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 [73] Assignee **N. V. Industriële Handelscombinatie**
Netherlands
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 [33] **Netherlands**
 [31] **6715439**

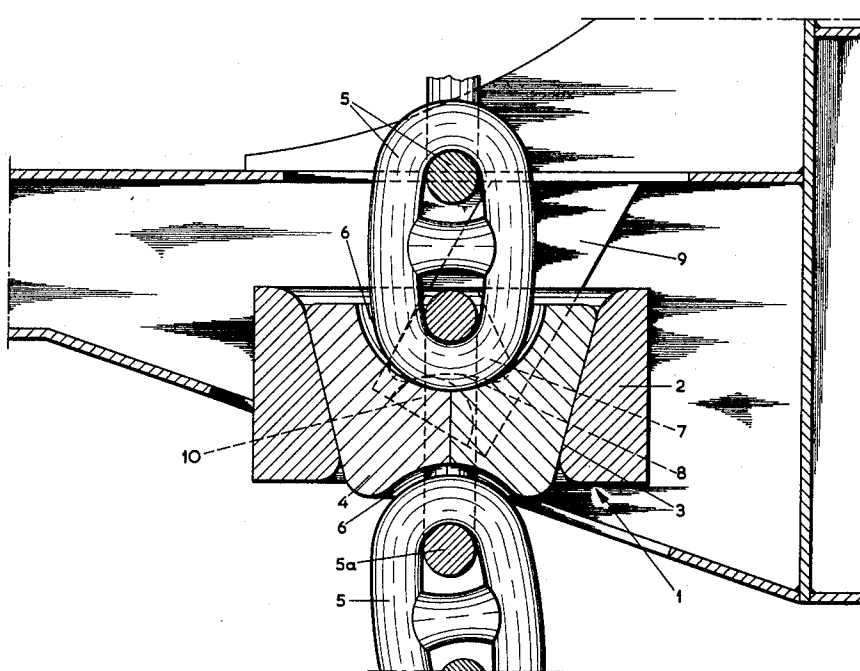
[50] Field of Search..... 114/200;
 24/123.1, 116, 265SE

[56] **References Cited**
UNITED STATES PATENTS
 1,258,580 3/1918 Lassiter..... 24/123
 3,289,626 12/1966 Petrie et al..... 114/200
Primary Examiner—Andrew H. Farrell
Attorney—Young & Thompson

[54] **CHAIN STOPPER**
4 Claims, 3 Drawing Figs.

[52] U.S. Cl..... 114/200,
 24/116
 [51] Int. Cl..... B63b 21/18

ABSTRACT: A chain stopper comprises a separable chain-grasping insert rotatably received in a conical recess in a body which is supported on oppositely outwardly extending trunnions that have concave supporting under surfaces curved on a relatively long radius of curvature and which rest on fixed convex supporting surfaces curved on a relatively short radius of curvature.



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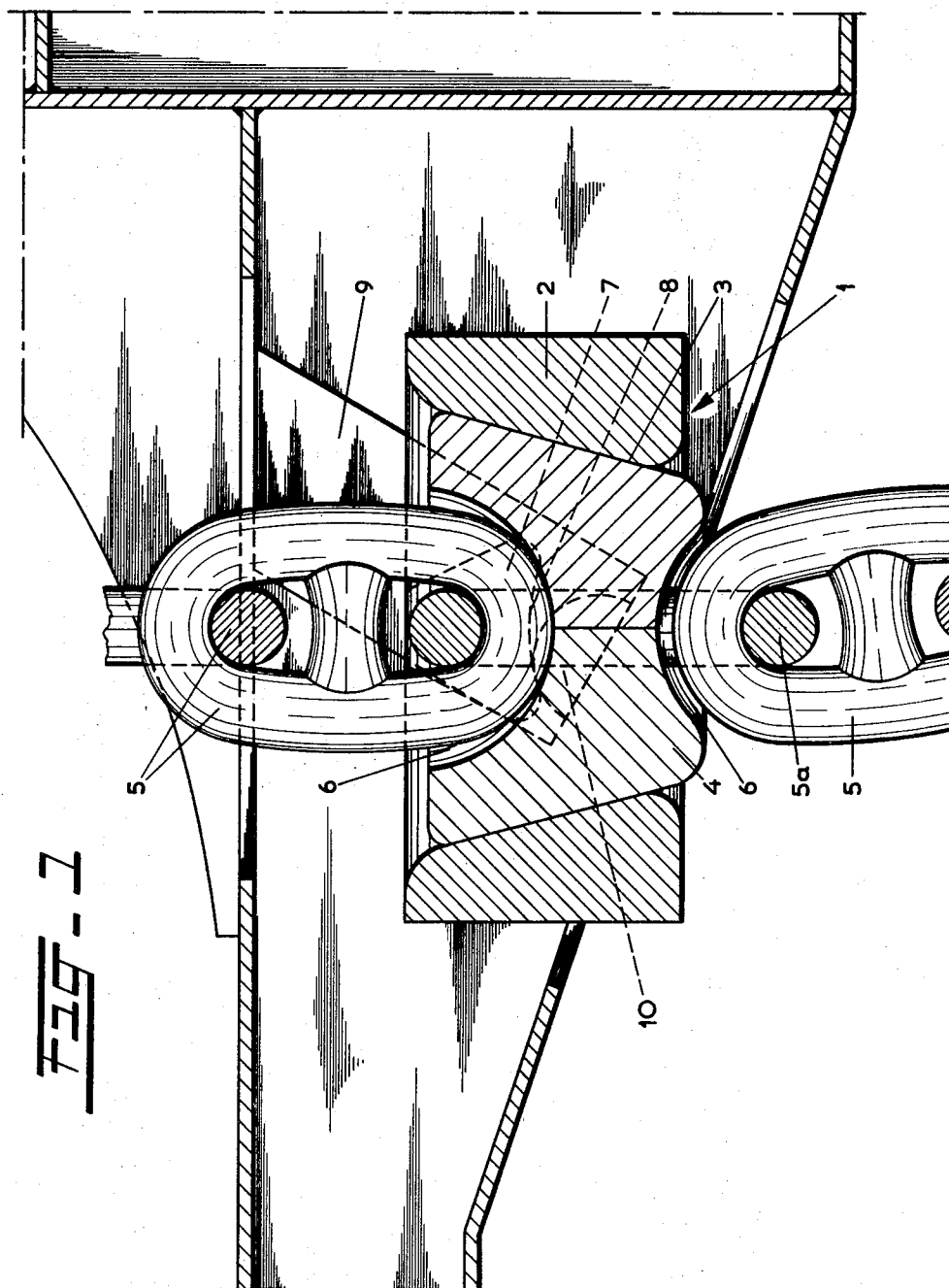


Fig. 1

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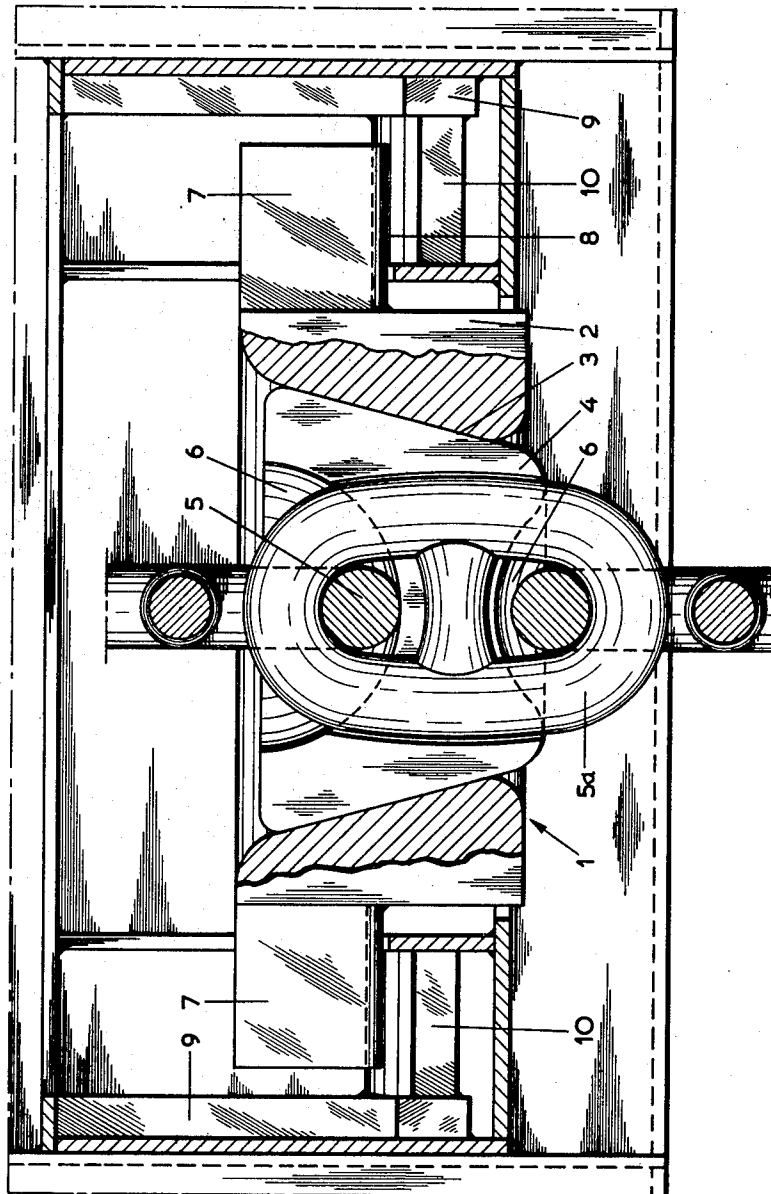
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FIG. 2



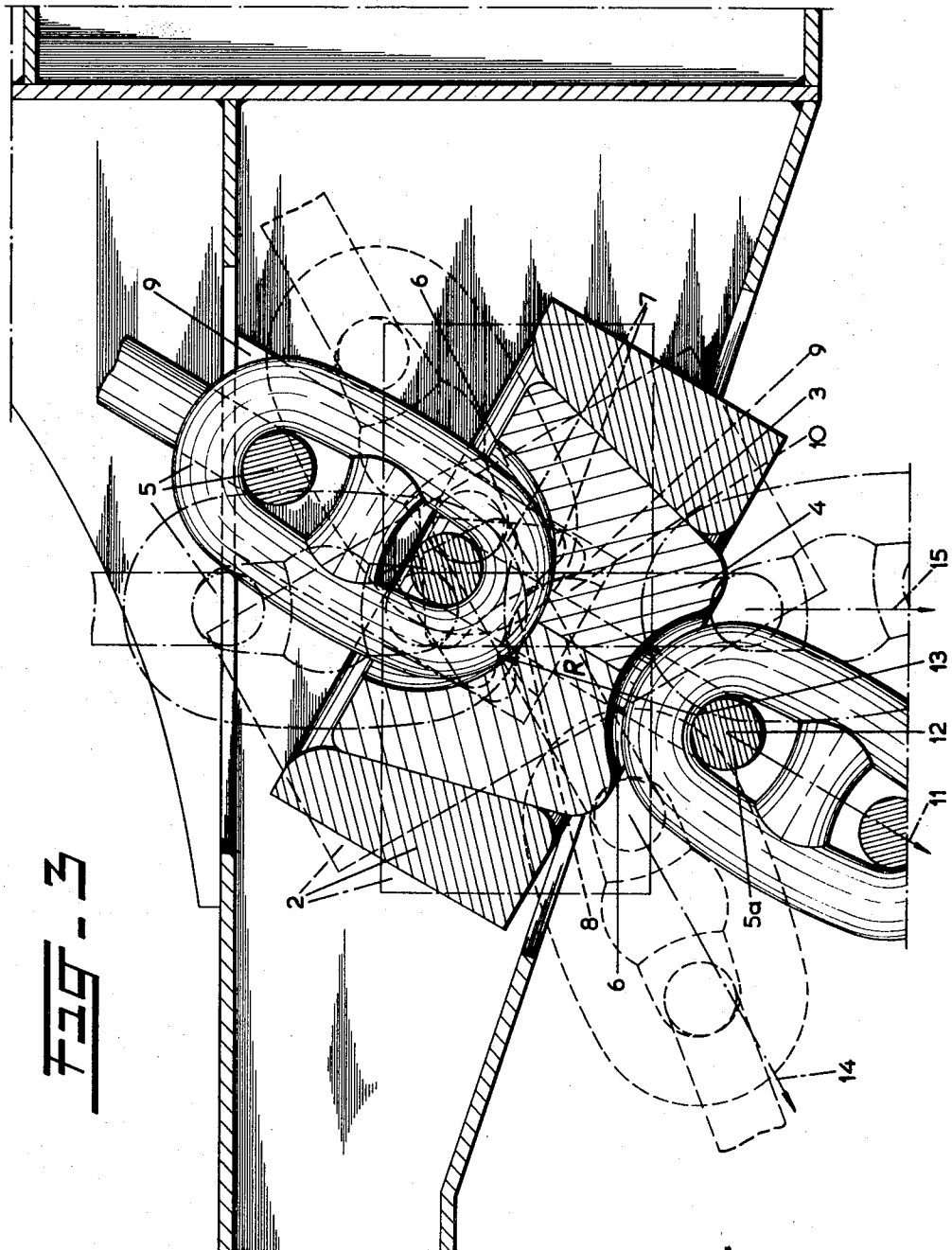
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CHAIN STOPPER

The present invention relates to chain stoppers, more particularly of the type for mooring buoys and the like. Chain stoppers of this general type are disclosed in U.S. Pat. No. 3,289,626, Dec. 6, 1966.

It is an object of the present invention to provide chain stoppers which have interengaging supporting surfaces that roll on each other and do not slide on each other.

Another object of the present invention is the provision of chain stoppers in which the relatively moving supporting surfaces do not become locked because of corrosion or fouling.

still another object of the present invention is the provision of a chain stopper which imposes relatively little wear on the chain.

Finally, it is an object of the present invention to provide a chain stopper which will be relatively simple and inexpensive to manufacture, easy to install, operate, maintain and repair, and rugged and durable in use.

Other objects and advantages of the present invention will become apparent from a consideration of the following description, taken in connection with the accompanying drawings, in which:

FIG. 1 is a cross-sectional view of a chain stopper according to the present invention;

FIG. 2 is a cross-sectional view of the structure of FIG. 1 but at a right angle to FIG. 1; and

FIG. 3 is a view similar to FIG. 1 but showing a chain and chain stopper according to the present invention swung into one position of use in full line and swung to other positions of use in phantom line.

Referring now to the drawings in greater detail, there is shown a chain stopper according to the invention indicated generally at 1 and comprising an annular body 2 having a bore 3 therethrough whose sidewalls are conical. Body 2 includes a frustoconical chain grasping assembly disposed in bore 3 comprising two separable elements 4 which together grasp between them a link 5a of a chain 5. As will be evident, the stronger the downward pull on the chain, the more firmly the elements 4 will grasp the link 5a. Elements 4 also have cuplike depressions on their upper and lower sides for the accommodation of the next adjacent links of the chain 5. The cross-piece of the link 5a has been omitted in FIGS. 1 and 3 so as to avoid a confusing mass of lines.

Trunnions 7 extend horizontally outwardly from opposite sides of body 2. As best seen in phantom line in FIG. 1, each trunnion 7 has the cross-sectional configuration generally of a truncated pyramid. The cross-sectional configuration of each trunnion 7 is constant from end to end thereof.

The under surface 8 of each trunnion 7 is formed as a bearing surface and is concave and partially cylindrical about a radius of curvature R shown in FIG. 3.

The bearing surface provided by surface 8 is thus in two sections disposed one on each side of body portion 2. The two surfaces 8 are in alignment with each other. Surfaces 8 rest on the convex upper surfaces of support members 10 rigidly secured to members 9 fixed on the buoy or other support. These upper support surfaces of members 10 are part cylindrical about a radius of curvature which is substantially shorter than radius R.

Turning now to FIG. 3, the relationships and function of the chain stopper of the present invention will become apparent. As is seen in FIG. 3, the full-line position of the parts is assumed when a force is exerted on the chain in the direction of the arrow 11. This arrow 11, when extended rearwardly, intersects the line of contact between the engaged supporting surfaces of trunnions 7 and support members 10. Also, the tangents to the curves of the supporting surfaces at this point of intersection on the line of contact overlie each other in FIG. 3 and are perpendicular to the direction of arrow 11.

In order substantially to maintain this perpendicular relationship of the line of force and the tangents to the supporting

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surfaces at the point of intersection of the line of force and their line of contact, the center of curvature of the surface 8 is disposed at the center 12 of that portion of the link 5a which is grasped by the element 4. This section of link 5a is the section which is contacted by the next link down the chain.

On the other hand, if a chain with an unequal number of links has to be shortened, then from time to time it will happen that the grasped link will be disposed at right angles to the link 5a shown in FIG. 3. In that latter case, the center of curvature of the surface 8 will be located at the point of contact 13 between the grasped chain link 5a and the next link down the chain. As a result, when force is applied on the chain 5 in the direction of arrow 14 in FIG. 3, there will be, in accordance with this slightly altered location of the center of curvature, a slight displacement, practically negligible, of the next link down the chain with respect to the grasped link 5a. Arrow 14 remains perpendicular to the line of contact between surface 8 and supporting surfaces of members 10.

In a third position, shown in dot-and-dash line in FIG. 3, the pull on the chain acts in the direction of the arrow 15.

It will thus be appreciated that the chain stopper of the present invention always follows the direction of pull of the chain, so that any wear between the constrained chain link and the next link, as a result of relative swinging of these links, is largely avoided. Wear on the chain is thus greatly reduced and fouling or blockage of the chain by virtue of corrosion or fouling is avoided. In moving between the various positions shown in FIG. 3, for example, the supporting surfaces roll on each other and do not slide; and of course it is known that rolling friction is considerably less than sliding friction. The absence of relative sliding movement means that there will be no slipping or jerking during operation and that the tension in the chain will remain substantially constant.

From a consideration of the foregoing disclosure, therefore, it will be evident that all of the initially recited objects of the present invention have been achieved.

Although the present invention has been described and illustrated in connection with preferred embodiments, it is to be understood that modifications and variations may be resorted to without departing from the spirit of the invention, as those skilled in this art will readily understand. Such modifications and variations are considered to be within the purview and scope of the present invention as defined by the appended claims.

I claim:

1. In a chain stopper comprising a body adapted to grasp a chain, and a support on which said body is supported, said body having supporting surfaces carried thereby which engage with supporting surfaces carried by said support to support said body for swinging movement relative to said support, the supporting surfaces carried by one of said body and support being convex and the supporting surfaces carried by the other of said body and support being concave; the improvement in which the radius of curvature of said convex supporting surfaces is substantially shorter than the radius of curvature of said concave supporting surfaces where said surfaces contact each other.

2. a chain stopper as claimed in claim 1, said convex supporting surfaces being carried by said support and said concave supporting surfaces being carried by said body.

3. A chain stopper as claimed in claim 2, said body having stub shafts extending outwardly from opposite sides thereof, said concave surfaces being disposed on the under sides of said stub shafts.

4. A chain stopper as claimed in claim 1, in combination with a chain one of whose links is grasped by said body, said chain being comprised of a plurality of relatively swingable links disposed in planes alternately at right angles to each other, the center of curvature of said concave surfaces being at about the point of contact of the grasped link with the next link.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,557,737 Dated Jan. 26, 1971

Inventor(s) August Hendrik Maria Smulders

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover sheet [73]

"N.V. Industriele Handelscombinatie Netherlands" should read -- [73] N.V. Industriele Handelscombinatie Holland --

Signed and sealed this 11th day of April 1972.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents