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STARTING SYSTEM FOR MOTOR BOATS

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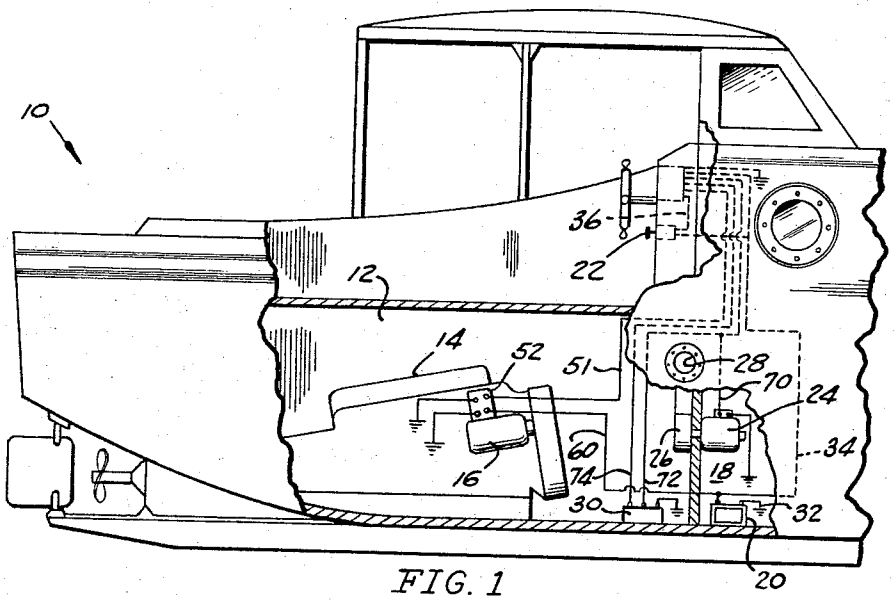

FIG. 1

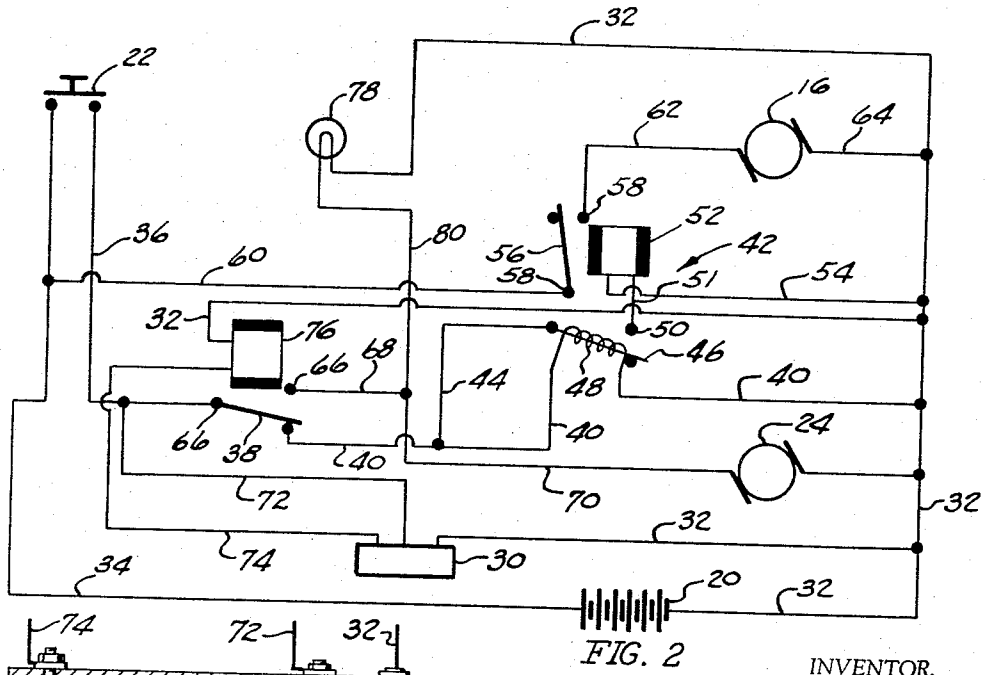

FIG. 2

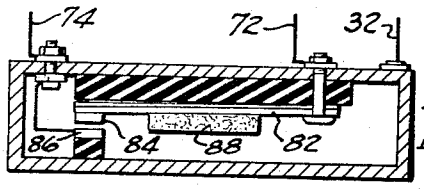

FIG. 3

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STARTING SYSTEM FOR MOTOR BOATS

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The present invention relates to a starting system for motor boats and cruisers, and more particularly to such a system which is adapted to prevent explosions in the engine room when starting a boat or cruiser.

In motor boats and cruisers having internal combustion engines which are located in closed engine compartments, explosive mixtures of gasoline or diesel fumes and air sometimes accumulate in these closed compartments. Such fumes are apt to occur for a variety of reasons, such as leaks in fuel lines, leaks in tanks, or even gasoline fumes which may escape from the carburetor.

The danger of such explosions is greatest when a boat has been idle for some period of time and when the boat operator has attempted to start the engine without properly ventilating the compartment. Under these circumstances, a spark created while starting the engine may cause a violent explosion which will completely destroy the boat, or at least, will cause an explosion or fire which may be extremely dangerous to the passengers aboard the vessel.

It is one of the objects of the present invention to increase the safety of motor boats by providing an improved starting system which will substantially, if not completely, eliminate the possibility of an explosion in the engine compartment during the time when the engine is being started.

It is another object of the present invention to provide an improved starting system of the foregoing character which includes a blower for automatically removing gaseous fumes from the engine compartment, should such fumes be present at the time when it is desired to use the starting system.

It is another object of the present invention to provide an improved starting system of the foregoing character which is constructed and arranged to include a sensing element which will automatically prevent connection of the starting circuit, including the electric starter, and will energize the circuit containing the blower, so that the blower will remove the dangerous fumes from the engine compartment.

It is still another object of the present invention to provide an improved starting system of the foregoing character which is constructed and arranged so that if no dangerous fumes are present in the engine compartment, or after such dangerous fumes have been exhausted from the compartment, the sensing device will automatically permit the electric starter to be energized, thereby enabling the operator to start the propulsion engine of the vessel in the normal manner.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawing forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

In the drawing:

FIGURE 1 is a side elevational view of a small marine vessel equipped with the present invention, part of the hull of the vessel being broken away to show the engine compartment;

FIGURE 2 is a schematic wiring diagram of the embodiment of the invention shown in FIGURE 1; and

FIGURE 3 is an enlarged fragmentary sectional view of one form of a sensing element that may be used with the illustrated embodiment of the invention.

Before explaining the present invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawing, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also, it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Referring now to the drawing, the invention will be described in greater detail. The marine vessel **10** shown in FIG. 1 includes a closed engine room compartment **12** within which is mounted a conventional marine engine **14** which has, for starting purposes, a conventional electrical starting motor **16**. In a forward compartment **18** is located a conventional electric battery **20**. The electric starting motor **16** and battery **20** are electrically connected to a starting switch **22** in a manner to be described. Also located in the forward compartment **18** is an electric motor **24** which is adapted to drive the blower **26**, the latter being located in the engine compartment **12** so that it can exhaust gaseous fumes from the compartment **12** through the exhaust duct **28** to the outside atmosphere. Also located in the engine compartment **12** is a gas sensing element **30** which will also be described in greater detail hereinafter.

Referring now to FIG. 2 of the drawings, the electric circuitry of the starting system will be described.

In the preferred form of the invention illustrated in the drawing, the starter motor **16** is in a starting circuit with the battery **20**, which circuit cannot be closed until a time delay of approximately 10 to 15 seconds occurs between closing of the starting switch **22** and energizing of the starter motor **16**. This time delay is provided to assure that the gas sensing control circuit including sensing element **30** has had adequate time to function in the intended manner so that no current can flow to starter motor **16**, even momentarily, if unwanted hydrocarbon fumes or gases are present in the engine compartment **12**.

The time delay circuit includes ground **32**, battery **20**, conductor **34** between battery **20** and starting switch **22**, conductor **36** to the solenoid operated switch **38**, conductor **40** through the time delay switch means **42** to ground **32**. Also as part of the time delay circuit is the conductor **44** which is connected to conductor **40** and extends in parallel therewith through the normally open bimetallic switch element **46**, which when caused to be heated by the winding **48** in conductor **40**, will close against contact **50** so as to close the circuit via conductor **51** through solenoid coil **52** and conductor **54** to ground **32**. Thus, it can be seen that when the starting switch **22** is initially closed, the time delay circuit normally will be energized, as described, to close after a time delay the normally open starter switch **56** across contacts **58**, by virtue of solenoid **52** being energized.

The starter switch **56** is in the starting circuit for motor **16** and closing of this switch will have the desired effect of energizing motor **16**. The starting circuit includes ground **32**, battery **20**, conductor **34**, conductor **60** connected to conductor **34** and to switch **56**, conductor **62** to starting motor **16**, and conductor **64** which is connected to motor **16** and leads to ground **32**. Thus, in normal operation, the starting circuit will not be energized until approximately 10 to 15 seconds after closing of starting switch **22**, this time delay being realized by the operation of time delay switch means **42** which controls the time of closing of switch **56** in the starting circuit.

The present starting system also includes a blower circuit with hydrocarbon gas sensing means for controlling operation of this circuit and for opening the time delay circuit described above, so as to prevent starting of motor **16** until all hydrocarbon gases have been removed from the compartment in which they have been detected. Re-

ferring to FIGS. 2 and 3, this circuitry will now be described.

The blower circuit includes the battery **20**, conductor **34** to starting switch **22**, conductor **36** from switch **22** to switch **38**, which is normally open across contacts **66**, conductor **68** which is connected to conductor **70**, and the latter is connected to blower **24** which in turn is connected to battery **20** via the ground **32**. It will be observed that switch **38**, which is normally open in the blower circuit, is normally closed in the time delay circuit, previously described. Thus, blower **24** will not be energized during the starting operation unless switch **38** is closed in the starting circuit, and such action will result in the time delay circuit being held open thereby preventing the starting motor **16** from being energized at any time while the blower **24** is in operation.

The gas sensing control circuit for selectively controlling operation of the blower circuit or the time delay circuit will now be described. The gas sensing element or device **30** is connected in the sensing control circuit which includes battery **20**, conductor **34**, switch **22**, conductor **36**, conductor **72** extending from conductor **36** to sensing device **30**, conductor **74** extending from sensing device **30** to solenoid **76** and from there to ground **32**. If the gas sensing element **30** is electrically open, then the switch **38** will remain in the position shown in FIGURE 2 and the normal starting operation described above for energizing starter motor **16** will occur. However, if gas sensing element **30** is electrically closed because of the presence of hydrocarbon gases in compartment **12**, the solenoid **76** will be energized causing switch element **38** to close across the normally open contacts **66**, thereby energizing the blower **24** and causing the time delay switch means **42** to be deenergized. Thus, it can be understood the the blower **24** will remain in operation for so long as the gas sensing element **30** remains electrically closed because of the presence of hydrocarbon gases in the compartment **12**, and when the compartment is exhausted of such hydrocarbon gases, the gas sensing element **30** will become electrically open, thereby causing solenoid **76** to be deenergized which in turn will cause switch element **38** to return to the position illustrated in FIGURE 2, and the normal starting of starter motor **16** can then occur. Also, in view of the fact that even a momentary flow of current to the motor **16** can cause an undesired spark or turning of the motor, the time delay switch means **42** is provided to assure that such momentary flow of current to motor **16** cannot occur before switch element **38** can be moved to the position across contacts **66**.

For the convenience of the operator of the boat or cruiser **10**, a warning light is provided to indicate when the blower **24** is in operation, thus indicating that a danger condition exists in the engine room. For this purpose a lamp **78** has been placed in parallel with the blower **24** by means of the conductor **80** which is connected to conductor **68** from one of contacts **66**. Thus, when switch element **38** closes across contacts **66**, a circuit is closed including battery **20**, conductor **34**, switch **22**, conductor **36** to switch **38**, conductors **68** and **80**, lamp **78** and ground **32**. The lamp **78** preferably will be located adjacent to the switch **22** so that it will be readily visible to the operator of the boat **10**.

It is to be understood that any of the conventional gas sensing devices now known may be used with the present invention. One such device is disclosed in United States Letters Patent No. 2,786,195. As shown in FIGURE 3, such as gas sensing element **30** includes a bi-metallic switch element **82** which has the property of bending when subjected to temperature changes. In this embodiment, as the temperature increases, the bi-metallic strip bends causing the contact **84** to engage the contact **86** closing the circuit through gas sensing element **30**. Attached to the bi-metallic strip **82** is sponge platinum **88**, which has the property of becoming heated when exposed to hydrocarbon gases or hydrogen, thus functioning to

cause the bi-metallic strip **82** to bend and close the circuit through gas sensing element **30**, if hydrocarbon gases are present in compartment **12**. It is to be understood, however, that any other gas sensing device may be employed in the present starting system without departing from the present invention.

Having thus described my invention, I claim:

1. In a motor boat having an engine compartment enclosing an internal combustion engine, a safety engine-starting system comprising an electric starter motor for starting said engine, a source of electrical energy, a normally open starter motor switch connected in circuit with said starter motor and said source, an electrical time delay means coupled to said starter motor switch for closing said starter motor switch a preset time period after said time delay means has been energized, a normally open starting switch connected in circuit with said source and said time delay means for energizing the time delay means when the starting switch is closed, a normally open gas sensing switch device positioned in said compartment and adapted to close so as to be electrically conductive when a predetermined amount of hydrocarbon gas is present in the ambient atmosphere, and electrically operated blower positioned to ventilate said compartment and connected in a normally open electrical circuit with said source, and a gas sensing control circuit including said gas sensing switch device and said starting switch and responsive to closing of said gas sensing switch device when said starting switch is closed for opening the circuit containing said time delay switch means and thereby maintaining open said starter motor switch and for closing the normally open circuit containing said blower and said source.

2. In a motor boat having an engine compartment enclosing an internal combustion engine, a safety engine-starting system according to claim **1** which includes a warning means which is energized when said blower is in operation.

3. In a motor boat having an engine compartment enclosing an internal combustion engine, an engine starting system comprising a first circuit including a starter motor for starting said engine, a second circuit including an electrically driven blower for removing combustible gases from said compartment, a source of electrical energy, and a control circuit including means responsive to the hydrocarbon content of the ambient atmosphere in said compartment for selectively energizing from said source either said first circuit or said second circuit in accordance with whether said hydrocarbon content is within allowable limits or in excess of such limits, respectively.

4. In a motor boat having an engine compartment enclosing an internal combustion engine, an engine starting system comprising a first circuit including a starter motor for starting said engine, a second circuit including an electrically driven blower for removing combustible gases from a selected compartment within said boat, a source of electrical energy, and a control circuit including a sensing element responsive to the absence or presence of combustible gases in the ambient atmosphere in said compartment for energizing from said source respectively said first circuit or said second circuit, a circuit associated with said first circuit and including time delay means for preventing said first circuit from being energized until said control circuit has had an opportunity to function for the purpose of selecting the circuit to be energized.

5. In a motor boat having an engine compartment enclosing an internal combustion engine, an engine starting system comprising a starter motor for said engine, a source of electrical energy, a normally open starter motor switch connected in circuit with said starter motor and said source, time delay means for closing said motor switch a predetermined time after said time delay means is energized, a normally open starting switch connected in circuit with said source and said time delay means for energizing said time delay switch when the starting switch is closed, an electric powered blower connected in circuit

with said source and said starting switch, and a gas sensing control circuit including a gas sensing element located in said compartment and said starting switch operable when said starting switch is closed and hydrocarbon gas above a predetermined amount is present in ambient atmosphere to open the circuit containing said time delay means so that said motor switch remains open and to close the circuit between said blower and said source of electrical energy.

6. In a motor boat having an engine compartment enclosing an internal combustion engine, an engine starting system according to claim 5 wherein said gas sensing control circuit is operable when said starting switch is closed and hydrocarbon gas is absent from the ambient atmosphere to maintain open the circuit between said blower and said source of energy and to close the circuit between said starting switch, said source and said time delay means.

7. In a motor boat having an engine compartment enclosing an internal combustion engine, an engine starting system according to claim 6, including a warning means to indicate when said blower is in operation.

References Cited by the Examiner

UNITED STATES PATENTS

1,387,848	8/1921	Good	123—179
2,142,210	1/1939	Rippingille	123—179
2,356,392	8/1944	Fluor	114—211
2,526,446	10/1950	Zurit et al.	307—10

FOREIGN PATENTS

1,286,531	1/1962	France.

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