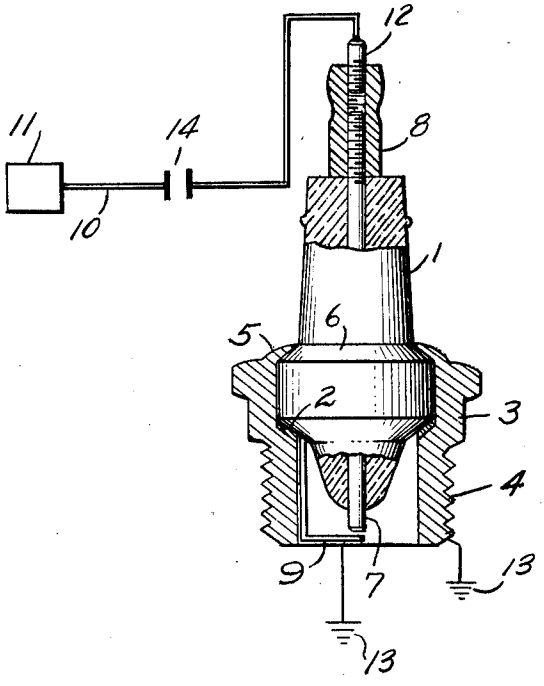
April 6, 1954 M. F. PETERS 2,674,237

IGNITION CONTROL

Filed Sept. 19, 1950




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Patented Apr. 6, 1954

2,674,237

# UNITED STATES PATENT OFFICE

2,674,237

## IGNITION CONTROL

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Application September 19, 1950, Serial No. 185,616

2 Claims. (Cl. 123—169)

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This invention relates to internal combustion engines, and particularly to the control of the delivery of fuel igniting sparks across the electrodes of a spark plug constituting a part of the combustion chamber assembly in an internal combustion engine.

In my United States patent applications, Nos. 126,771, now Patent No. 2,639,408, and 126,772, filed November 12, 1949, now abandoned, it is explained that in the conventional high-tension cable types of ignition systems there is a substantial amount of electrical energy remaining in the ignition cable after the initial spark discharge across the electrodes of the spark plug in which the cable terminates. In said applications it is also explained that this residual energy frequently creates a reverse potential gradient condition that opposes further flow of current to the spark plug in sufficient strength to produce a second spark discharge across the plug electrodes. It is this impediment to "follow-up" flow that frequently interferes with successful "starting" of an internal combustion engine. The patent applications above identified disclose methods and means for removing from the high-tension cable the objectionable residual energy above described.

The present invention provides a novel spark plug construction adapted to serve automatically to drain off, to ground, the residual energy remaining after each spark discharge occurrence; the novel construction involving the use of a central body element of insulating material of such composition as to be capable of serving not only the normal function of insulating the central electrode, but also an additional function of permitting a gradual, continuous draining off, direct to the outer grounded shell of the plug, of all such residual energy; the said central body element thus constituting, in effect, a parallel energy grounding path that requires no special conductors or surface coatings, as the said grounding path utilizes and is constituted by the material of which the plug body is composed.

To achieve this result I choose, as the material from which the plug body is to be formed, a ceramic or equivalent substance having a dielectric constant sufficiently high to satisfy the requirements for performance of the necessary insulating function, as respects the high-tension energy delivered to the electrode gap by way of the central spindle of the plug, yet at the same time being sufficiently conductive, electrically, as to permit the maintenance of a substantially continuous energy draining action of sufficient

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intensity to insure the dissipation of all residual energy while not seriously modifying the spark discharge intensity characteristics of the plug.

In the accompanying drawing the invention is shown applied to a conventional type of plug having a ceramic body element 1 supported upon an internal shelf 2 of the outer metallic shell 3 whose threads 4 serve for attachment to an engine cylinder opening in the usual manner; the body 1 being pressed into gas-tight relationship to said shelf, along the area supplied with the usual packing material or sealing gasket, during the process of turning in the upper lip 5 of the shell against the upper shoulder of the body 1. The body is centrally bored to receive the metallic spindle 7 extending from head 8 to the base of the shell, for cooperation with shell electrode 9. High-tension energy is delivered to the spindle 7 by cable 10 leading from energy source 11 and attaching to spindle 7 with the aid of the usual terminal nut 12.

As above explained, the material selected for body 1 is of such intermediate dielectric qualities as to be capable of performing the dual functions of (*a*) insulating substantially the entire peak-voltage energy at the instant of each successive spark discharge occurrence, and yet (*b*) maintaining a continuous, relatively high resistance path to ground (13) by way of shell 3 with which the said body 1 has contact, so that all residual energy is drained off.

To further insure constancy of performance, and substantial uniformity of peak voltage for successive spark discharge cycles, the cable 10 may include a series gap 14 corresponding in function to the gap of my co-pending application No. 126,772 filed November 12, 1949, now abandoned. This gap 14 may be located between successive cable sections, as illustrated, or it may be incorporated between successive sections of the spindle 7, within the body 1, in which latter event the approach side of the series gap may be surrounded with an insulating sleeve to confine drain-off of energy into the body 1 to that portion of the spindle 7 lying below the exit side of the series gap. Alternatively, both sections of the spindle 7—that is, the portion above and the portion below the series gap—may serve as feeders to the body 1, for residual energy drain-off.

What I claim is:

1. In an ignition circuit, a spark plug having a gas-igniting current path comprising a central spindle terminating in a spark discharge primary electrode, a secondary electrode adjacent said

primary electrode, a dielectric body surrounding said spindle, and a metallic shell receiving said dielectric body and serving as a mounting base therefor, said dielectric body also forming, by virtue of its inherent composition, a continuous current path entirely independent of and distinct from, said gas-igniting current path, said continuous current path being of limited conductivity for draining off to ground, by way of said shell, any residual energy remaining in said ignition circuit at the conclusion of a spark discharge between said primary and secondary electrodes.

2. A spark plug as defined in claim 1, wherein said spindle projects a considerable distance beyond said dielectric body, thus causing its electrode terminal end to be completely exposed for free impingement thereagainst of the combustible gases to be ignited; the free, exposed length of said spindle being much greater, dimensionally, than the width of the gap between said primary and secondary electrodes.



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