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SAFETY ARRANGEMENT FOR STABILIZATION SYSTEM

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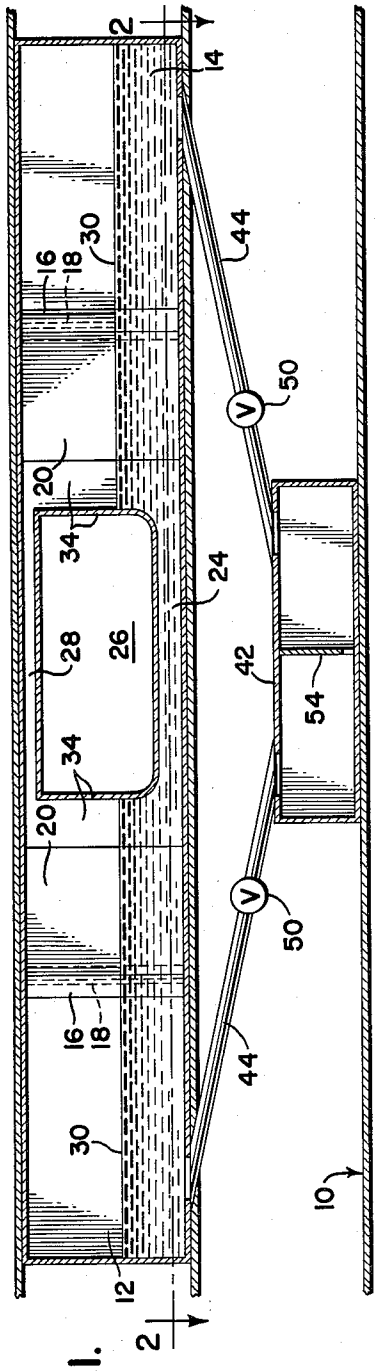


FIG. 1.

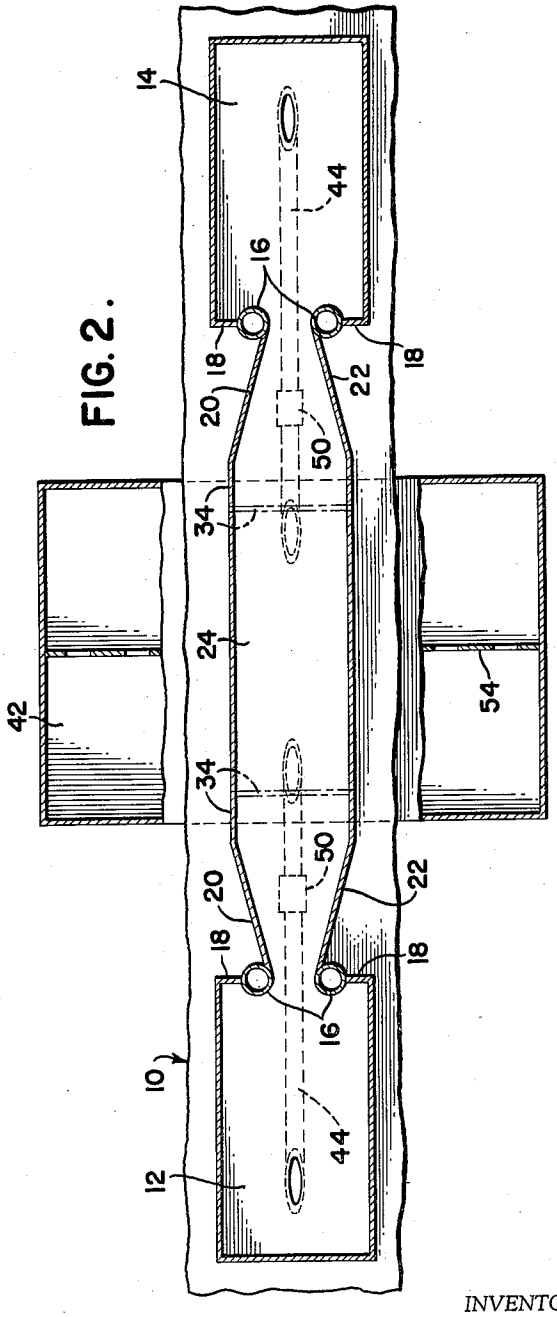


FIG. 2.

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SAFETY ARRANGEMENT FOR STABILIZATION SYSTEM

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1 Claim. (Cl. 114—125)

The present invention relates to passive stabilization systems for vessels and more particularly to a safety arrangement for such systems to be operated in the event the vessel is damaged and in danger of capsizing.

In the development of passive tank stabilization systems, it has been advanced by applicant that efficient and effective stabilization can be achieved through the use of a unique design which incorporates velocity squared damping at the intersection of the liquid crossover duct and a pair of liquid storage tanks arranged athwartship. In a simple design, the storage tanks are located at the extreme opposite sides of the ship and the crossover duct extends between them. The point where the crossover duct enters each of the tanks is featured by a nozzle design which may be flared or straight. In the operation of this system, the rhythm of the liquid transfer from one tank to the other is approximately 90° out of phase, leading the rolling angle when the vessel is rolling at resonance. This produces the stabilizing effect. If, however, the vessel is damaged and commences to heel, the stabilizing arrangement becomes dangerous to the safety of the ship and the liquid in the stabilizing arrangement seeks to a new mean level due to the heeling of the vessel. The center of gravity of the stabilizing system is thereby shifted in the direction of the heeling and tends to produce an upsetting or capsizing moment. It is to overcome this problem and to introduce a safety aspect to the stabilizing system that the present invention was conceived.

In essence, the present invention provides a safety arrangement for a passive tank stabilization system of the type described in the foregoing, wherein a dumping arrangement is provided for draining the fluid from the stabilization system to a storage point located at a lower level whereby natural draining can be utilized.

The transverse dimension of the dump tank is kept to a minimum to minimize the free surface effect of the tank.

To satisfy Coast Guard requirements, the valves for controlling dumping must be capable of being operated from the main deck level so that even though the compartment where the stabilizing system is located becomes flooded, the captain of the ship can have the valves operated from above the water-tight compartmentation of the ship.

It is, accordingly, an object of the present invention to provide a unique safety arrangement for a passive tank stabilization system of the type described which will operate effectively and expediently in the event the vessel is damaged and commences to heel excessively.

Other and further objects of the present invention will become readily apparent from the following detailed description of the present invention when taken in conjunction with the appended drawings in which:

FIGURE 1 portrays a vertical sectional view of a stabilizing system of the type previously described and illustrating the novel safety arrangement according to the principles and teachings of the present invention; and

FIGURE 2 is a section taken along line 2—2 of FIGURE 1.

Referring now to the drawings in detail, a vessel is shown in FIGURES 1 and 2 designated generally by the reference numeral 10. A pair of tanks 12 and 14 are

arranged at opposite sides of the vessel 10, athwartship, and these tanks are interconnected by means of a crossover duct arrangement. More specifically, pairs of pipes 16, vertically arranged, are positioned at openings defined by the inner wall 18 of each of the side tanks 12 and 14. Extending from each pair of vertical pipes are vertical wall sections 20 and 22. Each set of wall sections 20 and 22 diverge in the manner illustrated in FIGURE 2 to define in combination with their associated pair of vertical pipes 16 diverging nozzle designs. The center portion of the crossover duct is completely submerged and consists of an enclosed duct section 24 communicating the diverging nozzle areas defined by the wall sections 20 and 22 and associated pair of vertical pipes 16. The space above the enclosed duct section 24 is completed by a series of wall sections 34 which cooperate with the diverging wall sections 20 and 22 to define a liquid-tight space 26. An air duct 28 communicates the top portions of the two diverging nozzle areas in order that the air space defined by the two tanks and the diverging nozzle areas, above the liquid level 30 in these parts, is always instantaneously equalized.

In the operation of the stabilizer as described, motion of the vessel 10 will cause the liquid present in the side tanks 12 and 14 to flow back and forth in rhythm through the diverging nozzle regions and the submerged crossover duct 24 to produce a stabilizing effect upon the vessel. The use of the submerged crossover duct section 24 between the two diverging nozzle regions serves to inhibit wave action in the crossover duct. This particular design feature is advantageous in stabilizing arrangements wherein the side tanks are located quite far apart.

The enclosed space defined immediately above the submerged crossover duct section 24 can be utilized as an observation room for watching the action of the stabilizing system. To this end, the enclosure 26 may be fashioned as a passenger lounge and suitable portholes located in the bulkheads or wall sections 34 defining the enclosure.

The safety arrangement provided by the present invention is comprised of dump pipes 44 communicating the side tanks 12 and 14 with a centrally located dump tank 42 arranged at a lower location in the vessel and on the center line of the vessel. The transverse dimension of the dump tank is made as small as possible in order to minimize the free surface effect of the liquid in the dump tank 42. Dump pipes 44 communicate the extreme outboard portions of side tanks 12 and 14 with the dump tank 42. The dump pipes 44 are valved as indicated by reference numeral 50 and the valves are arranged to be operated remotely by any conventional arrangement from the weather deck of the vessel. For instance, valves 50 can be spring operated responsive to remote manual actuation of a long shaft or lever. This circumstance satisfies prevailing Coast Guard requirements.

It will be readily appreciated that in the event of damage there is a possibility that the areas of the ship in which the valves 50 are located could be flooded and the valves rendered inaccessible. Under these circumstances, it is imperative that they be operable from the weather deck of the vessel. The tanks must drain completely even when the ship is heeled to the margin line. The margin line defines the maximum safe heel of the ship in calm water and this is a recognized term in the art. To satisfy the above, the dump tank 42 is located a predetermined distance below the submerged crossover duct 24 such that the side dump pipes 44 allow complete draining of the system when the ship is heeled to the margin line.

A swash bulkhead 54 is located in dump tank 42 extending substantially along the midline of the ship. The

bulkhead is comprised of a perforated or cutout plate and serves to break up wave action in the tank 42.

Although the present invention has been shown and described in terms of a specific preferred embodiment, various changes and modifications will occur to those skilled in the art from a knowledge of the teachings of the present invention. Such changes as are obvious and which do not depart from the spirit, scope and contemplation of the invention are deemed to come within the purview thereof.

What is claimed is:

A safety arrangement for a vessel having a passive stabilization system mounted therein athwartship including a stabilizer means comprising a pair of side tanks mounted in spaced relation at opposite sides of the vessel centerline, each tank having wall means defining a restricted, communicating, vertically elongated opening, an elongated crossover duct interconnecting the openings of said side tanks for the transfer of liquid therebetween, a body of liquid contained in said side tank and crossover duct, liquid storage means located below and at right angles with said stabilizer means and placed along the centerline of the vessel, said liquid storage means having a length along said centerline substantially greater than the transverse width of said liquid storage means and being of sufficient capacity to hold all the liquid displaceable from said stabilizer means, pipe means extending from substantially each end of said stabilizer means to the corresponding side of said storage means, said pipe means positioned at a predetermined angle to allow full drainage by gravity of all the liquid in the said stabilizer means into said storage means when the vessel is heeled to the margin line, and remotely operated valve means associated with the pipe means to control the flow of liquid therethrough.

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