

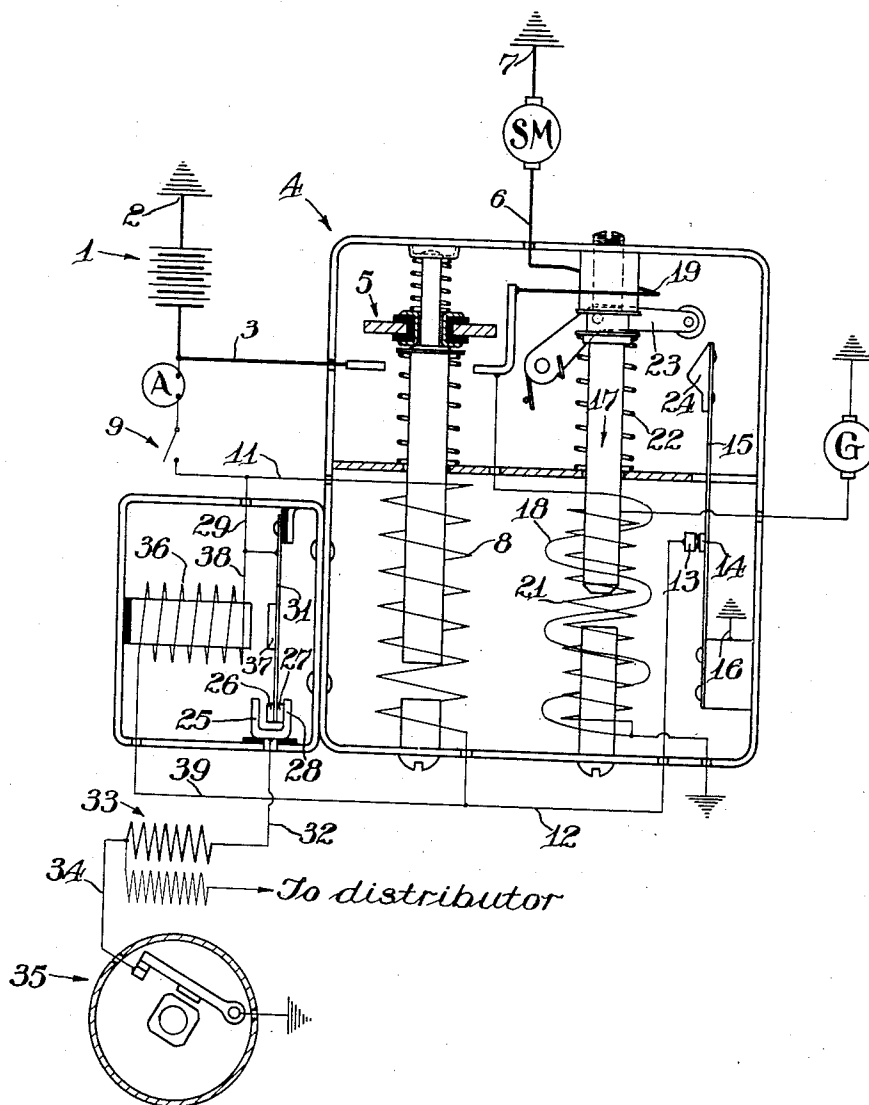
March 10, 1936.

D. L. WERTZ

BACKFIRE STOP

Filed Nov. 24, 1931

2,033,364



INVENTOR
BY *Daniel L. Wertz*
Clinton S. Jones
ATTORNEY

UNITED STATES PATENT OFFICE

2,033,364

BACKFIRE STOP

Daniel L. Wertz, Elmira, N. Y., assignor to Eclipse Machine Company, Elmira, N. Y., a corporation of New York

Application November 24, 1931, Serial No. 577,123

8 Claims. (Cl. 290—37)

This invention relates to a back-fire stop and more particularly to a device for restricting the recurrence of back-firing especially in connection with automatic starting mechanism.

5 Back-firing of internal combustion engines due to improperly timed ignition or other causes is undesirable particularly in connection with certain forms of automatic starting mechanism which may operate to engage the starting mechanism during the backward rotation of the engine thus putting unnecessary stresses on the parts of the starting mechanism.

10 It is an object of the present invention to provide a novel device for restricting back-firing of internal combustion engines.

It is another object of the invention to provide such a device which is adapted to prevent firing of the engine for a time interval after said engine reverses its rotation.

20 It is a further object of the invention to provide in connection with an automatic starting mechanism a novel device for making the ignition system of an engine inoperative in order to allow the engine to come to rest from reverse rotation before the actuation of the starting mechanism.

25 Further objects and advantages will be apparent to those skilled in this art from the following description taken in connection with the accompanying drawing in which the figure is a semi-diagrammatic illustration partly in section of a preferred embodiment of the invention.

30 Referring to the drawing, there is illustrated an electrical system for an internal combustion engine, not shown, comprising a starting circuit, and an ignition circuit. The starting circuit comprises a battery 1, grounded at 2 and connected by a lead 3 to an automatic starting mechanism indicated generally at 4 and comprising an electrically operated starting switch 5 connected by a lead 6 to the starting motor SM which is grounded at 7. The starting switch 5 is arranged to be operated by a solenoid 8 which is included in a control circuit comprising a switch 9 which may be the ignition switch of the engine, leads 11 and 12, fixed contact 13, and movable contact 14 mounted on spring strip 15 which is grounded at 16. The arrangement of this circuit is such that when contacts 13, 14 are closed, closure of the switch 9 will cause energization of solenoid 8 to close the starting switch 5.

55 Contact 14 is actuated by a solenoid plunger 17 the action of which is controlled by a voltage

coil 18, a current coil 19 in the starting circuit, and a coil 21 energized by the generator G driven from the engine. The plunger 17 is normally maintained in its upper position as by means of a spring 22 and is retained in that position during cranking by the current coil 19, but when the engine starts the voltage coil 18 overcomes the action of coil 19 and spring 22, retracting the plunger 17. A lever 23 pivoted at one end as at 23' is provided with a pin 232 at an intermediate point thereof adapted to extend laterally between a pair of flanges 233 and 234 suitably formed on the end of the magnetic plunger 17, whereby longitudinal motion of the plunger 17 is caused to swing the lever 23 about its pivot. The free end of lever 23 is provided with an engaging element 235 preferably in the form of a roller which is adapted to engage a tapered weight element 24 fixed on the end of the spring strip 15. A suitable spring 236 is provided for normally holding the lever 23 in its upper or disengaged position, and for returning it to that position upon release of the magnetic plunger 17.

Under the usual operating conditions, the plunger 17 is retained in its retracted position by the generator coil 21. Should the engine back-fire, however, after an initial forward impulse of the crank shaft, sufficient to disconnect the starter, the generator will not retain the plunger retracted during the reverse rotation of the engine so that reengagement of the starting mechanism will be allowed to occur. This reengagement is delayed for a predetermined time by virtue of the pendulous vibration of the weight 24 on the spring strip 15 which prevents effective closure of contact 14 during such vibration. When the vibration ceases, however, reengagement will occur and if the back-firing condition has continued, such reengagement will cause excessive and possibly destructive stresses to be imposed on the starting mechanism.

According to the present invention, means are provided for preventing the continued back-firing of the engine during the time interval that the spring strip 15 is in vibration, whereby the engine will come to rest before the reactivation of the starting mechanism. As here shown, this means is in the form of a set of contacts 25, 26, 27, 28 which are placed in series in the primary circuit of the ignition system and are arranged to render the ignition system inoperative during said time interval. As shown in the drawing, the ignition system thus comprises the battery 1, switch 9, lead 29, spring strip 31, 55

contacts 25, 26, 27, 28, lead 32, coil 33 and lead 34 to the usual breaker mechanism indicated generally at 35. Contacts 25, 26 and 27, 28 are controlled by a coil 36 adapted to attract an armature 37 on the spring strip 31 which carries contacts 26 and 27. Coil 36 is arranged to be energized when the switch 9 and the contacts 13, 14 are closed, by virtue of the leads 38 and 39 which connect the coil 36 in parallel with the starting switch coil 8. It will thus be seen that when the switch 9 is closed, if the contacts 13, 14 are closed, coil 36 will be energized, completing the ignition circuit through contacts 25, 26; and if contacts 13, 14 be opened, the coil 36 is deenergized and the ignition circuit is completed through contacts 27, 28. However, when the contact 14 is vibrating during the time delay period, coil 36 will be intermittently actuated to vibrate the armature 37 thus causing contacts 26 and 27 to flutter and prevent effective closure of the ignition circuit. It will be understood that since there is no condenser shunted around these contacts, the pulsations of current caused by this fluttering action are ineffective to energize the ignition coil.

In operation of the device, closure of the switch 9 causes energization of coil 8 to close the starting switch 5 and cause the starting motor SM to crank the engine. At the same time, coil 36 is energized to close contacts 25, 26 and complete the ignition circuit for starting purposes. When the engine starts, plunger 17 is withdrawn by voltage coil 18, breaking contacts 13, 14 causing the deenergization of coil 8 to open the starting switch, and the deenergization of coil 36 which breaks contacts 25, 26 and allows contacts 27, 28 to again close the ignition circuit for running purposes. If a successful start is secured, the generator G energizes the generator coil 21 to retain the plunger 17 in its retracted position. If a backfire should occur, however, the generator coil 21 is deenergized allowing the plunger 17 to return to its initial position releasing the spring strip 15 which vibrates for the predetermined time interval and then closes contacts 13, 14 to cause reactuation of the starting mechanism. During this period of vibration, the coil 8 is not energized to close the starting switch since said coil is designed to have sufficient self-inductance to prevent actuation thereof until contact 14 comes to rest on contact 13. Coil 36, however, is designed to be actuated by the pulsating currents caused by the vibration of contact 14 on contact 13, thus causing fluttering of contacts 26 and 27 and rendering the ignition inoperative. Back-firing of the engine during this time interval is therefore prevented and the engine consequently comes to rest before the re-actuation of the starting mechanism takes place.

Although but one embodiment of the invention has been shown and described in detail, it will be understood that various other embodiments are possible and that various changes may be made in the construction of the parts and in their methods of cooperation without departing from the spirit of the invention as defined in the claims appended hereto.

What is claimed is:—

1. In combination with an internal combustion

engine, an ignition system and an automatic starting mechanism therefor, means for rendering the ignition system and automatic starting mechanism inoperative for a predetermined period after a backfire of the engine occurs, whereby the engine is permitted to come completely to rest before reactuation thereof.

2. In combination with an internal combustion engine and an ignition system therefor, a plurality of contacts controlling said ignition system, and means for fluttering said contacts for a predetermined time after forward rotation of the engine ceases.

3. In combination with an internal combustion engine, an ignition system and automatic starting mechanism therefor including means for delaying the operation of the automatic starting mechanism for a time interval after the engine ceases forward rotation, means controlled by said delaying means for preventing operation of the ignition system during said time interval.

4. In combination with an internal combustion engine, and an ignition system therefor, starting mechanism for said engine including a relay starting switch, contacts for controlling said switch, and means also controlled by said contacts for controlling said ignition system.

5. In combination with an internal combustion engine, and an ignition system therefor, starting mechanism for said engine including a relay starting switch, contacts for controlling said switch, means for delaying effective closure of said contacts for a predetermined time interval after forward rotation of the engine ceases, and means also controlled by said contacts for controlling said ignition system and effective to prevent ignition during said time interval.

6. An electrical system for internal combustion engines including an ignition system, a starting system, controlling means automatically operative in case of engine stall to actuate the starting system, means for delaying such actuation until a predetermined time interval after forward rotation of the engine ceases, and means for rendering said ignition system inoperative during said predetermined interval.

7. An electrical system for internal combustion engines including an ignition system, a starting system, controlling means automatically operative in case of engine stall to actuate the starting system, means for delaying such actuation until a predetermined time interval after forward rotation of the engine ceases, and means controlled by said delaying means for preventing operation of the ignition system.

8. An electrical system for internal combustion engines including an ignition system, a starting system, controlling means for the starting system including a pair of contacts, closure of which causes actuation of the starting system, means for opening said contacts when the engine starts and closing the same when the engine stalls, said means being arranged to vibrate said contacts for a predetermined time prior to closure thereof and means rendering the ignition system operative when said contacts are open or closed, but preventing actuation of the ignition system while the contacts are vibrating.

DANIEL L. WERTZ.