Jan. 20, 1970 J. P. WELSH 3,490,427

GLOW PLUG TIMER

Filed Feb. 7, 1968

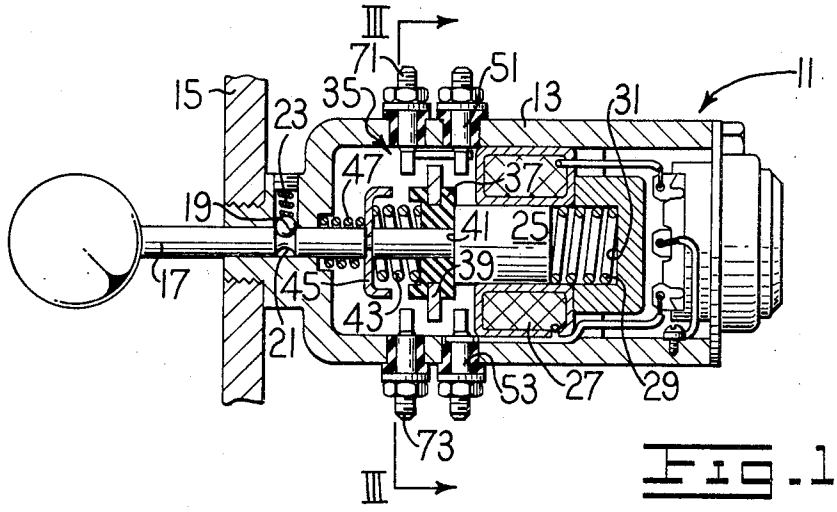


FIG. 1.

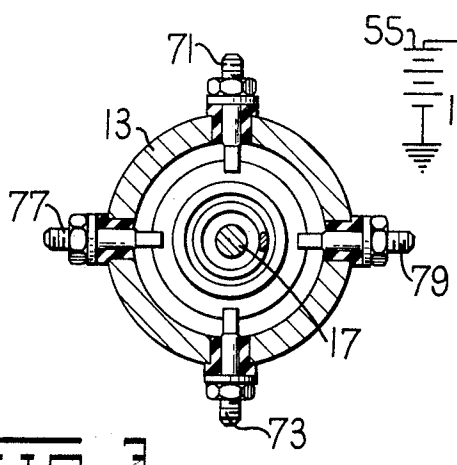


FIG. 3.

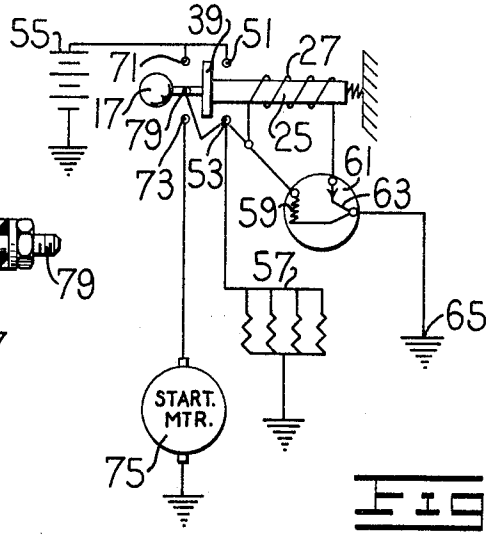


FIG. 2.

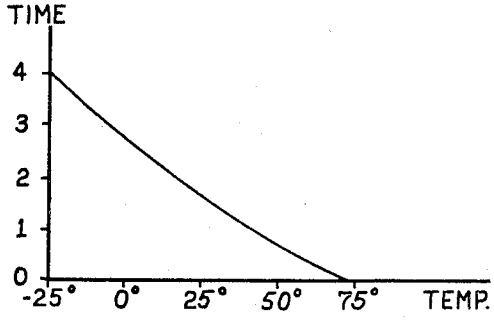


FIG. 4.

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GLOW PLUG TIMER

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U.S. Cl. 123—179 1 Claim

ABSTRACT OF THE DISCLOSURE

A diesel engine precombustion chamber automatic heating device having an electromagnetic circuit breaker manually actuated so as to commence the heating of the chambers and thermostatically released upon the attainment of a predetermined temperature in the chambers.

Starting a diesel engine is often a rather difficult task when the ambient temperature is low. In order to ease this difficulty, it has become known that a warming of the combustion or precombustion chambers will reduce the time and energy required to start the engine.

Of the many ways to heat the chambers of an engine, the use of glow plugs has become very prevalent. However, the length of time a glow plug must be energized to provide a properly heated chamber is dependent upon the ambient temperature at which the diesel engine will be started. In engines using the glow plugs, it has been found that vehicle operators often are unable to accurately judge the time required for the glow plugs to be energized. This results in improper heating of the precombustion chambers and hard starting is encountered in spite of the glow plugs.

Thus it has become almost imperative that a timing device be provided so that an accurate energization time may be obtained. The timing devices heretofore known, however, have proven to be highly complicated and expensive mechanisms.

It is therefore an object of the instant invention to provide a means to improve the starting characteristics of an internal combustion engine.

It is an object of this invention to provide a device for accurately heating the precombustion chamber of an internal combustion engine so as to produce satisfactory starting characteristics in that engine.

It is also an object of this invention to provide a device which will automatically discontinue the heating of the precombustion chambers when the desired temperature has been reached.

It is a further object of this invention to provide an inexpensive and simple mechanism for warming the precombustion chambers of an internal combustion engine to a predetermined temperature while obviating the problem of "operator error."

Other objects of the invention will become apparent to those skilled in the art upon reading the following description with reference to the accompanying drawing.

In the drawing:

FIG. 1 shows a sectional side view of the preferred embodiment of the invention;

FIG. 2 shows a schematic diagram of the electrical circuitry of the invention;

FIG. 3 shows a view of the device taken along the line III—III of FIG. 1; and

FIG. 4 is a graph showing the relationship between ambient temperature and time required for heating the precombustion chambers of the engine.

Referring now to the drawing in greater detail, there is shown in FIG. 1 a timing mechanism **11** having a housing **13** which is suitably secured to a support member **15**. Extending longitudinally through a portion of the

housing, a control rod **17** is held in the position shown in FIG. 1 by a detent **19** which is biased into a groove **21** in the rod by a spring **23**.

When rod **17** is moved to the right as shown in the drawing, the detent **19** is forced out of the groove and an end **25** of the rod slidable within a coil **27** aligns with the coil and compresses a spring **29** disposed between end **25** and a face **31** of the housing.

A contact assembly **35** is mounted on rod **17** consisting of an insulator **37** and a contact plate **39**. The assembly **35** is urged against a shoulder **41** of the end **25** of rod **17** by a spring **43** disposed between the insulator **37** and a cup-shaped spring holder **45** which is, in turn, biased to its holding position by a spring **47**.

Rightward movement of the rod **17** causes the contact plate **39** to enter into contact with electrical terminals **51** and **53**. Referring to FIG. 2, the cooperation of plate **39** with contacts **51** and **53** causes the completion of a circuit between a battery **55** and glow plugs **57**. One end of coil **27** is also energized by the contact of the plate **39** with terminal **53**, as is a resistor **59** in a fixed temperature thermostat **61**. The other end of coil **27** is connected to a thermal disc **63** in the thermostat and the resistor and disc are grounded as shown at **65**.

As current flows through the coil **27**, the end **25** of the rod is restrained in the rightward position and contact plate **39** is held in contact with terminals **51** and **53**. Current passing through resistor **59** in the thermostat causes heat to be generated and at a predetermined temperature, thermal disc **63** will snap to an open position breaking ground contact of the coil **27**. The biasing force of spring **29** will then urge rod **17** to the left until detent **19** again enters groove **21**.

When this snap action has occurred, rod **17** may then be manually moved to the left as shown in the drawing, bringing contact plate **39** into contact with terminals **71** and **73**. This causes completion of an electrical circuit from battery **55** to the starting motor **75** and the starting motor begins to crank the engine for starting.

When contact plate **39** contacts terminals **71** and **73**, it will also come into contact with a third set of terminals **77** and **79** and the contact with terminal **79** will cause a continuation of the heating by the glow plugs until the engine is started and the rod **17** is returned once again to the central position of FIG. 1.

As shown in FIG. 4, as the ambient temperature increases, the amount of time required for heating by the glow plugs is decreased. This relationship is a function of the fixed temperature thermostat **61** so that when the suitable starting temperature in the precombustion chamber has been attained, thermal disc **63** will snap open releasing rod **17**.

Thus applicant has provided a new and improved glow plug timing device which presents a true advancement in the art in view of its dependability, simplicity, and low cost of manufacture.

I claim:

1. A glow plug actuating and timing device comprising

a housing,

a coil fixedly mounted within the housing,

a spring mounted within the coil and abutting a face of said housing,

a manually actuatable rod extending into said housing and abutting said spring in axially slidable relationship relative to said coil,

means within said housing for biasing said rod to a first position,

means for positively retaining said rod in said first position,

a contact member mounted on said rod,

a first set of contacts in said housing for cooperation with said contact member to actuate said coil when

the rod is moved to a second position by forceably overcoming said positive retaining means and said spring whereby said rod is retained in said second position by the magnetic field of said coil,

at least one glow plug electrically connected to said first set of contacts for actuation when said rod is moved to said second position,

a heat generating device similarly connected to said first set of contacts in parallel relationship with said at least one glow plug,

a switch actuated to an open position by the heat generated by said heat generating device at a predetermined temperature thereof, said switch being in series relationship with said coil, and said switch and coil being in parallel relationship with said heat generating device and with said at least one glow plug, whereby actuation of said switch opens the electrical circuit of said coil and said biasing means motivate said rod into said first position,

an engine starter motor,

a second set of contacts in said housing for cooperation with said contact member to actuate said starter motor when the rod is moved to a third position by forceably overcoming said positive retaining means, and

means connecting said at least one glow plug to said second set of contacts for actuation thereof while said starter motor is being actuated.

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U.S. Cl. X.R.

123—32, 145; 335—107