Dec. 20, 1966 L. E. RUSSELL 3,292,566

BUMPER ELEMENT

Filed Sept. 14, 1962 2 Sheets-Sheet 1

Fig-1

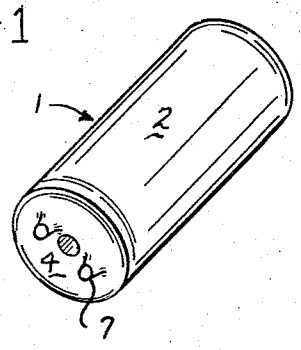
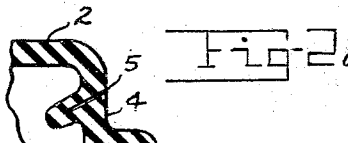


Fig-2a



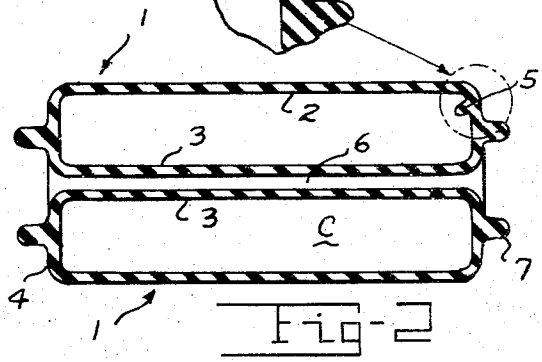


Fig-2

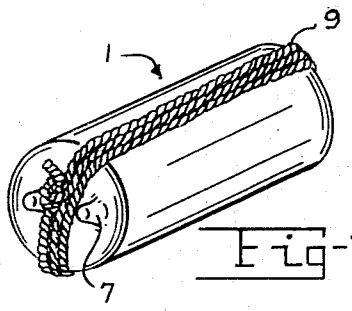


Fig-3

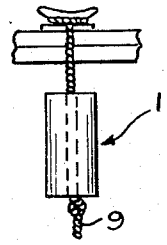


Fig-6

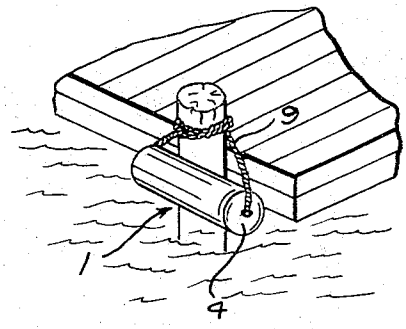


Fig-5

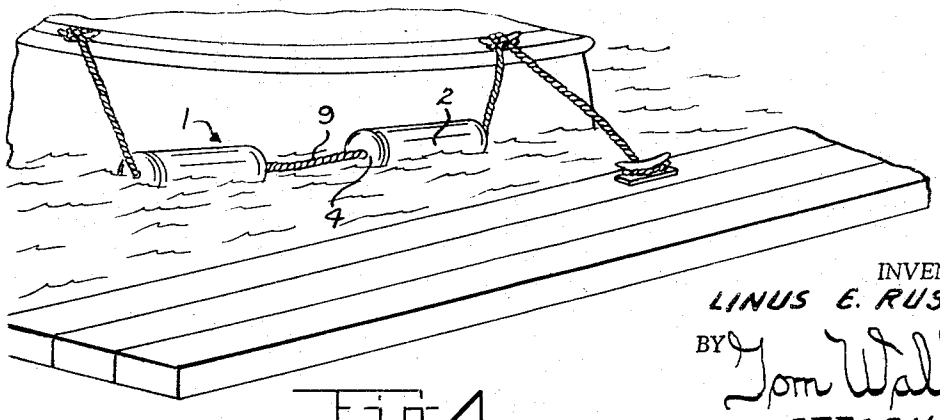


Fig-4

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Dec. 20, 1966 L. E. RUSSELL 3,292,566

BUMPER ELEMENT

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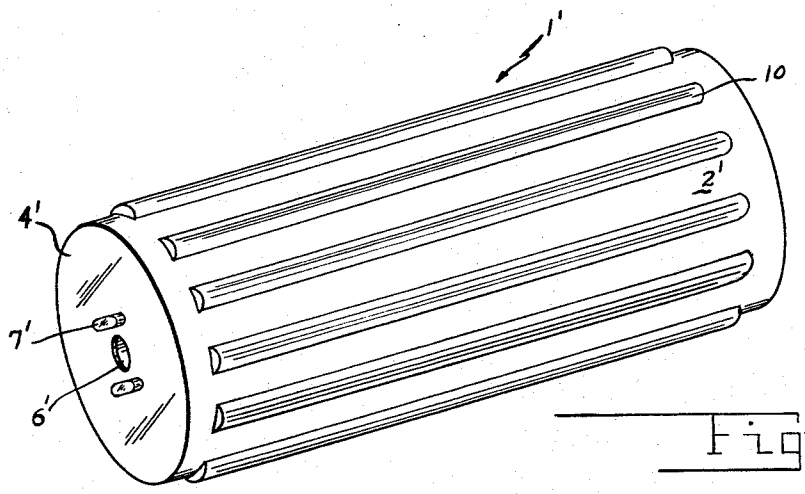


Fig. 7

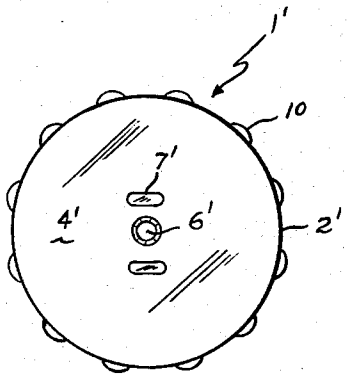


Fig. 8

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United States Patent Office 3,292,566 Patented Dec. 20, 1966

3,292,566

BUMPER ELEMENT

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Filed Sept. 14, 1962, Ser. No. 226,765
12 Claims. (Cl. 114—219)

The instant case is a continuation-in-part of an application by the same applicant, Serial No. 817,296, filed June 1, 1959, now abandoned.

This invention relates to novel air bumpers having particular utility in the marine art. However, while so described, it should be obvious from the following that their application is not so limited.

The art of providing bumpers or fenders for marine use is very old. Most bumpers or fenders have limited application, are quite heavy, hard to handle and difficult to rig. Moreover, they generally need constant attention. They are easily damaged, subject to mildew and require considerable storage space. A further objectionable feature of prior art bumpers is their tendency to create weird noises when they rub against a boat or dock surface.

The present invention is particularly directed to eliminate the undesirable characteristics of prior art bumpers above described. Further, it provides effective and utilitarian air bumpers of a nature not heretofore contemplated which may be quickly and easily rigged on a single line. These bumpers, in a preferred form, are centrifugally cast to be of seamless construction. Their construction is such as to lend them superior strength while enabling them to retain the necessary resilience to safely accommodate impact. A preferred embodiment of the invention provides air bumpers, as described, which incorporate means externally thereof to keep them from riding up and down in an unrestricted fashion when a boat moves against a wall or is going through locks.

A primary object of the invention is to provide improvements in fenders or bumpers rendering them economical to fabricate, more efficient and satisfactory in use, adaptable to a wide variety of applications and unlikely to require any great amount of maintenance.

A further object of the invention is to provide a bumper unit which can be more simply and more effectively rigged.

Another object of the invention is to provide a bumper unit which can be quickly and easily rigged on a single line.

An additional object of the invention is to provide an improved air bumper.

Another object of the invention is to provide a seamless air bumper which is extremely light in weight and will not mush, leak, rip, discolor or mildew.

An additional object of the invention is to provide a boat bumper the entire surface of which is capable of serving as a protective medium.

Another object of the invention is to provide a simple boat bumper which eliminates the need for cheeks, grommets or rope loops, thereby enabling reduction of its size and cost.

A further object of the invention is to provide a versatile plastic bumper structure which will not squeak.

An additional object of the invention is to provide a novel bumper unit of high impact capacity which is internally strengthened and capable of being simply rigged by a single line and stored in a minimum of space.

Another object of the invention is to provide an improved bumper which is equivalent in strength and capacity to a conventional bumper of considerably larger size.

Another object of the invention is to provide a novel

annular boat bumper wherein the wall defining its inner periphery is formed by a tubular portion which is relatively inflexible in comparison to the wall portion thereof defining its outer periphery.

An additional object of the invention is to provide a bumper structure possessing the advantageous structural features, the inherent meritorious characteristics and the mode of operation herein described.

With the above primary and other incidental objects in view which will more fully appear in the specification, the invention intended to be protected by Letters Patent consists of the features of construction, the parts and combinations thereof, and the mode of operation as hereinafter described or illustrated in the accompanying drawings, or their equivalents.

Referring to the drawings, wherein a preferred but not necessarily the only form of embodiment of the invention is shown,

FIG. 1 is a perspective view of an air bumper in accordance with the invention;

FIG. 2 is a longitudinal cross section of the bumper of FIG. 1, the valve section thereof being shown in FIG. 2A in an enlarged fragmentary view;

FIG. 3 shows the device of FIG. 1 rigged for stowing;

FIG. 4 shows one application of the bumper of FIG. 1, bumpers being shown in a rigged condition;

FIG. 5 shows a further application of the bumper of FIG. 1;

FIG. 6 shows a preferred rigging of the bumper;

FIG. 7 is a side elevation view of a preferred modification of the device of FIG. 1; and

FIG. 8 is an end view of the device of FIG. 7.

Like parts are indicated by similar characters of reference throughout the several views.

The bumper **1** illustrated has an annular form and is preferably fabricated of an extremely tough and elastic non-squeaking, plastic compound.

As shown in FIGS. 1 and 2 of the drawings, the bumper **1** includes a tubular outer wall section **2** and a tubular inner wall section **3**. The wall sections **2** and **3** are coextensive and in concentric spaced relation. Formed integrally with and in bridging relation to the respectively adjacent ends of the sections **2** and **3** are annular end section **4** which define a sealed annular chamber C thereby. Molded integrally in one end section **4** is the conventional football type valve unit **5**. This particular type of valve is self sealing and leak proof even under shock of extreme impact. Air is introduced to the chamber C through the valve **5** through the medium of a needle type inflation pump.

In fabricating the bumper **1** in a preferred manner, the tube providing its inner wall section **3** is formed first. This tube is formed to be relatively inflexible. The outer wall section **2** and the end sections **4** are then centrifugally cast about the tube. In this process, the end sections **4** are bonded to the respective ends of the tubular section **3** in a manner to form flared expansions to either end of the passage **6** therethrough. The bumper so formed is completely seamless, thereby avoiding any localized vulnerability to rupture. By forming the section **3** to be relatively inflexible in comparison to the outer and end walls of the bumper, the entire bumper structure is provided with an inner core of significant strength which lends it a substantial resistance to deformation and rupture on impact. In the casting procedure, cleats **7** are formed to project from either end of the bumper, in diametrically opposed relation and equally spaced to opposite sides of the passage **6** therethrough.

Fluid may be introduced to the chamber C through the valve **5** to provide a tubular column of air therein under a predetermined pressure to suit the bumper application.

On threading a single line in the form of a suspension cord or cable **9** through the passage **6** in the bumper **1**, the invention provides a unique fender assembly. A bumper so assembled becomes a resilient squeak free roller unit which may freely rotate on its single line suspension means. As may be seen in the application of FIG. 6 of the drawings, the single line may be suitably knotted to fix the relative position of the roller thereon.

FIGS. 4 and 5 of the drawings show various means of utilizing the invention structure in the marine art. In each case a single bumper or a plurality of bumpers are threaded on the single line which forms the suspension medium. As indicated previously, the single line may be simply knotted to one or both sides of the bumpers thereon and thereby limit their axial movement, if such is desired.

FIG. 3 of the drawings indicates how simply the line **9** may be wrapped about the bumper **1** from end to end and between the projections **7** which define stowing cleats. This lengthwise disposal of the line enables a compact stowage of the bumper and eliminates the problems of loose or trailing ropes prevalent in the handling of prior art bumper or fender devices.

The bumper unit thus provided is extremely light in weight and compact in nature. Every inch of its exterior surface is available and functions as an impact absorbing medium. It has obvious advantages in use. Since its effective suspension requires only a single line through the passage **6**, the bumper **1** eliminates the need for customary cheeks and grommets provided in conventional bumpers. The invention bumper need never be tied on in the manner of conventional units. Rather, a line is passed all the way through the passage **6** and the bumper may be simply positioned by knots formed in the line to either end thereof. Moreover, the invention bumpers may be slid freely on such a line to any position that serves the immediate purpose. The simplicity of the suspension which its construction facilitates eliminates the need for actual fixing of the bumper to its suspension means and thereby prevents damage to the bumper when an undue strain is supplied to its suspension line.

It is further significant that the air bumper as provided is seamless and incorporates a sealed column of air. This column of air is in encompassing relation to the relatively inflexible inner wall **3** to form a cushion thereabout and within the resilient external and end walls cast integral therewith. The resilient body thus established is rigidified and strengthened by the wall structure which forms its inner core. Such a unit yields under minimum applied weight yet is capable of absorbing terrific impact shock and recovering its original configuration. The construction of the seamless bumper renders it highly resistant to rupture and collapse, a feature enhanced by the simplicity and freedom of its mount to a suspension line.

No great amount of work is necessary in rigging or maintaining the bumper apparatus of the invention. As is obvious, the single suspension cable can be easily and quickly rigged to suit any application. The use of plastic avoids the problems of discoloration and mildew existing with commercial bumpers. Every inch of the external surface of the bumper is working surface, as distinguished from the conventional bumper, and it affords maximum protection for minimum size. As noted, the roller mount of the bumper structure is of definite importance. It enables a bumper unit having minimum frictional resistance to applied loads, thereby insuring a long life therefor.

It should be readily apparent to those versed in the art that a unique structure is thus provided which can be applied to a variety of uses in a variety of ways.

FIGS. 7 and 8 of the drawings illustrate a modification of the device of FIGS. 1 and 2 which is particularly significant for use on boats which go through locks, where the water level is going up and down. This modification of the invention provides a bumper **1'** having a form as the bumper **1** previously described save that when the outer

wall **2'** and end walls **4'** of this modification are centrifugally cast on the inner tube **3'**, the outer wall **2'** is formed to have external parallel ribs **10** which extend from adjacent one end wall to points adjacent the other. In the example illustrated the ribs are spaced circumferentially, 30° apart. These ribs have a significant function in the application of the bumper structure as a protective medium on a boat going through locks. The merit of the ribs **10** is that they tend to cause the bumpers to hug the boat and keep the bumper units from riding up and down the sides of a boat too readily when the boat is going through locks or moving against a wall. This insures a more complete continuous protection for a boat structure under such circumstances and does not detract from the capabilities of the bumper to turn on a single suspension line and to be simply and readily rigged through the medium thereof.

A feature of the invention embodiment which should be carefully observed is the fact that the relative freedom of the bumper structures with reference to the suspension line makes it practically impossible for stress on the line to rip the bumper, even under the most extreme conditions. Further, the use of the single threaded line in conjunction with the bumper as described enables that the bumper can be hung horizontally, vertically, and in combination on a single line without necessity for any particular manipulation or re-tying of the suspension line relative the bumper structure.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific features shown, but that the means and construction herein disclosed comprise but one of several modes of putting the invention into effect, and the invention is therefore claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described my invention, I claim:

1. A bumper including, a tubular relatively flexible outer wall section of elastic material, a tubular inner wall section of elastic material, said inner wall section being per se relatively inflexible in comparison to said outer wall section and arranged concentric thereto and substantially coextensive therewith, means connecting said wall sections at opposite ends thereof formed integral therewith and defining a hollow seamless annular body thereby having a passage therethrough defined by said inner wall section which lends strength thereto, and diametrically positioned stowing cleats formed integral with the respectively opposite ends of said hollow annular body and projected oppositely therefrom.

2. A bumper including, a tubular relatively flexible outer wall section of elastic material, a tubular inner wall section of elastic material, said inner wall section being per se relatively inflexible in comparison to said outer wall section, arranged generally concentric with the outer wall section and substantially coextensive therewith, and means connecting said wall sections at opposite ends thereof forming a hollow annular body having a passage therethrough defined by said inner wall section which lends strength thereto.

3. A fender comprising an essentially one-piece tubular casing consisting essentially of a relatively stiff central tube of plastic material, an outer casing of plastic material surrounding said tube, elongated in the direction of the length of said tube and bonded to said tube at both ends thereof to form a closed annular chamber, said outer casing being more flexible than said central tube, and an air valve carried in said casing and communi-

cating with said chamber to permit inflation of said chamber, whereby said central tube provides a passageway through said tube for receiving a securing line, resists the tendency of said casing to shorten along the axis of said tube under inflation pressure, and stiffens said fender against bending in a direction transverse to the length thereof.

4. A bumper consisting of concentrically spaced walls of resilient material, means formed integral with and connecting said walls to define a sealed chamber therebetween, the inner of said walls being formed to be relatively inflexible in comparison to the outer and providing means for free passage of a suspension line therethrough for said bumper to rotate thereon and valve means integrated in said body to supply and maintain fluid in said sealed chamber at a selective pressure level.

5. A roller type bumper comprising an inflatable hollow flexible casing of synthetic plastic, a relatively inflexible central tube of similar plastic material within and bonded to said casing and extending the length thereof for resisting distortion of said bumper and forming an axial passageway through the bumper for receiving a securing line, said casing and tube forming an annular chamber in said bumper.

6. A bumper or the like including, a tubular relatively flexible outer wall section, a tubular relatively inflexible inner wall section, concentric with the outer wall section and substantially coextensive therewith, means connecting said wall sections at opposite ends thereof, a hollow annular body being formed thereby having a passage therethrough defined by said relatively inflexible inner wall section and circumferentially spaced ribs projected from and oriented longitudinally of said outer wall section.

7. A bumper including a tubular flexible outer wall section of an elastic material positioned, a tubular inner wall section of an elastic material positioned concentric therewith said inner wall section having the physical characteristic of being inflexible in comparison to said outer wall section, means connecting said wall sections to either end forming a hollow tubular body having a passage therethrough defined by said relatively inflexible inner wall section, said body being resilient by virtue of its outer wall structure and rigidified by its inner wall structure, said inner wall defining an opening through said body for passage of a line, the line providing means independent of said body limiting relative longitudinal motion thereof by engagement with said relatively inflexible inner wall structure.

8. A bumper including a tubular relatively flexible outer wall section, a tubular inner wall section, means connecting said wall sections at opposite ends thereof having diametrically positioned stowing cleats formed integral therewith and projected oppositely therefrom, a hollow body being formed thereby having a passage therethrough defined by said inner wall section, and means formed integral with and projected from said outer wall

section arranged to inhibit an unrestricted vertical displacement of said bumper body when applied to the side of a boat or other wall type structure.

9. A bumper including, a tubular relatively flexible outer wall section of resilient material, a tubular inner wall section of resilient material having a lesser degree of flexibility than said outer wall section, means providing a seamless connection of said wall sections at opposite ends thereof to define a fluid chamber therebetween and means defining projections formed integral with and arranged to extend longitudinally of the outer of said wall sections operating to induce the bumper to hug the relatively adjacent surface to which it mounts.

10. A bumper including a tubular relatively flexible outer wall section, a tubular inner wall section, means connecting said wall sections at opposite ends to define a fluid chamber therebetween, means defining circumferentially spaced projections formed integral with and extending longitudinally of the outer of said wall sections and operating to induce the bumper to hug the adjacent surface to which it mounts and the inner of said wall sections being resilient but relatively inflexible.

11. Bumper apparatus including a single suspension line, seamless tubular means of an elastic material formed to provide an integral structure encompassing a fluid column which is rotatable thereon, the outer surface thereof being relatively flexible and the inner surface thereof being relatively inflexible.

12. Bumper apparatus including, a seamless tubular means of elastic material, the inner surface of which is relatively inflexible to provide it with a strengthening core and the outer surface of which is resilient and includes means projected peripherally and longitudinally thereof for inducing said means to hug the surface adjacent to which it mounts and suspension means for said tubular means providing for rotation of said tubular means thereon.

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