ACTIVE TANK STABILIZERS FOR FLOATING BODIES

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Filed Feb. 14, 1967, Ser. No. 615,978

Claims priority, application Great Britain, Mar. 22, 1966, 12,589/66

Int. Cl. B63b 43/06

U.S. Cl. 114—125 1 Claim

ABSTRACT OF THE DISCLOSURE

A tank stabilizer comprising tanks partially filled with liquid located on each side of a ship or other floating body, a channel system connecting the tanks, means for sensing the roll of the ship or other floating body and valve means operated from the roll sensing means for controlling the flow of liquid through the channel system characterized in that the tanks and channel system with their controlling valves are so arranged and proportioned in relation to the amount of liquid therein that a resonant condition is set up at a predetermined roll frequency during the period of maximum flow of liquid through the channel system.

The invention thus consists of the incorporation of the resonant features of a passive tank in the active system achieving thereby economy in the amount of power consumed in transferring the fluid from one tank to the other. The system may also operate as a more effective passive tank when no power is applied.

The art of tuning consists of so proportioning the passages or connecting ducts between the tanks, having regard to the cubic contents of the tanks and also their superficial area that a resonant condition is achieved at the appropriate selected frequency. A channel of smaller area or a longer channel for the fluid to be passed from one tank to the other requires a greater acceleration and velocity and this leads to a longer natural period. Conversely, broadening or shortening the connecting channel makes the resonant period shorter.

The invention applies to both three-tank active stabilizer systems of the kind described and claimed in British patent specification No. 996,276 and also to two-tank systems of the kind described in British patent application No. 1,017,549, more especially with the central reservoir or header tank.

The invention will be further described, with reference to the accompanying drawing which is a cross section of a vessel showing the stabilizing system.

The drawings shows a section of a vessel 1 in which tanks 2 and 3 are located, and the tanks are connected by a channel system 4. In the channel 4 operates a propeller 5 driven by motor 6. Channel 4 is divided into two parts in a horizontal sense, providing a diaphragm or nozzle in which the propeller operates and contains valves 7, 8, 9 and 10 which are controlled for guiding the flow of fluid from the propeller which is continuously driven in one direction. Considering valves 7 and 9 as being closed, the fluid will flow from tank 2 to tank 3 via the channel ABCD. When flowing in the opposite sense, the valves 8 and 10 would be closed and valves 7 and 9 open.

Thus, for maximum flow the half channel only is used at a time and the tuning required is with respect to this channel and is dependent upon the area and length of the channel and also the area of the side tanks.

During the period in which the valves 7, 8, 9, and 10 are moving across from open to closed positions and also when no signal is being generated for controlling these valves, the complete channel 4 will be open but this is not a resonant condition; fluid is not required to flow in quantity. Hence, although the tuning is different, it does not affect the operation of the tank.

I claim:

1. A vessel, a tank stabilizer unit in said vessel, tanks for said stabilizer unit disposed on each side of the vessel, an athwartships channel system interconnecting the lower regions of said tanks, a liquid volume partially filling said tanks and wholly filling said channel system, and axially upright propeller in said channel system for producing liquid flow therein between said tanks, valve means in said channel system controlling the direction of liquid flow therethrough, said valve means including two pairs of valves of which the valves of each pair operate in opposite senses respectively and are disposed one on each side of said propeller, one pair of valves being disposed above the level of said propeller and controlling liquid flow through channels leading to respective tanks, and the other pair of valves being disposed beneath the level of said propeller and controlling liquid flow through
channels leading to respective tanks, with the propeller being driven in one direction only and reversal of liquid flow between the tanks being attained by operation of the valves, and means for sensing rolling of the vessel and controlling operation of said valve means, said tanks and said channel system being dimensioned to cooperate with said liquid volume to impart to the stabilizer unit a predetermined natural resonant frequency of operation tuned to substantially the highest roll frequency to which the containing vessel to be stabilized by the system might roll significantly.