebetween and at the same time the washer should not give rise to significant frictional resistance. In other words the washer should be capable of sliding easily and without substantial friction along
25 the member against which it bears.

According to the invention at least the primary object thereof is achieved by means of the features defined in the characterizing part of claim 1. Preferred embodiments of the invention are furthermore defined in the dependent claims.

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Further elucidation of the prior art

US 3 445 143 discloses a puck-like washer made of plastics material, such as nylon, which in addition to a circumferential portion has a central portion confined therein, said central
35 portion being arranged to bear with low friction against one of two reciprocally movable members. In this case the central portion of the washer is, however, comparatively thin and arranged to bear against a fixed support in the form of a head of a bolt. The plastic washer is, together with the bolt head, inserted in
40 a guide rail of C-shaped cross section, the primary task of the

washer being to reduce the friction between the bolt head and the rail. The central portion of the washer has, however, no scope to yield in the space between the bolt head and the rail, and therefore it would never be capable of accomodating to
5 varying clearance.

FR 2 307 175 discloses a washer-like construction having an annular, yielding flange between a central portion and a circumferential portion. This washer is, however, included in a shock absorber and its purpose is not to provide guidance between two members being displacable or movable by translation in
10 relation to each other. What is more, this washer has no central core portion at all in as much as an aperture is recessed in the centre thereof.

15 Brief description of the attached drawing

In the drawing:

- Fig 1 is a partially sectioned perspective view of a guide washer according to the invention,
Fig 2 is a cross sectional view through the washer in an unloaded condition,
20 Fig 3 is a similar sectional view showing the same washer mounted on one of two members movable relative to each other, the washer being illustrated in a moderately loaded condition,
25 Fig 4 is a corresponding sectional view showing the washer in a condition of maximum load in which the core portion of the washer is completely impressed, and
Fig 5 is a sectional view corresponding to Fig 2, but having
30 dimensional indicators.

Detailed description of a preferred embodiment of the invention

In the drawing reference numeral 1 generally designates a guide washer according to the invention. This washer is mounted on one of two members 2, 3 reciprocally movable relative to each
35 other. One member 2 presents a circular, drilled hole or aperture 4 serving as a seat for the washer 1. The members 2, 3, which are movable relative to each other in the direction of the double-arrow A, may be portions of metal plates or flanges included, for instance, in the box girders of a crane jib. The
40 members in question may however have any shape and be included

in other constructions, such as telescopically extendable support legs of vehicles provided with cranes. The physical shape of members 2, 3 and the field of application thereof is accordingly not critical for the inventive idea, provided that the members are reciprocally movable relative to each other in the manner indicated by the arrow A.

The washer 1 consists of a body form-pressed or moulded in one piece of plastics material, the body including a cylindrical collar 5 and a flange 6 projecting radially outwardly therefrom. Spanning the collar 5, at the flange end, a disc has a central, thick core portion 7 and an annular transition portion 8 intermediate the core portion and the collar. This disc or central portion has a generally frustroconical shape, with the core portion 7 outwardly confined by a substantially circular plane surface 9 which, at the circumferential circular edge thereof, develops into a conical surface 10 forming the external surface of the annular transition portion 8. The opposite surface 11, inside the core portion 7 and the annular portion 8, is substantially plane and merges at its periphery into the collar 5 by a smoothly rounded transition surface 12. In practice the flange 6 is preferably continuous around the entire periphery of the collar, and its external and internal surfaces 13, 13' are parallel. The thickness of the core portion 7 is advantageously at least twice the thickness of the flange 6. In a strain-free condition the core portion projects proud of the surface 13 of the flange 6 a distance which is at least equal to the thickness of the flange. The outer diameter of the collar 5 should be about equal to the diameter of the seat-forming aperture 4 in the member 2.

With reference to Fig 5, an actual size of a prototype washer made is indicated. The outer diameter D_1 of the flange 6 is 45 mm and the outer diameter D_2 of collar 5 is 30 mm. The inner diameter D_3 of the collar is 24 mm, so that the wall thickness of the collar is 3 mm. The outer diameter D_4 of the central disc of the washer is 26 mm. The cone angle α for the conical surface 8 can be within the range of 50 to 70° or suitably about 60°. The flange thickness t_1 is 2 mm, and the depth of the collar 5 is 5 mm. The total thickness t_2 of the body, i.e. the axial distance between the surface 9 and the annular inner edge surface 14 of the collar, is 10 mm, so that the

distance by which the core portion 7 projects outwardly from the outer surface 13 of the flange 6 is 3 mm. The radius of the internal transition surface 12 is 2 mm.

The washer described operates in the following manner. In a strain-free condition the washer is mounted in aperture 4. In practice the washer may be loosely mounted in the aperture, or possibly with a certain press-fit. Alternatively, it is also possible to attach the washer by means of a light glue joint, using a dab of glue or adhesive. In the next step members 2, 3 are brought into cooperation with each other. In the case of telescopically movably box girders or profiles of the type referred to above, one box girder is inserted in the other. Depending on the clearance existing between such box girders, the core portion 7 of the washer will at least slightly be impressed into the free space 15 within the collar 5, as illustrated in fig 3, where the clearance between the members 2, 3 is designated 16. This clearance may vary quite considerably along the axial length of the members (i.e. in the direction of arrow A) depending on the actual tolerances in manufacture, although the clearance is always at least equal to the thickness of the flange 6. When the members 2, 3 are thereafter displaced reciprocally relative to each other in the direction of arrow A the core portion 7 of the washer will be impressed into the space 15 to a varying degree depending on the momentary actual clearance between said members. In other words the outside surface 9 of the core portion 7 will always be kept urged against member 3 while providing a resilient guiding of members 2, 3 relative to each other. In an extreme position in which the clearance 16 approaches the thickness of the flange 6 the core portion 7 of the washer will be completely impressed into space 15, as illustrated in fig 4.

As the plastics material of the washer 1, polyurethane may advantageously be used.

The advantages of the invention are as follows. The simple washer can be cheaply mass produced. It enables two reciprocally movable members of a machine or construction to be mutually guided in a manner which accommodates to varying clearance. The washer can be mounted in a simple and safe manner merely by drilling a hole in the machine member in question. The material of the washer has a rather low coefficient of friction and so

the members will be movable relative to each other without substantial frictional resistance. In addition the washer is easy to replace after wearing.

5 Conceivable modifications of the invention

Of course the invention is not limited merely to the embodiment described above and shown in the drawing. Thus, it is, for example, possible to have instead of the continuous flange 6 a number of tabs spaced apart by gaps. In such a way material
10 will be spared. Furthermore the geometrical shape of the core portion 7 the tapering transition portion 8 may differ. Naturally the specific dimensions given in connection with Fig 5 should be seen merely as examples.

Claims

1. Washer for guiding two reciprocally movable members (2, 3) relative to each other, consisting of a body (1) of plastics material with a circumferential portion adapted to seat in one of said members (2, 3) and a central portion, confined by said circumferential portion, adapted to bear against the other member, characterized in that the circumferential portion of the washer body (1) includes a substantially cylindrical collar (5) having substantially the same outer diameter as a seat-forming aperture (4) in said one member, and a radial projection (6) from one end of the collar to bear against the surface of said one member around said seat aperture, and in that said central portion has a central, comparatively thick core portion (7), which in a strain-free condition projects proud of the radial projection, away from said one end of the collar, and an annular transition portion (8) extending between the core portion (7) and the collar (5), the thickness of said transition portion decreasing radially from said core portion towards said collar, the annular transition portion being resilient in order to allow varying impression of the core portion into the collar.

2. Washer according to claim 1, characterized in that the radial projection (6) is a continuous annular flange around the entire periphery of the collar (5).

3. Washer according to claim 1 or 2, characterized in that the thickness of the core portion (7) is at least twice the thickness of the radial projection (6), said core portion projecting, in the strain free condition, proud of the radial projection a distance which is at least equal to the thickness of the radial projection.

4. Washer according any one of the preceding claims, characterized in that the central portion of the washer body is substantially frustroconical, the external surface (10) of the annular transition portion (8) being conical and the external surface (9) of the core portion being substantially planar and circular.

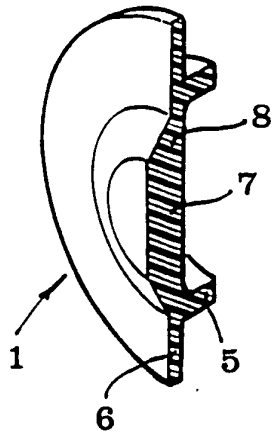


Fig 1

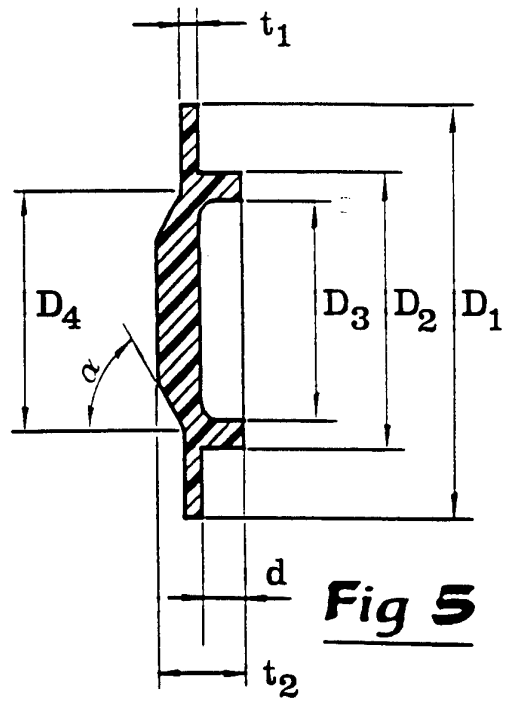


Fig 5

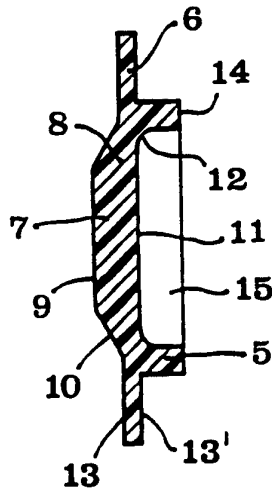


Fig 2

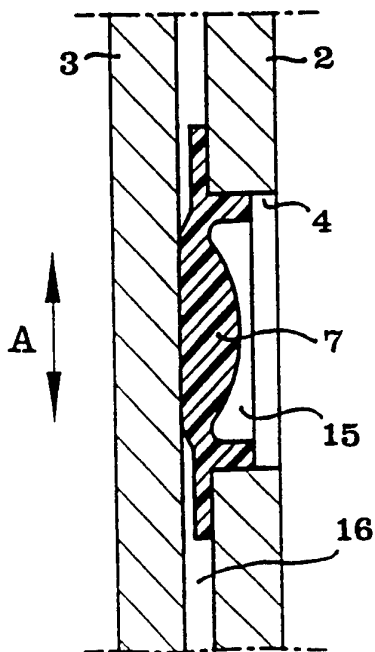


Fig 3

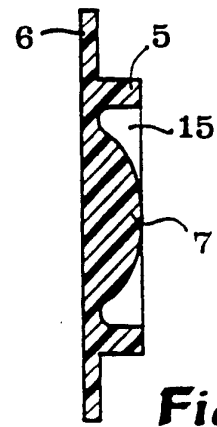


Fig 4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 94/01116

A. CLASSIFICATION OF SUBJECT MATTER		
IPC6: F16C 29/02, F16C 27/02 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)		
IPC6: F16C, F16F, B66C		
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)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US, A, 4986674 (DECKER ET AL), 22 January 1991 (22.01.91), column 3, line 28 - line 47 --	
A	US, A, 3445143 (R.F. SWENSON), 20 May 1969 (20.05.69), column 2, line 25 - line 45 --	
A	DE, A, 1400282 (GENERAL ELECTRIC COMPANY), 17 July 1969 (17.07.69), figures 14-16 --	
A	CH, A, 341362 (CARO-WERK GESELLSCHAFT MBH), 14 November 1959 (14.11.59), figures 1-4 --	
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search		Date of mailing of the international search report
9 March 1995		27 -03- 1995
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR, A2, 2307175 (ETABLISSEMENTS CATTIN S.A.), 5 November 1976 (05.11.76), figures 4,5 -----	

INTERNATIONAL SEARCH REPORT
Information on patent family members

09/02/95

International application No.
PCT/SE 94/01116

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 4986674	22/01/91	CA-A- 2034635	28/09/91
US-A- 3445143	20/05/69	NONE	
DE-A- 1400282	17/07/69	NONE	
CH-A- 341362	14/11/59	NONE	
FR-A2- 2307175	05/11/76	NONE	