

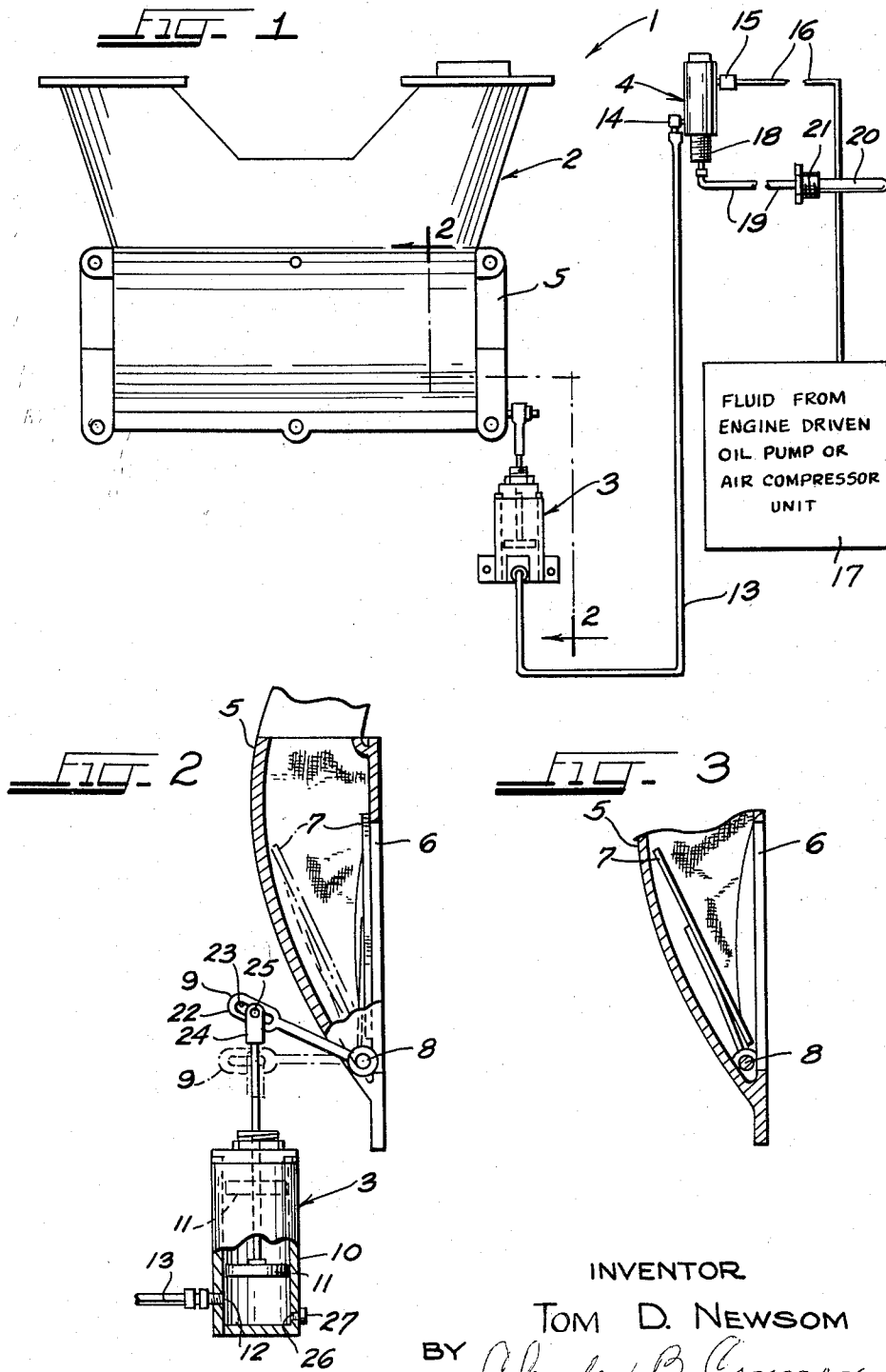
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PROTECTIVE SHUTOFF DEVICE FOR INTERNAL COMBUSTION ENGINES

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PROTECTIVE SHUTOFF DEVICE FOR INTERNAL COMBUSTION ENGINES

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This invention relates to internal combustion engines, and, more particularly, to protective shutoff devices for internal combustion engines.

It is a primary object of the present invention to afford a novel shutoff device for internal combustion engines, and the like.

Diesel engines, and other types of combustion engines, are subject to severe damage, requiring extensive and expensive repairs, if not absolute replacement, if they are operated in overheated condition. Engines of this nature are frequently operated without anyone attending them for prolonged periods of time, and under such conditions of operation the danger of such damage thereto by reason of overheated operation is particularly acute. It is an important object of the present invention to afford a novel shutoff for such engines, which may be relied upon to quickly and automatically shut off such an engine before such damage is suffered because of overheating.

Devices intended for shutting off internal combustion engines to protect the engines from overheating have been heretofore known in the art. However, such shutoff devices as have been heretofore known in the art have had several inherent disadvantages, such as, for example, being large and cumbersome in size; being complicated in construction and operation; being relatively delicate, and susceptible to ready damage and breakage; being unreliable and inefficient in operation; requiring sources of power, such as, for example, electric power, not readily available at the site of the installation of the engine; or being difficult and expensive to produce commercially, and the like. It is an important object of the present invention to overcome such disadvantages.

Shutoff devices for internal combustion engines, wherein the supply of fuel being fed to the engine was shut off for stopping the engine, have been heretofore known in the art. However, in certain types of internal combustion engines, such as, for example, diesel engines, and, particularly, when such diesel engines have become overheated, the shutting off of the fuel supply is ineffective to immediately stop the engine, such engines often continuing to run for several minutes on the sludges present therein after the normal supply of fuel thereto has been stopped. Such operation of an internal combustion engine, under overheated conditions, for such a prolonged period of time, can result in very extensive damage thereto. It is an important object of the present invention to prevent such damage to internal combustion engines.

Another object of the present invention is to afford a novel shutoff device which will quickly stop the operation of an internal combustion engine in a positive manner.

Another object is to afford a novel shutoff device of the aforementioned type which is operable to shut off the flow of combustion air thereinto, and thereby stop the engine.

Yet another object is to afford a novel shutoff device of the aforementioned type which is sensitive to the temperature of the cooling system of the engine which it controls.

A further object is to afford a novel shutoff device of the aforementioned type which may be operated from a source of power, which is normally readily available.

An object ancillary to the foregoing is to afford a novel

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shutoff device for internal combustion engines which may be operated in a novel and expeditious manner from the oil pump of the engine, or from an auxiliary source of working fluid such as, for example, an air compressor, or the like.

Another object is to afford a novel shutoff device of the aforementioned type which is small and compact in size, and which is sturdy in construction.

A further object is to afford a novel shutoff device of the aforementioned type which is practical and efficient in operation and may be readily and economically produced commercially.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawings which, by way of illustration, show a preferred embodiment of the present invention and the principles thereof and what I now consider to be the best mode in which I have contemplated applying these principles. Other embodiments of the invention embodying the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

In the drawings:

FIG. 1 is a somewhat diagrammatic, elevational view of an internal combustion engine system embodying the principles of the present invention;

FIG. 2 is a fragmentary detail sectional view taken substantially along the line 2-2 in FIG. 1; and

FIG. 3 is a fragmentary detail sectional view of a portion of the engine system shown in FIG. 2, with certain parts thereof disposed in different operative position.

An internal combustion engine system 1, embodying the principles of the present invention, is shown in the drawings to illustrate the preferred embodiment of the present invention.

The engine system 1 embodies, in general, a diesel engine 2, a fluid-cylinder 3, and a heat-sensitive valve 4. The engine 2 includes a blower horn 5 having a combustion air intake passage 6 therein. A flapper valve 7 is pivotally mounted in the blower horn 5 on a shaft 8 for movement between a fully closed position shown in solid lines in FIG. 2, wherein it is effective to close the air intake passage 6, and a fully open position, shown in broken lines in FIG. 2 and in solid lines in FIG. 3, wherein it is disposed in position to open the air intake passage 6. An arm 9 is mounted on and secured to the shaft 8 outwardly of the blower housing 5, and projects outwardly therefrom in substantially perpendicular relation thereto to afford an outwardly projecting member by which the shaft 8 and the valve 7 may be pivoted in the blower horn 5.

The fluid-cylinder 3 includes an elongated cylinder housing 10 in which is reciprocally mounted a piston 11. The piston 11 is slidable in the housing 10 between a lowermost position, such as that shown in solid lines in FIG. 2, and a fully raised position, such as shown in broken lines in FIG. 2. An inlet opening 12 is formed in the lower end portion of the housing 10, below the lowermost position of the piston 11, and one end of a suitable conduit 13 made of suitable material, such as, for example, copper tubing, is connected into the inlet opening 12. The other end of the conduit 13 is connected to an outlet 14 at the lower end of the valve 4, FIG. 1, and an inlet 15 at the upper end of the valve 4 is operatively connected by a similar conduit 16 to a suitable source 17 of working fluid. The source of working fluid 17 is shown diagrammatically in FIG. 1, and may be any suitable source of working fluid, such as, for example, the oil pump of the engine 2, or an auxiliary source of working fluid, such as, for ex-

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ample, an air compressor, which is operable by the engine 2 but which does not form an integral part thereof.

The valve 4 is normally closed, to thereby normally prevent the flow of working fluid therethrough from the inlet 15 to the outlet 14. The valve 4 is adapted to open under the influence of any suitable thermal responsive means, such means being somewhat diagrammatically shown herein as consisting of a bellows 18 connected by a suitable tube 19 to a bulb 20 containing a readily expansible fluid. Valve actuators of this type are well known in the art. The bulb 20 in the engine system 1 is disposed in the cooling system of the engine 2, in contact with the coolant flowing therethrough. For example, the bulb 20 may be mounted in the water jacket of a diesel engine, the bulb 20 including a coupling member 21 by which it may be secured in such a water jacket.

The free end 22 of the arm 9 on the shaft 8 has an elongated slot 23 formed therein, and the free end 24 of the piston 11 is operatively connected to the arm 9 by suitable means such as a pin or bolt 25 extending through the free end 24 of the piston 11 and the slot 23 in the arm 9. The fluid-cylinder 3 and the arm 9 are so disposed relative to each other that movement of the piston 11 in the cylinder housing 10 between the aforementioned lowermost position and fully raised position thereof is effective to move the arm 9 between a fully lowered position, as shown in broken lines in FIG. 2, and a fully raised position, as shown in solid lines in FIG. 2, to thereby move the valve 7 between the aforementioned fully opened and fully closed positions, respectively.

In the operation of my novel engine system 1, the valve 4 is normally closed, and the piston 11 is normally disposed in the aforementioned lowermost position to thereby dispose the valve 7 in fully open position. However, if during operation of the engine 2, the temperature of the coolant therein rises to a predetermined temperature such as, for example 200 degrees Fahrenheit, which is above the desired normal operating temperature of the engine, the bulb 20 is sufficiently heated by the coolant, which is in contact therewith, that the thermal responsive means 18-20 is effective to open the valve 4. The opening of the valve 4 permits working fluid, such as the aforementioned oil or compressed air, to flow under pressure from the source 17 of working fluid through the conduit 16, the valve 4, and the conduit 13 into the lower end portion of the cylinder housing 10, to thereby raise the piston 11 into its fully raised position shown in broken lines in FIG. 2. This movement of the piston 11 is effective to move the flapper valve 7 into fully closed position, to thereby completely stop the flow of combustion air through the intake passage 6 into the engine 2. Such stopping of the combustion air into the engine 2 is effective to quickly stop the operation of the engine 2.

A bleed opening 26 may be afforded in the bottom of the cylinder housing 10, a suitable plug, such as, for example, a threaded plug 27 being normally mounted in the opening 26 to thereby close the same. After the piston 11 in the fluid-cylinder 3 has been moved to the aforementioned fully raised position by the flow of working fluid into the cylinder housing 10 below the piston 11, the valve 7 will remain closed until the fluid pressure in the lower end of the cylinder housing 10 has been relieved. In some installations such relief of the fluid pressure in the cylinder housing 10 may occur through opening of the valve 4, when the bulb 20 cools sufficiently to permit such opening. However, if desired the fluid pressure in the cylinder housing 10 may be relieved by removing the plug 27 and permitting the working fluid to drain out of the cylinder housing 10. The arm 9 and the piston 11 may then be manually moved to lowermost position, to thereby open the valve 7. If the plug 27 has been removed, it may then be reinserted into the bleed opening 26, and the engine system 1 is again ready to resume normal operation.

From the foregoing, it will be seen that I have afforded a novel internal combustion engine system which is effective to stop, in a positive manner, the operation of an internal combustion engine which has become heated to a temperature above the normal desired temperatures of operation.

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Also, it will be seen that I have afforded such a novel internal combustion engine system which may be relied upon to automatically operate in the desired manner even when the engine is unattended.

Also, it will be seen that my novel shutoff device may be actuated from power sources, such as oil pumps, and the like, which are readily available on operating internal combustion engines.

In addition, it will be seen that I have afforded a novel engine shutoff device which is practical and efficient in construction and operation, and which may be readily and economically produced commercially.

Thus, while I have illustrated and described the preferred embodiment of my invention, it is to be understood that this is capable of variation and modification, and I therefore do not wish to be limited to the precise details set forth, but desire to avail myself of such changes and alterations as fall within the purview of the following claims.

I claim:

1. In an engine system including an internal combustion engine having coolant therein, and having an air intake,
 - (a) a valve mounted in said system and movable between one position effective to open said air intake and another position effective to close said air intake,
 - (b) said valve being normally disposed in said one position during normal operation of said engine,
 - (c) a fluid-cylinder including
 - (1) a cylinder housing, and
 - (2) a piston including an extension rod means thereon,
 - (a') the extension rod being directly mechanically connected to said valve, and
 - (b') said piston and extension being reciprocable as a unit in said cylinder housing for moving said valve between said positions, and
 - (d) means for moving said piston and thereby moving said valve to said other position during operation of said engine when the temperature of said coolant exceeds a predetermined temperature,
 - (e) said means comprising
 - (1) means for feeding working fluid into said cylinder housing, and
 - (2) heat-sensitive valve means
 - (a') disposed in position to be controlled by the temperature of said coolant, and
 - (b') operatively connected to said feeding means for controlling the flow of working fluid therethrough.
2. In an engine system including an internal combustion engine having a cooling system through which coolant flows in the normal operation of said engine, and having a combustion air intake passageway,
 - (a) a flapper valve pivotally mounted in said intake passageway,
 - (b) said valve being pivotable between
 - (1) one position effective to close said passageway to thereby prevent the passage of air therethrough, and
 - (2) another position effective to permit the passage of air through said passageway,
 - (c) and means for pivoting said valve from said other position to said one position to thereby close said passageway and prevent the flow of air through said passageway when the temperature of the coolant in said cooling system exceeds a predetermined temperature during the operation of said engine,
 - (d) said means including
 - (1) a fluid-cylinder operatively connected to said

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valve and operable upon actuation to move said valve to said one position,

(2) means for feeding working fluid under pressure to said fluid-cylinder for so actuating the latter, and

(3) heat-responsive valve means for controlling the flow of working fluid through said feeding means,

(4) said means for pivoting said valve comprising an integrally attached shaft extension, a rod directly mechanically attached to said extension, and a piston operable in said cylinder and directly connected to said rod,

(e) said heat-responsive valve means being operatively connected to said cooling system in position to be responsive to variations in the temperature of said coolant.

3. In an engine system including an internal combustion engine having a cooling system through which coolant flows in the normal operation of said engine, and having a combustion air intake passageway,

(a) a flapper valve pivotally mounted in said intake passageway,

(b) said valve being pivotable between

(1) one position effective to close said passageway to thereby prevent the passage of air there-through, and

(2) another position effective to permit the passage of air through said passageway,

(c) an arm directly carried by and projecting outwardly from said valve,

(d) and means for pivoting said valve from said other position to said one position to thereby stop the flow of combustion air through said passageway,

(e) said means comprising

(1) a cylinder,

(2) a piston reciprocally mounted in said cylinder and directly mechanically connected to said arm,

(3) means for feeding working fluid into said cylinder for moving said piston through a path of movement effective to move said valve to said one position, and

(4) means for controlling the feeding of working fluid into said cylinder,

(f) said last-named means comprising

(1) a valve operatively connected to said feeding means, and

(2) heat-sensitive means

(a') operatively connected to said valve and to said cooling system and

(b') operable to open said valve and permit the flow of said working fluid to said cylinder when the temperature of said coolant exceeds a predetermined temperature.

4. The combination defined in claim 3, and in which said means for feeding working fluid includes an oil pump mounted on said engine and operable thereby.

5. The combination defined in claim 3, and in which said means for feeding working fluid includes an air compressor operably connected to said valve for feeding compressed air thereto.

6. In an engine system,

(a) a diesel engine having

(1) a cooling system, and

(2) a blower housing therein, having

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(a') a combustion air passageway therein,

(b) a flapper valve pivotally mounted in said intake passageway,

(c) said valve being pivotable between

(1) one position effective to close said passageway to thereby prevent the passage of air there-through, and

(2) another position effective to permit the passage of air through said passageway,

(d) an arm integrally attached to and projecting outwardly from said valve,

(e) a fluid-cylinder including

(1) a cylinder housing, and

(2) a piston including an extension rod reciprocally mounted in said cylinder,

(f) said piston and said rod being

(1) directly mechanically connected to said arm, and

(2) reciprocable in said cylinder between one position effective to dispose said flapper valve in position effective to open said passageway, and another position effective to dispose said flapper valve in position to close said passageway,

(g) fluid feeding means operatively connected to said cylinder for feeding working fluid therein under pressure and thereby move said piston to said other position,

(h) and means for controlling the flow of said working fluid through said feeding means,

(i) said control means comprising a heat-sensitive valve in said feeding means and operatively connected to said cooling system and operable to open said feeding means to thereby permit said working fluid to flow therethrough into said cylinder when the temperature of said cooling system is above a predetermined temperature.

7. An apparatus for shutting off the air supply to an internal combustion engine for immediately stopping the engine in response to an overheated condition of a selected part thereof comprising, in combination, a shutoff valve for stopping the flow of air to the cylinders of said engine, arm means integrally attached to said valve for moving it between an open and a closed position, means for supplying a closing motion to said arm means in response to fluid pressure in a fluid supplied from a pressure-storing device to which fluid is supplied by engine operation, said means for supplying said closing motion including a fluid cylinder, a piston in said cylinder, an extension rod directly attached to said piston, said rod being directly attached to said arm, a displaceable check valve keeping said source of pressure from operating said piston to close said valve, and means responsive to an increase in temperature for displacing said check valve, whereby, in response to said overheated condition, said check valve allows said pressure in said pressure-storing device to close said shutoff valve.

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