Nov. 2, 1943. S. W. GRAHAM 2,333,370

AUTOMATIC SHUTOFF

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Fig. 1.

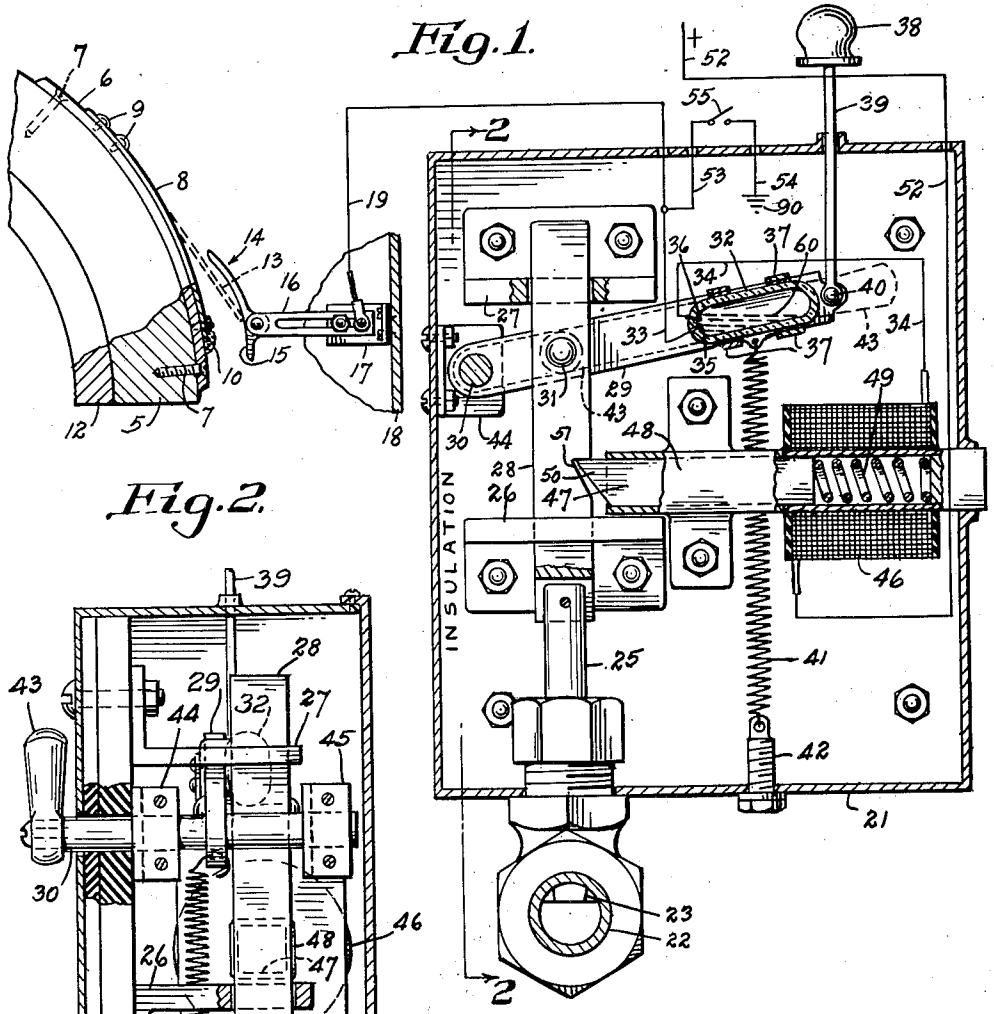
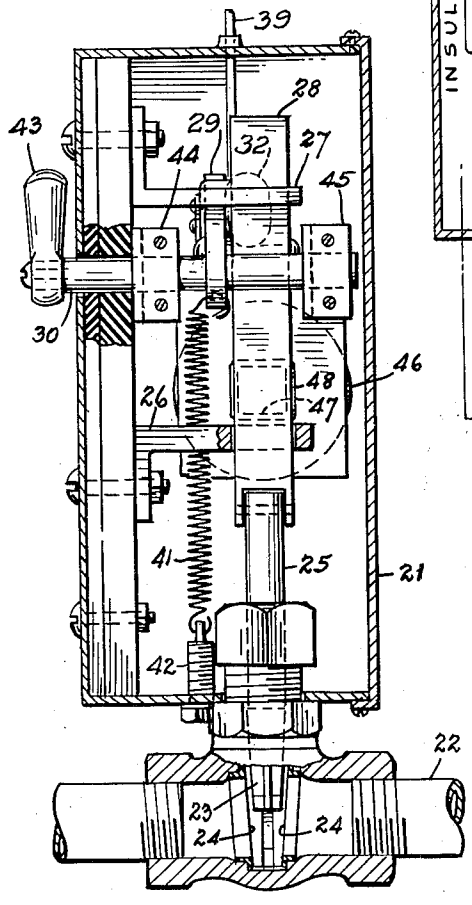


Fig. 2.



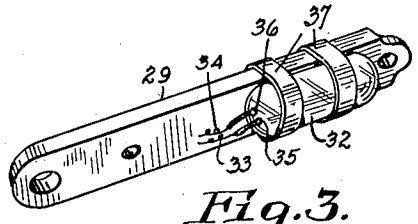


Fig. 3.

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Fig. 4.

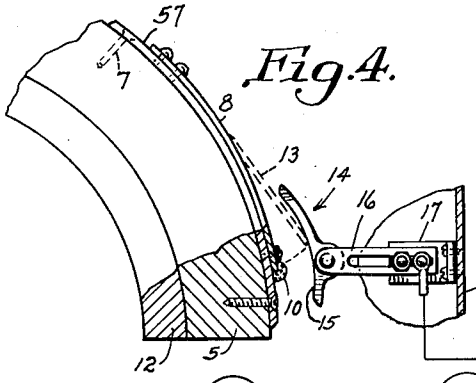


Fig. 6.

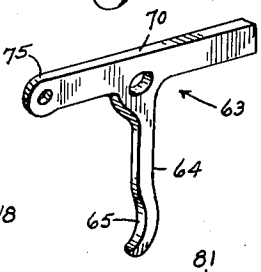


Fig. 5.

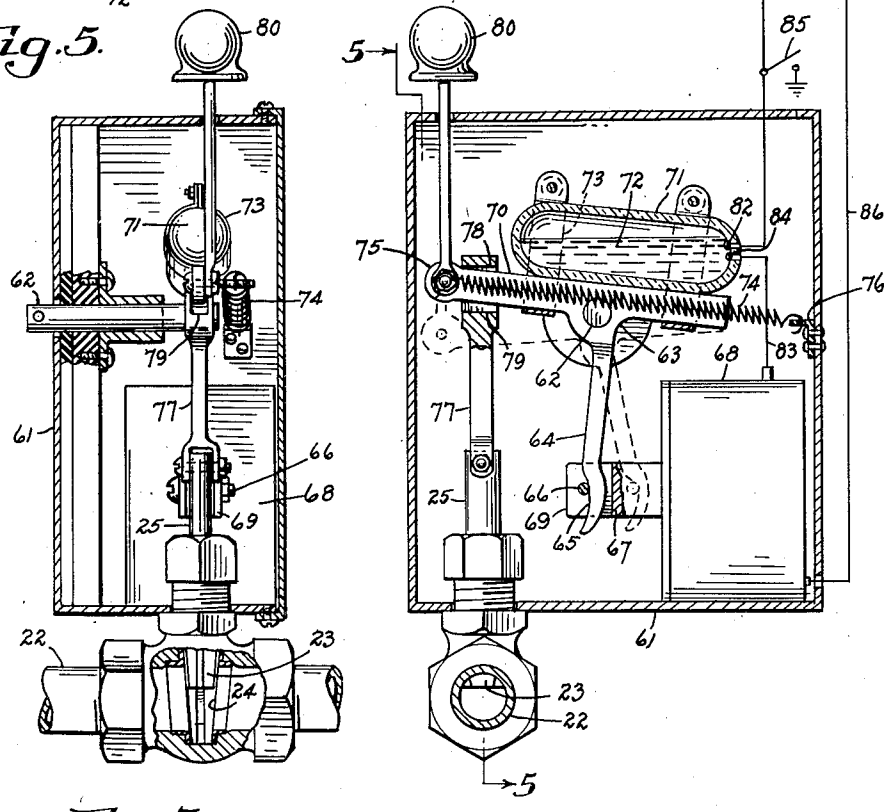
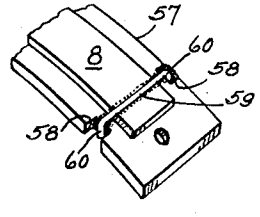


Fig. 7.



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Patented Nov. 2, 1943

2,333,370

UNITED STATES PATENT OFFICE

2,333,370

AUTOMATIC SHUTOFF

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Application September 16, 1940, Serial No. 356,903

4 Claims. (Cl. 74—2)

My invention relates to an automatic shutoff, and more particularly to an automatic shutoff for internal combustion engines.

In Diesel engines, the cracking up of babbitt is not accompanied by a clearly perceptible knocking that signals to the operator that something is wrong. Thus it is possible for the babbitt to break up to the point where the connecting rod bearing of a Diesel engine becomes overheated and worn, and damages the crank shaft, without the operator knowing of it.

An object of the present invention is to provide means for automatically shutting off the Diesel engine when the babbitt has worn down to a point where the connecting rod bearing begins to overheat. Thus the Diesel engine is stopped before the bearing burns out and before any damage is done to the crank pin on the crank shaft. An injured crank shaft is of course rather expensive to replace, and it is to avoid such expense that is an object of the present invention.

My invention also has for its objects to provide positiveness in operation, economy of manufacture, greater speed of operation, general superiority in serviceability, relative simplicity, inexpensiveness in construction, and greater general efficiency.

The invention also comprises novel details of construction and novel combinations and arrangements of parts, which will more fully appear in the course of the following description. However, the drawings merely show and the following description merely describes one embodiment of the present invention, which is given by way of illustration or example only.

In the drawings, like reference characters designate similar parts in the several views.

Figure 1 is a broken, vertical section through an embodiment of my invention.

Figure 2 is a section taken on the line 2—2 of Figure 1.

Figure 3 is a perspective view of a mercury switch arm comprised in the invention.

Figure 4 is a view similar to Figure 1, but showing a modified construction.

Figure 5 is a section taken on the off-set line 5—5 of Figure 4.

Figures 6 and 7 are perspective views of details comprised in the embodiment, which will hereinafter be more fully described.

Referring more in detail to the drawings, the reference numeral 5 designates a broken-away portion of a connecting rod bearing, to which a plate 6 has been screwed, as shown at 7. The plate 6 is curved similarly to the curvature of the bearing 5.

A resilient contact 8 is riveted at one end to the plate 6, as suggested at 9. The opposite end of the contact 8 is bent and held under tension against the side of the plate 6, by means of fusible solder 10. The solder 10 is preferably, although of course not necessarily, fusible at 300° F. which is sufficient under ordinary working conditions, but is well below the melting temperature of the bearing 5, in case it is subjected to excessive cracking. When the contact 8 is thus soldered to the plate 6, the contact is bent to conform with the curvature of the plate 6. When the connecting rod becomes overheated by reason of the babbitt 12 becoming overheated, the heat causes the solder 10 to melt, permitting the resilience of the contact 8 to move such contact to the position shown by broken lines 13.

Another contact 14 in the circuit has a curved contact face 15. When the contact 8 is soldered in position upon the plate 6, there is no engagement between the contacts 8 and 14, but when the solder 10 is melted, the contact 8 springs outwardly so that it engages the contact 14 in the rotation of the bearing 5.

The contact 14 is adjustably fastened on an arm 16, which in turn is held on a bracket 17 that is insulated from housing 18 of the apparatus. A wire 19 connects the arm 16 and contact 14 in the circuit. The bearing 5 and the contact 8 are grounded through the frame of the engine, to include the contact 8 in the circuit.

A housing for the mechanism for shutting off the engine is suggested at 21. Depending from the housing 21 is a fuel line 22 for feeding fuel to the engine. A tapered valve 23 engages opposed seats 24 to shut off the fuel line 22. A needle valve may be used for the gate valve 23.

A vertical operating bar 25 controls the shutoff valve 23. Brackets 26 and 27 provide guides for sliding bar 28, which is pinned to bar 25 and effects vertical motion of the latter bar.

A lever arm 29, fulcrumed on the shaft 30, is pivotally connected to the bar 28 at 31. The shaft 30 is mounted in brackets 44, 45. The outer end of the lever 29 carries a mercury switch 32. Wires 33 and 34 connect with contacts 35 and 36 in the tube 32. Clamps 37 maintain the mercury tube on the lever 29. A knob 38 exteriorly of the housing 21 is mounted on a rod 39 that connects with the outer end of the lever 29, at the point 40.

A coiled spring 41 is connected with an adjust-

ing screw 42 in the housing 21. The spring 41 tends to pull the lever arm 29 downward. A crank handle 43 is fastened on the outer end of the shaft 30, to aid in re-setting the mercury switch and in re-setting the valve.

A solenoid or electromagnet 46 controls a core member 47, which is slidable in a sleeve 48. A coil spring 49 is disposed behind the core member 47. The core member 47 has a pointed end 50 to engage in a notch 51 in the sliding bar 28.

A wire 52 connects with a grounded source of electrical energy (not shown). Wire 52 connects with one end of the winding of the solenoid 46, while the wire 34 connects with the opposite end of the solenoid winding. Wires 19 and 33 connect with a wire 53, and a wire 54 connects with a ground 90. A manual switch 55 is arranged to make and break the circuit through the wires 53 and 54, to permit periodic testing.

In the modified form shown in Sheet II, a plate 57 having notches 58 is substituted for the plate 6. Contact 8 in Sheet II is not only held down by solder 10, but also by a clip 59 whose bent ends 60 are disposed in the notches 58. The clip is also soldered in position, as denoted by dots in Figure 7. The bent ends 60 are firmly anchored in the notches 58 by solder.

One side of housing 61, in the modified construction, supports a pivot 62, which pivotally supports a rocker 63. Depending from the rocker 63 is a finger 64 having a hooked end 65.

The hook 65 engages a pin 66 on a core 67 of a solenoid 68. The end 69 of the core 67 is bifurcated to receive the hook 65.

A bar 70 of the rocker 63 supports a closed tube 71 containing a body of mercury 72. Straps 73 hold the mercury tube on the bar 70.

An over-center, snap-acting spring 74 connects an end 75 of the bar 70 with a bracket 76 on an opposed wall of the housing. The rocker is arranged for the spring to snap the spring to one side or the other of the pivot 62, to provide a quick make or break of the circuit.

A link 77 connects the bar 25 with arm 75 of the bar 70. The link 77 provides abutments 78 and 79 at opposite sides of the arm 75, in order that the rocking motion of the rocker 63 may close and open the valve 23. A handle 80 is provided to control manually the rocking motion of the rocker 63.

A wire 81 connects conductive bracket 17 with contact 82 in the mercury switch, while wire 83 connects the other contact 84 in the switch with the solenoid 68. A manual switch 85 is arranged to ground the circuit manually for testing the automatic unit in the box or housing 21. Wire 86 connects the solenoid to a suitable source of electrical energy (not shown).

During the ordinary operation of the engine, the connecting rod bearing 5 is at a temperature below the melting point of the solder 10. During this normal operation of the engine, the contacts 8 and 14 are out of engagement with each other, so that the present apparatus is rendered inoperative.

When the babbitt 12 overheats from any cause to the point where it needs to be replaced, bearing 5 becomes overheated, thus raising its temperature above the melting point of the solder 10. This releases the contact 8, which by reason of its resilience springs outward to the dotted line position 13, so that in the next revolution of the bearing 5, the contacts 8 and 14 engage each other, thus energizing the solenoid 46. The core 47 is thereby withdrawn from engagement with the notch 51 in the bar 28. The spring 41 thereupon swings the lever 29 downwardly, as these parts are shown in Figure 1. This movement of the lever 29 causes downward movement of the bar 25, which closes the valve 23, thus shutting off the engine.

Said downward movement of the lever 29 causes the mercury tube 32 to tip to a position in which the body of mercury 60 flows away from the contacts 35 and 36. The circuit of the solenoid 46 is thereby broken when the valve 23 closes. Thus the solenoid 46 will not burn out even though the bearing 5 stops in a position in which the contacts 8 and 14 are in engagement with each other.

The mechanism is reset by re-soldering the contact 8 to its full line position, and raising the lever 29 to its position shown in the drawings, by means of the knob 38 and/or the crank arm 43. When the bar 28 is raised, the spring 49 urges the iron core 47 into engagement with the notch 51 of the bar 28. The mercury 60 has again closed the solenoid circuit, so that the solenoid may be energized as soon as the contacts 8 and 14 again engage each other. Raising of the bar 28 again opens the fuel line 22.

For the normal operation of the modified construction, the manual switch 85 is opened. The spring contact 8 operates in the modified construction the same as heretofore described, except that the clip 59 aids in maintaining the spring contact in the full line position shown in Figure 4, until the solder is fused.

When the solder melts and the contact springs to the broken line position 13, the circuit of the solenoid is closed, since the normal position of the mercury switch is as shown in Figure 4. Closing said circuit energizes the solenoid, whereby its core 67 is drawn to the right in said figure. This movement of the core, rocks the rocker 63 so that the finger 64 is moved to its broken line position.

This movement of the rocker 63 closes the valve 23 in the fuel line. The spring 74 causes the valve to snap to its closed position. At the same time, the mercury switch is tipped, causing the mercury to flow away from the contacts 82, 84, so as to break the solenoid circuit.

The mercury switch and valve are re-set by means of the handle 80, after the babbitt in the bearing is repaired and after the contact 8 is re-set. The spring 74 tends to hold the mercury switch in this re-set position, which is the position shown in the drawings. The spring 74 also tends to maintain the valve 23 in an open position.

While I have illustrated and described what I now regard as the preferred embodiment of my invention, the construction is, of course, subject to modifications without departing from the spirit and scope of my invention. I, therefore, do not wish to restrict myself to the particular form of construction illustrated and described, but desire to avail myself of all modifications which may fall within the scope of the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In a device for controlling operation of an engine having an orbitally moving connecting rod bearing subject to excessive heat therein, orbitally moving rotary means having a curved outer surface, means comprising a flat spring secured under tension in arcuate form on said curved surface, a part of said spring being movable laterally of said bearing upon release of

tension of said spring in response to heat of predetermined degree transmitted to said rotary means from said bearing.

2. In a device for controlling the operation of an engine, a part adapted to move orbitally, said part having a curved outer surface, a spring which when not under tension is flat with its flexing surfaces in parallel planes, said spring being secured near one of its ends to the curved outer surface of said first-mentioned part by means resistant to the abnormally excessive heat, and its other end being secured to said last-mentioned curved surface by means resistant to normal temperatures of said engine but fusible under abnormally excessive heat so when fused to release the end of said spring.

3. In a device for controlling the operation of an engine having a part with a curved exterior surface subject to excessive heat, means comprising a flat spring secured by means resistant to such excessive heat at one of its ends to the curved surface of said first-mentioned part, said spring being flexed in arcuate form to provide tension and secured on said curved surface at its other end by means fusible by such excessive heat, said flat spring being adapted upon the fusing of said last-mentioned means and release of its tension to assume a position parallel with a chord of the surface of the part to which it is attached.

4. In a device for controlling the operation of an engine, a rotatable part subject to excessive heat during abnormal operation of said engine, said part being enclosed within a member having a curved exterior surface, means comprising a flat spring of long rectangular form which, when not under tension, will retain its flexing surfaces in parallel planes, said spring being secured by means resistant to such excessive heat, adjacent one of its ends, to the exteriorly curved surface of said member, means adjacent the other end of said spring to secure it under tension in arcurate form on said curved exterior surface of said rotatable member, said last-mentioned means being fusible under such excessive heat and adapted when in fused condition to release said spring from its arcuate tensioned position, and means adapted to contact with the free end of said spring when said spring is not under tension.

STANLEY W. GRAHAM.