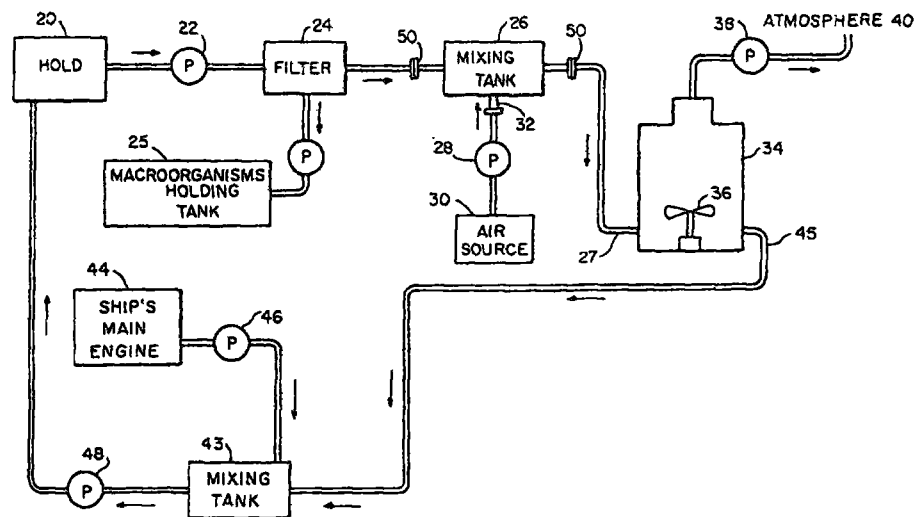




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : C02F 1/74, 1/20		A1	(11) International Publication Number: WO 98/23539
			(43) International Publication Date: 4 June 1998 (04.06.98)
(21) International Application Number: PCT/US97/19972		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).	
(22) International Filing Date: 10 November 1997 (10.11.97)			
(30) Priority Data: 60/031,605 27 November 1996 (27.11.96) US 08/921,336 29 August 1997 (29.08.97) US			
(71)(72) Applicant and Inventor: BROWNING, Wilson, J., Jr. [US/US]; 127 Bank Street, Norfolk, VA 29510 (US).			
(74) Agents: SEAS, Robert, J. et al.; Sughrue, Mion, Zinn, MacPeak & Seas, Suite 800, 2100 Pennsylvania Avenue, N.W., Washington, DC 20031-3202 (US).		Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.	

(54) Title: METHOD AND APPARATUS FOR KILLING MICROORGANISMS IN SHIP BALLAST WATER



(57) Abstract

A method and apparatus for treating ship ballast water before it is discharged into coastal waters. The ballast water may contain harmful non-indigenous microorganisms. Before discharge, the ballast water is oxygenated and deoxygenated to reduce the populations of anaerobic and aerobic microorganisms, respectively. If anaerobic microorganisms are no concern, the oxygenation step can be eliminated. The apparatus includes a vacuum chamber (34) for deoxygenating the ballast water containing aerobic microorganisms. The vacuum chamber (34) contains an internal agitator (36) for agitating the ballast water under a vacuum in the chamber (34) for a first period of time to remove dissolved oxygen from the ballast water. The agitator may be replaced by a Weir-type system (42) in which a series of vertical plates are placed in such a manner that they form a line of plates that are ever decreasingly shorter from an in-flow (27) to an out-flow (45) of the vacuum chamber (34).