ABSTRACT

A boat hull having compartments with inner explosion-resistant walls recessed within the hull for enclosing engines, fuel lines, fuel tanks and other gas tanks, said compartments venting and draining outwardly to the hull fairing surfaces and having outer fairing surfaces detachable outwardly in response to internal explosions within said compartments.

4 Claims, 7 Drawing Figures
EXPLOSION-SAFE BOAT HULL CONSTRUCTION

BACKGROUND OF THE INVENTION

Fire and explosion are the most grave hazards in relatively small power boats, particularly those powered by inboard gasoline engines. Explosions can occur as a result of careless fuel handling resulting in gasoline fumes or spilled raw gasoline which causes a concentration of explosive fumes at low points in the bilge or engine chamber. Additionally, gasoline from the carburetor is vaporized by the heat of the engine after engine shutdown. Also, in case of failure of the fuel pump diaphragm, liquid gasoline may collect at low points within the hull and be vaporized. Other causes of concentrating explosive gasoline fumes include leaking fuel tanks, loose connections, broken lines, and the like.

Sources of other explosive vapors aboard boats are leaks in the tanks or connecting lines to pressurized tanks of liquid petroleum gas used in cooking and heating and sewage holding tanks which may generate methane or other explosive vapors.

Once a pocket of explosive vapors has collected within a boat hull, it can be ignited by a spark from electric switches or motors, or flames from pilot lights of stove or water heater, or from lighting cigarettes, and the result is an explosion which may destroy the boat and seriously injure or kill the occupants.

In many cases, diesel engines are used in small craft in order to reduce the fire and explosion hazard because of the less volatile diesel fuel, but diesel engines are more costly and much heavier than gasoline engines, resulting in a substantial increase in overall boat cost and a decrease in boat performance, particularly in smaller boats of under 40 feet in length.

The early U.S. Pat. No. 741,512 disclosed a recognition of the danger of using explosive fuel in a boat and attempted to remedy the situation by an elaborate arrangement including an exposed pipeline extending along the keel outside of the hull with standpipes open to the water surrounding the vertical branch pipes connected at the ends of the pipeline to the fuel tank and the engine. U.S. Pat. No. 2,119,281 disclosed a sealed compartment in a boat for storing an auxiliary outboard motor in an inoperative position so as to prevent the escape of fumes and liquids from the stored auxiliary motor unit into the boat. To operate the motor it is removed from the compartment and mounted outside of the hull. U.S. Pat. Nos. 2,764,119 and 2,842,086 show separate compartments attached to the stern of a boat for housing outboard engines and fuel supply. These patents represent the most pertinent prior art known to applicant.

SUMMARY OF THE INVENTION

The primary object of the present invention is to provide an improved hull structure for gasoline powered inboard boats which is adapted substantially to prevent fire and explosion by dissipating explosive liquids and vapors outwardly from areas where they otherwise become concentrated, and to direct outwardly of the hull any explosive forces which may occur, thereby preventing damage to the inner hull and injury to its occupants.

Another object of the present invention is to provide an improved boat hull which will enclose all hazardous equipment within the outer fairing but outboard of the basic hull structure and in a manner to protect the hull structure from fire and explosion.

A further object is to provide recesses within the hull contours having sloping walls and surfaces providing overboard drainage therefrom and aiding in directing explosion forces outwardly of said recesses.

A still further object is to provide detachably mounted outer covers for said recesses which continue the outer facing surfaces of the hull while providing drainage and vent openings, and are adapted to release outwardly in response to excessive internal pressure.

Still another object is to provide an improved hull having recesses for enclosing hazardous or bulky equipment in such manner that the equipment may be installed, removed or repaired without removing decks or damaging the hull structure.

These and other objects are accomplished by the improvements comprising the present invention, preferred embodiments of which are shown in the accompanying drawings and described in the following specification. Various modifications and changes in details of construction are intended to be within the scope of the appended claims.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic partial elevational view, partly broken away and in section, of a boat powered by inboard twin gasoline engines.

FIG. 2 is a plan sectional view on line 2—2 of FIG. 1.

FIG. 3 is a cross section on line 3—3 of FIG. 2.

FIG. 4 is a partial elevational view, partly in section, of the stern area of a larger boat normally powered with diesel engines and having a sewing holding tank.

FIG. 5 is a plan elevational view thereof, partly in section.

FIG. 6 is a partial plan sectional view of the stern area of a boat powered by an inboard engine having an "outdrive" type of propulsion.

FIG. 7 is a vertical sectional view on line 7—7 of FIG. 6.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 1, 2 and 3, the boat shown therein has a hull indicated as a whole at 4 with a cabin 11 and a top deck 12 astern. A conventional gasoline marine engine indicated at 13 is mounted on an inclined platform 14 within the rear portion of the hull. The engine 13, which may be one of twins, is operatively connected to the propeller 15 by a conventional inboard "V" drive arrangement comprising the drive shaft 16 connecting the engine transmission 17 to the "V" drive gear box 18 from which the propeller shaft 19 is driven. The usual rudder 20 for steering is mounted in the hull behind the propeller 15.

As shown in FIGS. 1 and 2, the twin engines 13 are completely enclosed within a compartment 21 recessed inwardly and forwardly of the stern fairing wall or transom 22. Compartment 21 has a trapezoidal in cross section and has an upright forward wall 23 through which a water and vapor type seal 24 extends for the drive shaft 16, with outwardly inclined top, bottom and side walls 25, 26 and 27, respectively, extending rearwardly from wall 23. The engine platform 14 is supported on bottom wall 26. The compartment walls 23, 25, 26 and 27 are actually watertight continuations of the hull walls, and
are preferably of strong, rugged material such as molded fiberglass or welded metal, which is resistant to fire and explosive pressures.

By sloping the top, bottom and side walls outwardly from the forward wall 23 rearwardly, the force of any explosion occurring in the compartment is directed rearwardly of the hull. Also, the sloping bottom wall 26 is ideally arranged to terminate at the transom at or near water level when the boat is at rest. The water level at rest is indicated at 28 in FIG. 1.

A lightweight fairing or cover plate 30 extends across the open rear end of the compartment 21 to substantially close the compartment. This cover plate may be of thin aluminum or fiberglass sheet, and is mounted for outward detachment from the compartment by means of attaching screws 31 securing the cover to upright bars 32 extending between top and bottom walls 25 and 26. In case of an explosion within the compartment 21, the cover 30 is easily blown off to release the explosive pressure and prevent confining the explosion within the compartment. At the same time the cover 30 prevents excessive surging of sea water into the compartment and is braced against the inward pressure of the water by the support bars 32.

An opening 34 along the bottom of cover plate 30 allows a restricted amount of sea water to flow in and out of the compartment 21 when the boat is at rest and allows water to drain from the compartment when the boat is under way. Also, the sloping bottom wall 26 drains any volatile fuel which has leaked or been spilled into the compartment to the transom where it is carried away through the opening 34, thus greatly reducing the fire and explosion hazard. Conventional air scoops 35 located outboard of the cabin 11 allow air to flow through ducts 36 to ventilate the compartment 21 and dissipate any fumes therein through preferably peripheral vents 37 around the top and sides of cover plate 30. Louvers 38 may also be provided in the cover plate 30, if desired.

As shown in FIGS. 2 and 3, similar fire and explosion-resistant compartments 40, recessed within the outer fairing of the sides of the hull, may be provided for the fuel tanks 41. The compartments 40 have inner upright walls 42, and top, bottom and side walls 43, 44 and 45, respectively, extending outwardly therefrom to the outer fairings of the hull 16. Some or all of the top, bottom and side walls are inclined laterally outwardly, as shown, to direct explosive forces from within outwardly of the hull. Extension compartments 46 for the tank filler pipes 47 are preferably provided above the compartments 40 and have inner upright walls 48 outside of the cockpit area 49.

Lightweight cover plates 50 similar to covers 30 may be provided in continuation of the outer fairing walls 51 of the sides of the hull for covering and protecting the open sides of both compartments 40 and 46, the covers being mounted for outward detachment similarly to the covers 30 on compartment 21. Openings 52 are provided in said covers 50 for access to the filler pipes 47. In case of spillage within the compartment the gasoline will drain out of the bottoms, and in case of explosion within said compartments the covers are easily blown off. Drain openings 53 are provided along the bottom edges of the cover plates 50, the openings being at the water level when the boat is at rest, and suitable vent openings may be provided along the side and top edges of the covers.

Ducts 55, carrying the fuel lines from fuel compartments 40 to engine compartments 21, are made of the same fire and explosion-resistant material as the hull compartment wall so as to isolate them from communication with the interior of the hull, and may slope or drain to either compartment. They are preferably arranged to induce air flow from the compartments 50 to the compartments 21 to assist in removing any accumulation of liquids or vapors.

The embodiment of FIGS. 4 and 5 shows an arrangement of a recessed compartment in the stern area of a larger boat 10' which might normally be equipped with diesel propulsion comprising diesel engines 56 driving propellers 57. In boats of this size, the usual relatively large sewage holding tank located within the hull structure presents a hazardous condition because of possible explosion within the tank of methane gas and other explosive vapors inherently developed within such a tank. In this case, the recessed compartment 58 is formed inwardly and forwardly from the transom area and has walls similar to those forming compartments 21 and 40, and the compartment may be covered by fairing cover 59 attached to supporting bars 59' and having drain openings along its bottom edge and vents at its top and side edges. Sewage holding tank 60 may be constructed of lightweight metal, molded fiberglass or plastic material and is retained within the compartment by tie-down straps 61, with the tank resting on supporting rails 62. Sewage lines 63 are brought through the inner wall 64 of recessed compartment 58 by means of vapor and watertight connections 65 and into the top of tank 60 at 66. A pump-out connection 67 may extend through the fairing cover 59 and have a suction pipe 68 extending to the lowest point of tank 60. Suitable conventional vent connections at 69 are provided to ventilate the tank.

Construction of the sewage holding tank is such as to allow sufficient strength to support the contained liquids but to allow rupture along the back wall in case of an internal explosion, in which case the force of such explosion would be directed outwardly and in this case to the rear and blow off fairing cover 59.

In the embodiment of FIGS. 6 and 7, the boat 10' is provided with so-called "out-drive" propulsion having an inboard gasoline engine 70, heavier than the conventional outboard, driving the propeller 71 by means of an outboard drive assembly indicated generally at 72, which is used for steering when in operation and arranged to swing upwardly when not in operation.

This type of drive is frequently used in a large number of small pleasure boats by inexperienced persons who tend to be careless with regard to gasoline spillage and leakage, especially because they assume that this type of propulsion is comparable in safety to the conventional outboard engine which is wholly outside of the hull. As a result, a disproportionately large number of fire and explosion accidents have occurred with boats having out-drive propulsion.

The engine 70 is mounted in the recessed compartment 73 on a suitable support platform 74 which is carried on bottom wall 75 sloping rearwardly outwardly from the forward inner upright wall 76 of the compartment. Preferably, the side walls 77 of the compartment also slope rearwardly outwardly to direct explosive forces to the rear, and a lightweight fairing cover 78 normally closes the rear open end of the compartment, being mounted for outward detachment in case of ex-
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5 explosion. Vent and drain openings are provided around the cover 78.

If desired, a service hatch 80 of molded fiberglass or the like may be hinged at 81 to the top of the compartment with some slight sacrifice to the complete protection when the engine is completely enclosed by fire and explosion-resistant walls. Obviously, the fuel tank and any sewage tank for this embodiment may be enclosed within separate compartments recessed within the hull, similarly to those disclosed in FIGS. 1 – 5.

The improved boat hull construction provides for containing all the hazardous equipment within separate fire and explosion-resistant compartments recessed within the hull so as to protect the hull structure. The bottom walls of the compartments drain outwardly to remove any accumulation of explosion-causing liquids. The walls of the compartments contain fire and direct explosion pressures outwardly, and fairing covers mounted for outward detachment enclose the compartments in continuation of the hull surfaces. The compartments facilitate installation, repair and removal of large or hazardous equipment without removing or damaging decks and inner hull structure.

What is claimed is:

1. Boat hull construction comprising walls forming side and transom fairing surfaces determining the outer contour of said walls, said walls recessed inwardly from at least one of said fairing surfaces to form separate compartments for a fuel tank and an engine and adapted to resist explosive pressures within said compartments, at least one of the walls of each compartment being sloped toward said fairing surface to drain liquids and direct explosive forces outwardly from said compartment, and explosion-resistant ducts connecting said compartments.

2. Boat hull construction as in claim 1 in which the compartment for the engine is recessed inwardly from the transom and the compartment for the fuel tank is recessed inwardly from one side of the wall.

3. Boat hull construction as in claim 2 in which covers in continuation of said outer wall fairing surfaces are outwardly detachably mounted on said compartments.

4. Boat hull construction comprising walls forming side and transom fairing surfaces determining the outer contour of said walls, said walls recessed inwardly from said transom fairing surface to form an engine compartment adapted to resist explosive pressures within said compartment, at least one of said compartment walls being sloped outwardly toward said fairing surface to drain liquids and direct explosive forces outwardly from said compartment, said compartment having an upright forward wall, an engine mounted in said compartment for propelling the boat through a forward gear box, and a drive shaft extending forwardly through said upright forward wall for connection to the gear box.

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