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DOCK FENDER

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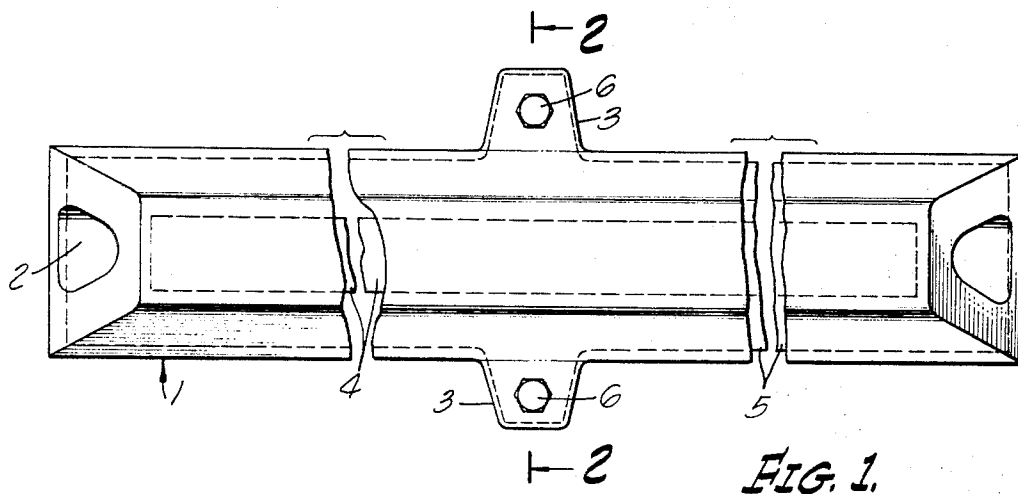


FIG. 1.

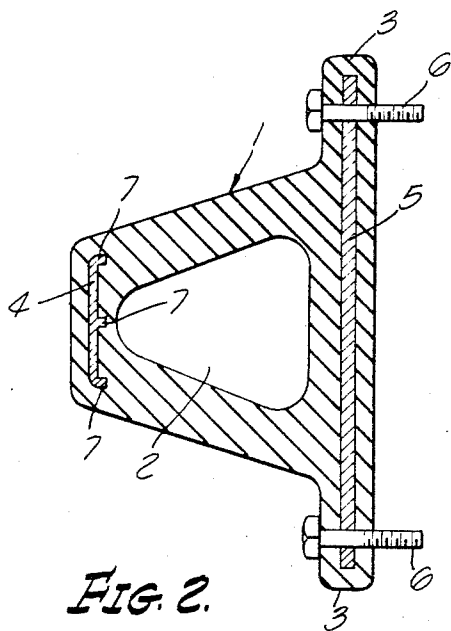


FIG. 2.

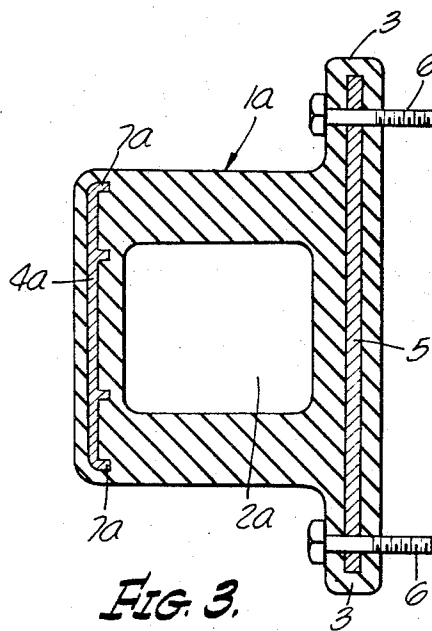


FIG. 3.

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3,418,815

DOCK FENDER

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3 Claims. (Cl. 61—48)

ABSTRACT OF THE DISCLOSURE

A device for resiliently cushioning the engagement between a ship and a dock or similar uses where a hollow body of resilient material has a flat steel plate embedded therein near the ship-engaging surface and generally parallel to the side of the ship for distributing the applied forces.

Background of the invention

This invention relates to a dock fender device adapted to be mounted on a dock, pier, wharf or the like for engagement by the side of the ship to cushion and distribute the forces therebetween and, in particular, is directed to such a device for use in connection with large ships. More specifically the device is of the type comprised of a resilient material but which includes means for distributing the applied forces more uniformly over a larger area of ship plating to reduce the possibility of damage to either the ship or the device.

A variety of devices have long been used to cushion the contact between a ship and the dock for protecting both the side of the ship and the dock itself. Part of the problem is to efficiently absorb the energy represented by the ship moving toward the dock without producing an undesirable repulsing action and the magnitude of energy involved increases with the size of the ship. Another factor is that the force imposed on and contact with the side of the ship must be such as to avoid damaging the ship's plating which of course is supported on a skeletal framework and extremely vulnerable between support members. Again the problem is increased with the size of the ship.

Dock fenders of a resilient material have been used with relative success and particularly hollow style devices which produce good energy-absorbing characteristics. However, these devices have been objectionable in certain respects such as imposing excessively localized forces on the side of the ship and a tendency to collapse too readily upon reaching certain load levels.

Summary of the invention

By this invention a dock fender or the like is provided which is comprised of a resilient material with a rigid plate embedded therein for optimum load-distribution both on the side of the ship and throughout the resilient material producing improved energy-absorbing characteristics.

An object of this invention is to provide a novel form of dock fender comprised of resilient material which absorbs any localized shock or force over its entire body.

Another object of this invention is to provide a novel form of hollow, resilient dock fender having a force distributing plate embedded therein adjacent the ship contacting surface for evenly distributing the forces between the ship and the device. A further object is to provide such a device which is elongated and has such plate running its full length.

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Brief description of the drawings

FIGURE 1 is an elevation view of the preferred embodiment of this invention with the drawing broken in two places to indicate the variable lengths the device may assume.

FIGURE 2 is a sectional elevation of the preferred embodiment of the device taken substantially on the line 2—2 in FIGURE 1.

FIGURE 3 is a sectional elevation similar to FIGURE 2 illustrating a modified form of the device of this invention.

Description of the preferred embodiments

Referring now to FIGURES 1 and 2, the dock fender device of this invention includes an integrally formed body 1 of any suitable elastic material such as natural rubber, synthetic rubber or synthetic resins. Normally the device is elongated as shown and extends horizontally when mounted for use but obviously the device may take other forms and orientations without departing from this invention. The elastic body 1 is hollow at 2 throughout its length as is relatively conventional with dock fenders of this general type. The body 1 is generally trapezoidal in shape and the hollow 2 is a related shape (triangular) whereby the body may be considered to be comprised of a pair of inclined side walls integrally supporting the front wall from the base portion.

The base portion of the device includes a base plate 5 of any convenient material such as steel for mounting the device on the vertical wall of the dock, pier, wharf, etc. One or more projections 3 may be provided along the sides of the device for mounting purposes with the number thereof depending generally on the length of the device. The plate 5 is embedded in or otherwise secured to the body 1 and has portions extending into the mounting projections 3. Holes are provided in the projections 3 for receiving the mounting bolts 6 used to secure the device to the dock. As thus far described the dock fender is relatively conventional and has been relatively successful commercially.

The front or contacting wall of the body 1 which has a relatively flat surface for engaging the ship has a substantially rigid plate 4 embedded therein closely spaced from and parallel to such contacting surface. The plate 4 may be of any convenient material, such as steel, of sufficient strength and rigidly to transmit any localized force applied at one portion along the entire length of the device and yet resiliently flexed to a limited degree. Plural ribs 7 may be provided on the plate 4 for reinforcing as well as insuring a permanent bond with the material of body 1.

The modified form of the device of this invention shown in FIGURE 3 differs from the device of FIGURES 1 and 2 only in cross-sectional shape. Here the body 1a is rectangular in cross section with parallel side walls and has a rectangular hollow portion 2a. The base plate 5 and projections 3 remain the same but the force distributing plate 4a is wider due to the increased width of the front contact wall and surface. Again reinforcing ribs 7a may be provided. Normally the device will be elongated as with the device of FIGURE 1.

With both embodiments, FIGURES 2 and 3, the embedded front plate 4, 4a is virtually coextensive with the contact surface of the device and overlies the supporting side walls. By this arrangement the imposed loads are transmitted to the side walls and along the length of the device. The flat contacting surface is maintained in that condition by the plate 4, 4a thereby preventing localized excessive forces to be imposed on small, vulnerable portions of the ship's plating which often occurs with the

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all-rubber type dock fenders. Moreover an improved energy absorption is obtained due to the more uniform force distribution along the length and within the resilient material itself. Further the desirable tubular shape is prevented from buckling and collapsing by the lateral reinforcement provided by the plate 4, 4a.

While the invention has been described in connection with particular embodiments thereof it is to be understood that the invention is not limited to these embodiments but is of the full scope of the appended claims.

What is claimed is:

1. A dock fender for resiliently engaging the side of a ship, comprising a body of elastic material having a substantial length and relatively narrow width, said body having a relatively flat outer surface for generally surface contact with the side of the ship and said body being hollow along its length for resilient collapsing upon being contacted by a ship, and a flat plate of rigid material embedded in said body parallel to and closely spaced from said flat outer surface, said plate being positioned between said flat outer surface and the hollow portion of said body and extending substantially the entire length of said body for distributing the forces imposed by the ship throughout the length of the body and preventing localized collapsing of any portion of said body.

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2. The dock fender of claim 1 wherein said plate is substantially the full size of said outer contact surface.

3. The dock fender of claim 1 wherein a second rigid plate is embedded in the body on the opposite side of said hollow portion from and substantially parallel to the first-mentioned rigid plate, said second rigid plate having means adapted for mounting the body to the dock, and said body having two wall portions extending between said two plates for the length of the body and forming the hollow therebetween, said wall portions being resiliently compressible and bendable for accommodating said resilient collapsing when the body is contacted by a ship.

References Cited

UNITED STATES PATENTS

2,935,855 5/1960 Reid ----- 114—214 X

FOREIGN PATENTS

945,456 1/1964 Great Britain.

JACOB SHAPIRO, *Primary Examiner*.

U.S. Cl. X.R.

114—219; 267—1; 293—71