Nov. 21, 1967 F. J. LUKETA 3,353,292

BALLAST AND BUOYANCY ATTACHMENTS FOR TRAWL DOORS

Original Filed June 22, 1964 3 Sheets-Sheet 1

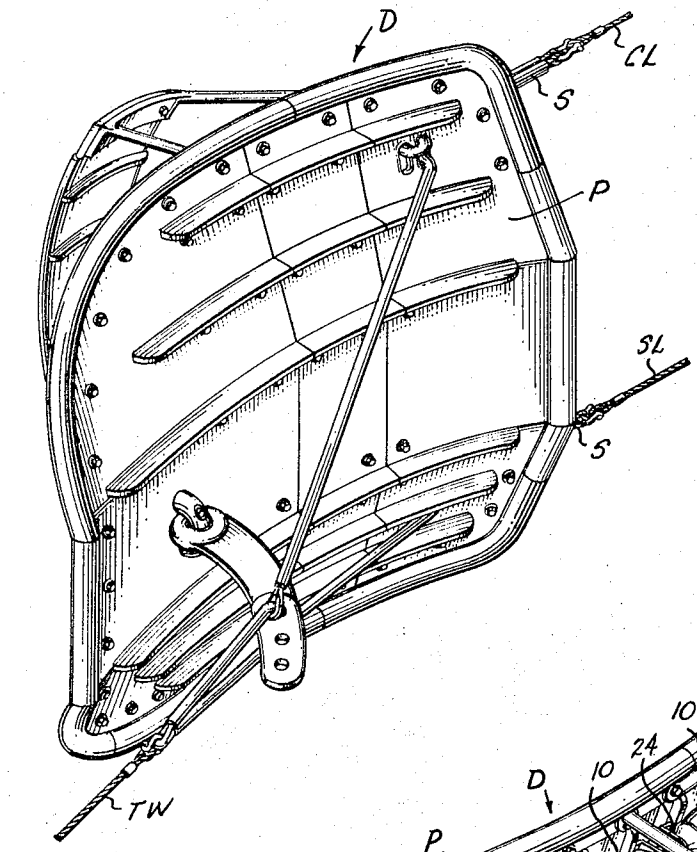


Fig. 1.

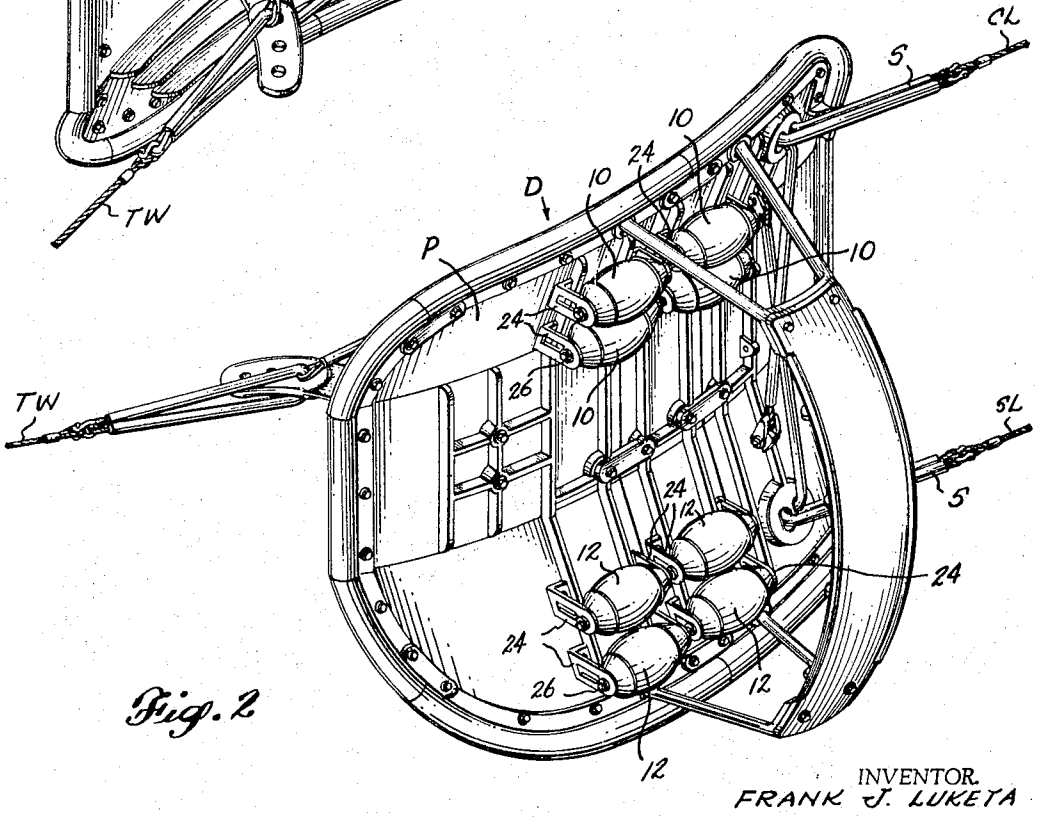


Fig. 2.

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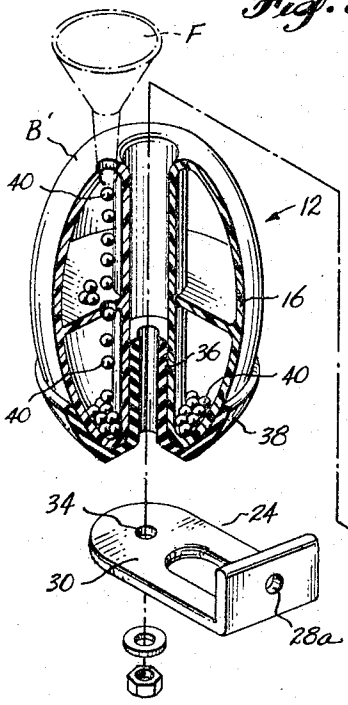
BY
Mathis and Dreyhead
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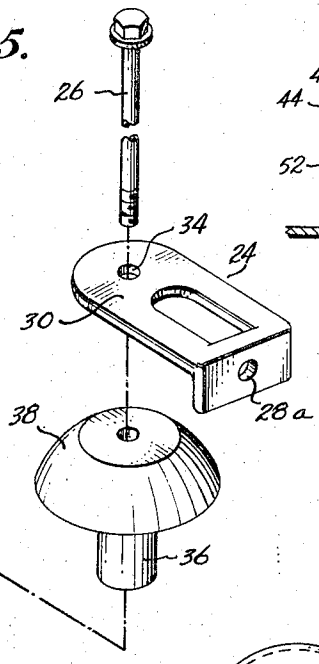
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BALLAST AND BUOYANCY ATTACHMENTS FOR TRAWL DOORS

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Fig. 5.





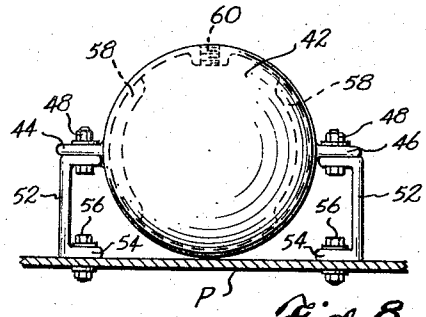


Fig. 8.

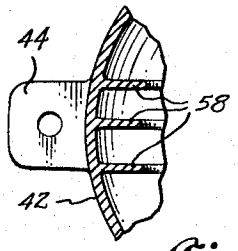


Fig. 9.

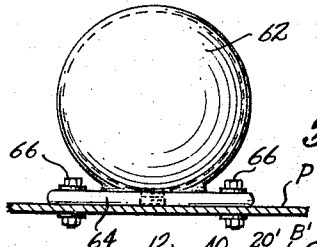


Fig. 10.

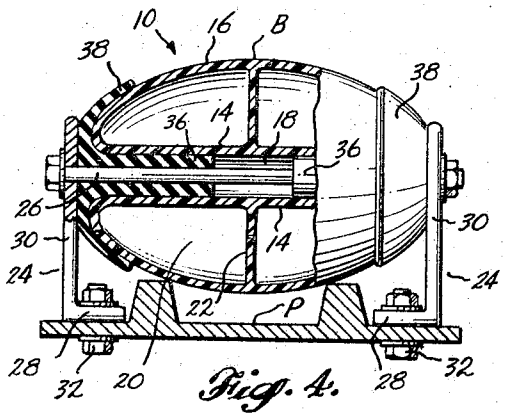


Fig. 4.

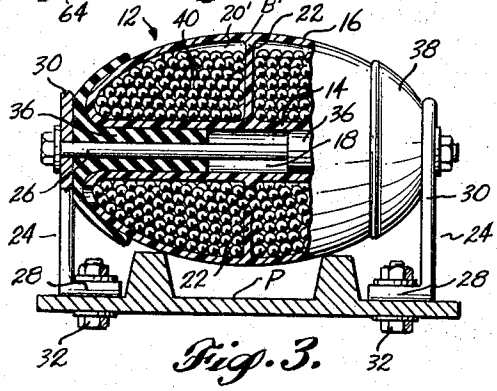


Fig. 3.

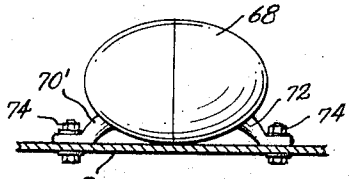


Fig. 11.

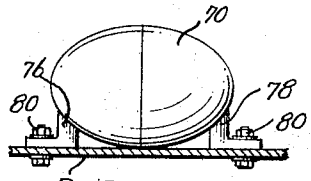


Fig. 12.

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BALLAST AND BUOYANCY ATTACHMENTS FOR TRAWL DOORS

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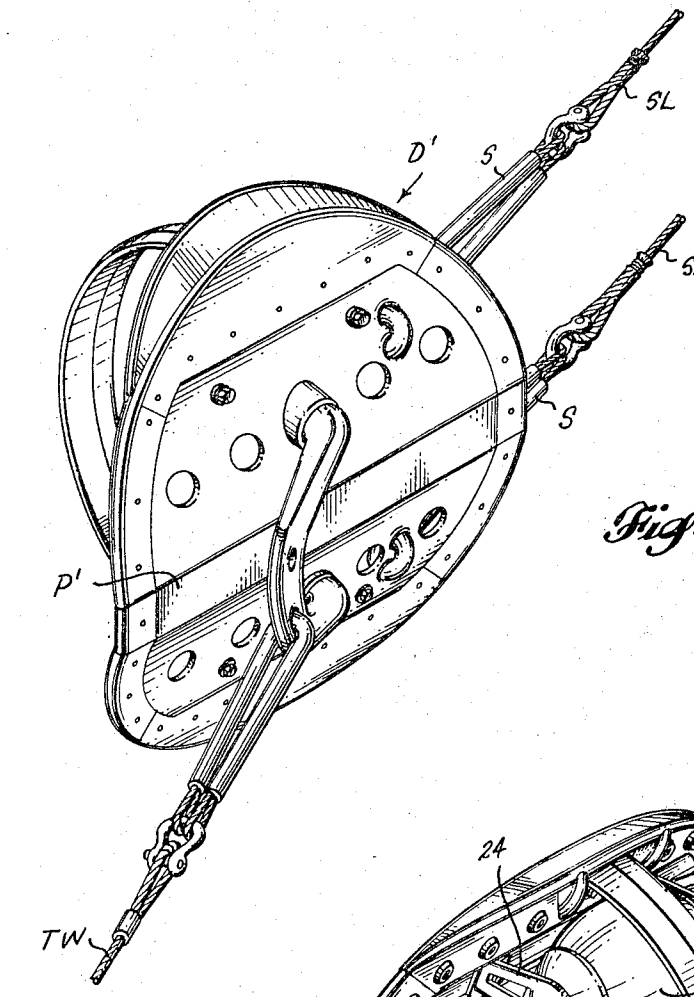


Fig. 7.

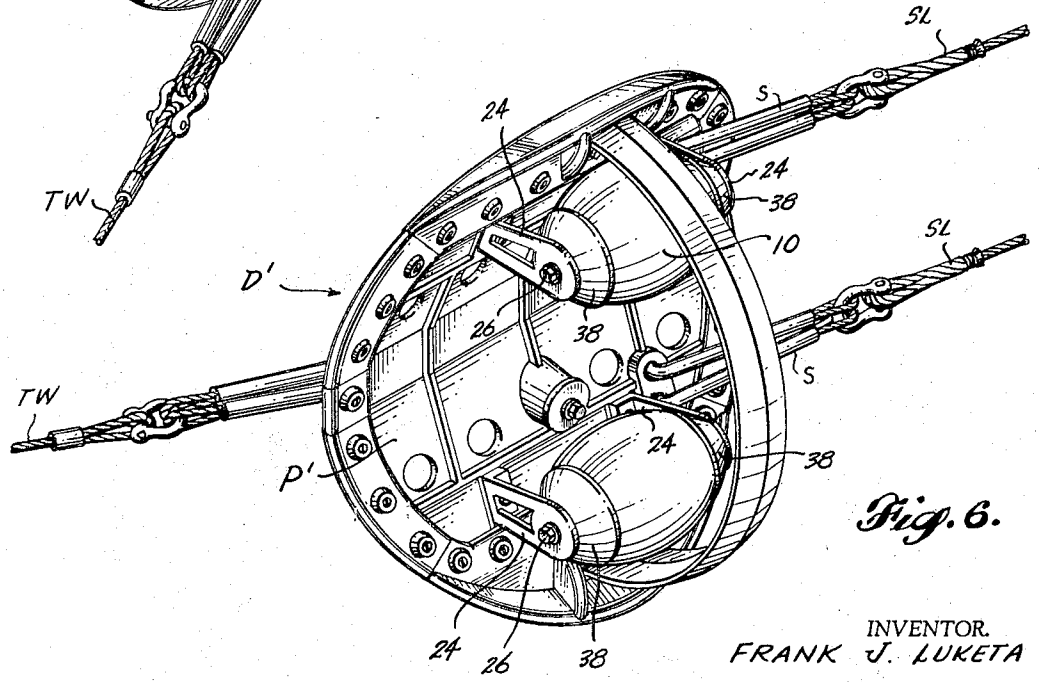


Fig. 6.

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United States Patent Office 3,353,292 Patented Nov. 21, 1967

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BALLAST AND BUOYANCY ATTACHMENTS FOR TRAWL DOORS

Frank J. Luketa, 5567 Greenwood Ave. N., Seattle, Wash. 98103

Continuation of application Ser. No. 376,993, June 22, 1964. This application Jan. 30, 1967, Ser. No. 622,852
11 Claims. (Cl. 43—9)

ABSTRACT OF THE DISCLOSURE

A trawl door having buoyancy means removably mounted adjacent its upper edge and variable ballast means removably mounted adjacent its lower edge, the buoyancy and ballast means being interchangeable to permit the use of the door in a reversed position.

This is a continuation of my now abandoned copending application Ser. No. 376,993, filed June 22, 1964, and entitled Ballast and Buoyancy Attachments for Trawl Doors.

The present invention relates to detachable buoyancy and ballasting assemblies for trawl doors and the like, and more particularly to buoyancy and ballasting units having common basic constructional characteristics and identical mounting structure.

In my U.S. Patent No. 3,231,998, issued Feb. 1, 1966, and entitled Invertible Trawl Door With Resilient Edge and Adjustable Ballasting, I disclose an invertible trawl door comprising a water reaction panel, a resilient, wear-resistant edging around at least the leading and lower edges of said panel, a ballast means situated just inboard of the lower edge of the door, and a buoyancy means situated just inboard of the upper edge of the door. Such ballast and buoyancy means, in the preferred form, are of similar basic construction, each involving an elongated canister as its principal component, with the canister of the ballasting means containing a longitudinally adjustable weight, and the canister of the buoyancy means being of hollow, airtight construction. As alternative forms, that application also discloses ballast means in the form of stacked bars, and buoyancy means in the form of a series of trawl net floats. Each of these forms of ballasting and buoyancy means are detachably mounted onto the door and are interchanged, together with other components of the door, when the door is inverted for use on the other side of the net.

A principal object of the present invention is to provide a new form of ballast and buoyancy means characterized chiefly by a simple and relatively inexpensive, but yet efficient and durable construction. The buoyancy and ballast means provided by this invention are of the same basic construction, each having as its principal component a hollow body member, preferably spherical or ellipsoidal (i.e. globular) in form. One form of body member is characterized by an elongated central passageway, coincident with its center axis, and a toroidal chamber surrounding said passageway. According to the present invention, this form of body member is secured to the trawl door by mounting means comprising a pair of end standards, each having an apertured outboard end portion; and an elongated securement bolt or the like insertable through the openings in said end standards and through the elongated central passageway of the body member. Preferably, the inboard ends of the standards are formed to include means by which the standards can be detachably secured to the door, such as by bolts, for example. In the case of the buoyancy means, the toroidal chamber is hollow and air-

tight, providing such body member with a gross specific gravity substantially less than one. In the case of the ballast means, a relatively high specific gravity material, such as lead shot, for example, is put into the toroidal chamber, giving such means a gross specific gravity substantially greater than one.

Another object of the present invention is to provide buoyancy and ballast means which are interchangeable and require the removal and replacement of but a single securement bolt each for effecting such interchange. The brackets used for mounting the body member of the buoyancy means onto the door are identical to the brackets used for mounting the ballast means onto the door. Thus, only the bolt which passes through the elongated passageway in the body member need be removed. When the buoyant body members are substituted for the weighted body members, the end standards of the latter become the mounting means for the former. This is also true at the opposite edge location on the door, where the weighted body members replace the buoyant body members.

A still another object of the present invention is to provide buoyancy and ballast means characterized by common mounting means making them interchangeable when used in conjunction with an invertible trawl door.

These and other objects, features, advantages and characteristics of the present invention will be apparent from the following description of certain typical and therefore non-limitive embodiments thereof, wherein like letters and numerals refer to like parts, and wherein:

FIG. 1 is a perspective view of a representative form of trawl door with which the ballast and buoyancy means of the present invention may be employed, as viewed from the leading or anterior side of such door, such view showing the door in an in use position on the starboard side of the net;

FIG. 2 is an isometric view of the trawl door shown in FIG. 1, rigged for use on the port side of the net, such view looking toward the rearward or posterior side of the port door, and showing a plurality each of the ballast and buoyancy means according to the present invention;

FIG. 3 is a plan view of one of the ballast means, with parts broken away for clarity of illustration;

FIG. 4 is a view similar to FIG. 3, but of one of the buoyancy means;

FIG. 5 is an exploded perspective view of one of the ballast means, pictorially showing one way in which the pelleted material may be added to the toroidal chamber of the body member;

FIG. 6 is a view similar to FIG. 2, but looking toward the posterior side of a different form of door, a try net door, which door is much smaller than the door shown in FIG. 2, such door being shown with only a single ballast means and a single buoyancy means;

FIG. 7 is an isometric view of the anterior side of the trawl door shown in FIG. 6;

FIG. 8 is an elevational view of another form of attitude control attachment according to the present invention, which may be either a buoyancy attachment or a ballast attachment depending on the content of its body member, such form involving a body member having opposed mounting flanges in lieu of the central passageway characterizing the form of FIGS. 1–6;

FIG. 9 is a fragmented plan view, partially in section, of the region immediately adjacent one of the mounting flanges of the body member of FIG. 8, the view showing the internal reinforcement of the body member in such region;

FIG. 10 is a view of still another form of attitude control attachment according to the present invention, this form involving a mounting pad preferably formed integral with the body member; and

FIGS. 11 and 12 illustrate still further additional forms of such attachments, which forms differ from each other in terms of the construction of the mounting means, which in both forms comprises mounting pads preferably formed integral with the body member.

FIGS. 1 and 2 present anterior and posterior views, respectively, of a representative form of door D embodying ballast and buoyancy attachments constructed according to the present invention. In FIG. 1 the door D is shown rigged for use on the starboard side of the net, and in FIG. 2 the same door is shown rigged for use at the port side of the net. In use, the door D is disposed generally upright, as pictured, and is towed forwardly by a towing rope TW leading forwardly from the door to a trawler. A pair of sweep lines, or a sweep line and a curtain line, which latter situation is illustrated, are attached to the rear portion of the door panel P by connectors S. The curtain and sweep lines, designated CL and SL, respectively, extend rearwardly from the door to the net (not shown). The features of this form of door which are not described below in connection with the ballast and buoyancy means characteristic of the present invention are described in my pending application Ser. No. 393,026, filed Aug. 31, 1964, and entitled Trawl Door Consisting of Components Usable to Make Up Various Size Doors.

In FIG. 2 a plurality of buoyancy units **10** are shown attached to the posterior side of the door panel P inboardly of its upper edge. A plurality of ballast units **12** of similar construction are mounted on the door panel P inboardly of its lower edge. During use of the door both the buoyancy units **10** and the ballast units **12** are protected by the door body or panel P.

As shown by FIGS. 3 and 4, buoyancy units **10** and the ballast units **12** are of similar construction Each comprises a body member B, B′ of identical construction. The representative form of body member B, B′ shown in FIGS. 2–6 comprises wall means **14** forming an elongated central passageway **18** and a toroidal chamber **20** surrounding said passageway **18**. The body member B, B′, which is preferably molded out of a suitable plastic, may be formed to include a centrally located transverse support wall or partition **22** so as to make it more rigid.

Identical mounting structure is used for both body members B, B′. The mounting structure comprises a pair of end standards **24** and a securement rod or bolt **26**. The preferred form of each brackets comprises a relatively short foot or base **28** and an elongated arm **30** extending at a right angle with respect to the foot **28**. Each end standard **24** is preferably constructed so as to be removably secured to the door panel P by a bolt fastener or the like extending through matched openings in the panel P and the foot **28** of the end standard. The bolt receiving openings **28***a* in the feet **28** are clearly illustrated in FIG. 5.

The outboard end portions of the arms **30** are also formed to include a bolt receiving opening **34** (FIG. 5). Referring again to FIGS. 3 and 4, the arms **30** of each pair of end standards **24** extend outwardly from the door panel P in parallel fashion. The body members B, B′ are disposed between the end standards **24** and are removably secured thereto by the securement rod or bolt **26**.

In the embodiment illustrated in FIGS. 2–6, the diameter of the elongated passageway **18** is larger than the diameter of the securement rod **26**. A spacer sleeve **36** of rubber or like material having an outside diameter substantially equal to the diameter of the passageway **18** and a central bore of a diameter substantially equal to the diameter of the securement rod **26** fits into each end of the body members B, B′. The rod **26** then extends through the bores of the spacer sleeves **36**.

The distance between the arms **30** may be slightly larger than the end-to-end length of the body members B, B′, in which case the spacer sleeves **36** are provided at their outboard end with a cap portion **38** shaped to match the end configuration of the body members B, B′. Such cap member **38** may possess a thickness that is larger than the space between the inner surface of an arm **30** and the adjacent end surface of the related body member B, B′. The caps **38** are compressed slightly when a body member B, B′, with spacer sleeves **36** and cap portion **38** attached, is installed between a pair of the arms **30**.

In assembling the buoyancy and ballast units **10**, **12**, respectively, onto the door panel P, the body members B, B′ may first be assembled between the end standards **24** and then the entire unit installed to the door panel by bolting the feet **28** to the panel P. Alternatively, the end standards **24** may first be secured to the door panel P and then the assembly comprising the body member B, B′ and the two spacer sleeve elements **36**, **38** be mounted on and between the end standards **24** by the securement rod **26**. In some installations it may be desirable to cast form or weld the end standards **24** directly to the door panel P in which case the latter method of securement must be employed.

According to the invention the toroidal chamber **20** of the body member B forming a part of the buoyancy unit **10** is constructed so as to be airtight. This gives the buoyancy unit **10** a gross specific gravity substantially less than one, making it buoyant. The toroidal chamber **20′** of the body member B′ forming a part of the ballast unit **12** is filled with a great many small pellets **40** of a relatively heavy ballast material, such as lead shot, for example. However, any suitable material of heavy specific gravity may be used such as mercury. This gives the ballast unit **12** a gross specific gravity substantially greater than one.

FIG. 5 pictorially illustrates one manner of filling the body member B′ with the ballast pellets. Aligned holes may be drilled or otherwise formed in one end of wall means **16** and in partition **22**. Next the body member B′ is set on end and a funnel F inserted into the opening in wall means **16**. The pellets **40** are then poured into the toroidal chamber **20′** through the funnel F, as illustrated. When the toroidal chamber **20′** is adequately filled, the funnel F is removed and the opening in wall means **16** closed by the cap portion **38** of the spacer sleeve **36** when the latter is installed in its place. The body member B′ is then ready to be mounted onto and between the end standards **24**. The end standards **24** place the body members B, B′ in positions of rearward offset from the panel P.

FIG. 6 shows a different form of trawl door D′, which is relatively small in size and is especially adapted for use with a try net. This form of door includes a generally circular panel P′ and the door D′ is towed through the water by a towing warp TW. A pair of sweep lines SL extend rearwardly of the door D′ to the try net (not shown). This form of door is fully disclosed in and forms the subject matter of my pending application Ser. No. 516,829, filed Nov. 26, 1965, and entitled Trawl Doors for Try Nets. It is illustrated herein as a representative example of another form of door with which the buoyancy and ballasting means **10**, **12** of the present invention may be employed. Owing to its relatively small size, the door D′ needs but a single buoyancy unit **10** and a single ballast unit **12** to provide the desired amount of attitude correction of the door.

Both forms of doors D, D′ are constructed to be invertible. They are of symmetrical construction about a horizontal center line, and all of the door components are constructed to be interchangeable from top to bottom or bottom to top when the door is inverted for use at the other side of the net.

With respect to the buoyancy and ballast units **10**, **12** when the door is inverted the end standards previously used for the body member B of the buoyancy unit **10** become the mounting means for the body member B′ of the ballast unit **12**, and the end standards **24** at the other edge of the door, formerly used to mount the body member B′, become the mounting means for the body member B. Thus, the interchange of the buoyancy and ballast

means may require the removal and reinstallation of but a single bolt (securement rod **26**) at each location.

FIGS. 8 and 9 relate to a modified form of attitude attachment according to the present invention. As shown by FIG. 8, wherein a ballast attachment is shown by way of example to show the constructional details of both the ballast and buoyancy means, this form comprises a generally spherical body member **42** having a pair of generally diametrically opposed mounting flanges or ears **44, 46**. Such ears **44, 46** are apertured and a suitable fastener, such as a bolt **48**, for example, extends through each such aperture and through an aperture in registry therewith formed in the upper flange portion of a related one of a pair of end standards **52**. The end standards **52** are also provided with apertured base flanges **54**, which function in the same manner as the feet **28** of the end standards 24 forming a part of the attachments illustrated in FIGS. 1–6. The end standards **52** are secured to the trawl door panel P by means of suitable fasteners, such as bolts **56** extending through the apertures and base flanges **54** and through corresponding openings formed in the panel P.

As shown by FIG. 9, the body member **42** may be provided with a plurality of internal strengthening ribs **58** adjacent the mounting ears **44, 46**. In FIG. 8 a filling opening for the ballast material is shown located on the side of body member **42** distal the door panel P, and such opening is shown to be closed by a suitable plug **60**. Of course, the body member for the buoyancy means (not shown) is gas filled.

The form of attitude attachment illustrated by FIG. 10 comprises a body member **62** and a mounting means in the form of a single mounting base or pad **64** secured thereto and extending generally at a tangent to the surface of body member **62** at the place of securement. The base **64** is formed with bolt receiving openings, and bolts **66** insertable therethrough serve to detachably connect the body member to the door panel P.

The attitude control attachment shown by FIGS. 11 and 12 are especially adapted for use in shallow waters. They comprise body members **68, 70**, respectively, each shown to be of sectional construction, with the two halves being suitably jointed together during the process of manufacture. Body member **68** (FIG. 11) is shown provided with a pair of mounting legs **70', 72**, each having an apertured foot portion in contact with the door panel P, and by which it is secured to such panel by means of bolts **74**, or the like. The portion of legs **70', 72** extending between the feet and the body member **68** diverge apart as they extend from the body member **68** to the feet. With regard to body member **70** (FIG. 12), the portions of mounting members **76, 78** interconnecting the feet or bases thereof with the body member **70** are generally parallel to each other. Bolts **80** or the like serve to secure the feet of members **76, 78** to the door panel P.

Like the preferred form of attitude control attachment illustrated by FIGS. 1–6, the attitude control attachment of FIGS. 8–12 can be either buoyancy or ballast means, depending upon the content of the respective body members. As before, if it is desired that the attachment have a specific gravity less than one, so that it will serve as a buoyancy means, the body member is filled with air or some other suitable gas and is made airtight so that in use it will not fill with water. On the other hand, if it is desired to use the attachment as a ballast means, the interior of the body member is filled with a suitable ballast material, such as lead pellets, for example. This will give the attachment a gross specific gravity greater than one.

Attitude control attachments according to the present invention which are to be used in relatively deep water are preferably made spherical in form (FIGS. 8 and 10, for example) and may be provided with interior reinforcing means (FIGS. 1–6, 8 and 9, for example). The body members may be constructed of aluminum, plastic, or Fiberglas reinforced plastic, for example. As will be appreciated, in at least some installations if plastic is to be used it will have to be provided with reinforcing means which would not be necessary if aluminum were used in the same installation.

Herein the term "globular" includes in its meaning both spherical and ellipsoidal. It is used to describe a rounded three dimensional body form that might be either exactly spherical (FIGS. 8 and 10) or off-spherical or oblong (FIGS. 3–5, 11 and 12, for example).

From the foregoing, various further modifications, arrangements, and adaptations of attitude control attachments according to the present invention will occur to those skilled in the art to which the invention is addressed, within the scope of the following claims.

What is claimed is:

1. In a trawl door, a water reaction body having an upper edge, and a buoyancy attachment comprising a globular body member having wall means forming an enclosed gas tight chamber, and said chamber containing a gas, providing said body member with a gross specific gravity substantially less than one; and mounting means having portions projecting rearwardly from an upper posterior portion of said water reaction body for detachably securing said body member to said upper posterior portion of said water reaction body, inwardly of said upper edge, and rearwardly offset therefrom.

2. In a trawl door, a water reaction body having a lower edge, and a ballast attachment comprising a globular body member having wall means forming an enclosed chamber, and a relatively heavy ballast material of pellet form in said chamber, providing said body member with a gross specific gravity substantially greater than one; and mounting means having portions projecting rearwardly from a lower posterior portion of said water reaction body for detachably securing said body member to said lower posterior portion of said water reaction body, inwardly of said lower edge, and rearwardly offset therefrom.

3. In a trawl door, a water reaction body having an upper edge, and a buoyancy attachment comprising a globular body member having wall means forming an elongated central passageway and a gas tight toroidal chamber surrounding said passageway, and said chamber containing a gas, providing said body member with a gross specific gravity substantially less than one; and mounting means for said body member comprising a pair of standards projecting rearwardly from an upper posterior portion of said water reaction body, each said standard having first and second end portions, and each being formed to include a securement rod receiving opening in its first end portion; means securing the second end portion of each standard to said upper posterior portion of said water reaction body, inwardly of said upper edge, to place said body member in a position rearwardly offset from said water reaction body, and securement rod means insertable through said securement rod receiving openings in the standards, and through said elongated central passageway in the body member, when said openings and said passageway are in mutual alignment, and serving to removably mount said body member on and between said end standards.

4. In a trawl door, a water reaction body having a lower edge, and a ballast attachment comprising a globular body member having wall means forming an elongated central passageway and a toroidal chamber surrounding said passageway, a relatively heavy ballast material in said chamber, providing said body member with a gross specific gravity substantially greater than one; and mounting means for said body member comprising a pair of standards projecting rearwardly from a lower posterior portion of said water reaction body, each said standard having first and second end portions, and each being formed to include a securement rod receiving opening in its first end portion; means securing the second end portion of each standard to said lower posterior portion of said water reaction body, inwardly of said lower edge,

to place said body member in a position rearwardly offset from said water reaction body, and securement rod means insertable through said securement rod receiving openings in the standards, and through said elongated central passageway in the body member, when said openings and said passageway are in mutual alignment, and serving to removably mount said body member on and between said end standards.

5. In a trawl door according to claim 4, wherein said ballast material is in pellet form.

6. An attitude control attachment for a trawl door or the like comprising: a body member having wall means forming an elongated central passageway and a toroidal chamber surrounding said passageway; mounting means for said body member comprising a pair of end standards, each said end standard having first and second end portions, and each being formed to include a securement rod receiving opening in its first end portion and a mounting foot at its second end portion; and securement rod means insertable through said securement rod receiving openings in the end standards, and through said elongated central passageway in the body member, when said openings and said passageway are in mutual alignment, and serving to removably mount said body member on and between said end standards with the diameter of said elongated passageway in said body member being larger than the diameter of the said securement rod means, and said attachment further including spacer sleeve means insertable into said passageway, said sleeve means having an outside diameter substantially equal to the diameter of said passageway and being formed to include a central bore having a diameter substantially equal to the diameter of said securement rod means.

7. An attitude control attachment according to claim 6, wherein said spacer sleeve means comprises a pair of separate elements, said elements being insertable into the opposite ends of said passageway, and each including a cap portion shaped to match the end configuration of said body member, and in use each said cap portion being disposed between an end of said body member and the adjacent end standard.

8. In a trawl door, a water reaction panel; a pair of spaced apart, substantially parallel standards attached to and extended rigidly outwardly from said panel, each said standard being formed to include a bolt receiving opening in its outboard end portion; attitude control means comprising a body member disposed between said rigid standards, with the length of said body member being slightly smaller than the distance between said standards, said body member including wall means forming an enclosed chamber; a spacer element of a resilient, compressible material interposed between each end of said body member and the standard adjacent thereto; and a single elongated bolt extending through said aligned bolt receiving openings in said standards and through said body member, said bolt serving to removably mount said body member on and between said standards.

9. The combination of claim 8, wehrein said enclosed chamber is gas filled and air-tight, giving said body member a gross specific gravity substantially less than one.

10. The combination of claim 8, wherein said enclosed chamber contains a relatively heavy ballast material, giving said body member a gross specific gravity substantially greater than one.

11. In an invertible trawl door, a water reaction panel having upper and lower edges; at least one pair of spaced apart, substantially parallel standards attached to and extended rigidly outwardly from said panel, adjacent both the said upper edge and the said lower edge of said panel; each of said standards being formed to include a bolt receiving opening in its outboard end portion; attitude control means comprising a body member disposed between each pair of rigid standards, each said body member including wall means forming an enclosed chamber, with the enclosed chamber of the upper body member being gas filled and air-tight, giving the said body member a gross specific gravity substantially less than one, and with the enclosed chamber of the lower body member containing a relatively heavy ballast material, giving said body member a gross specific gravity substantially greater than one; and a single elongated bolt extending through the aligned bolt receiving openings of each pair of standards, and through the body member disposed between each pair of standards, said bolt serving to removably mount each said body member on and between its pair of standards, with the pair of standards and the body member at the lower edge of the door being identical in construction with the standards and body member at the upper edge of the door, so that the said body members can be interchanged when the water reaction panel is inverted.

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