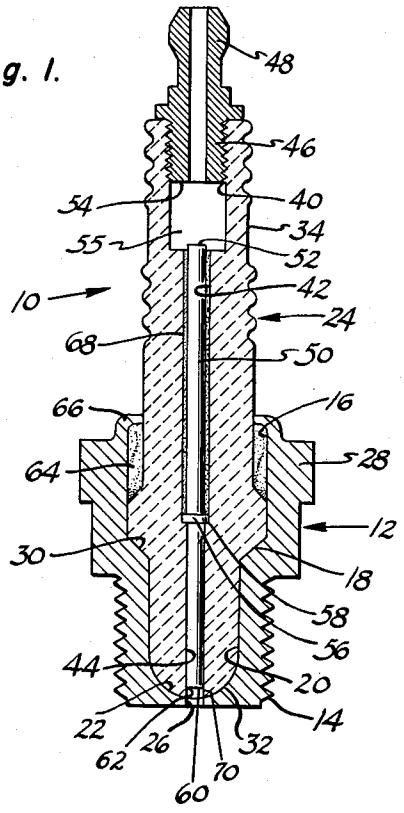
May 12, 1964 M. MALLORY 3,133,223

SPARK PLUG

Filed Feb. 20, 1961

Fig. 1.



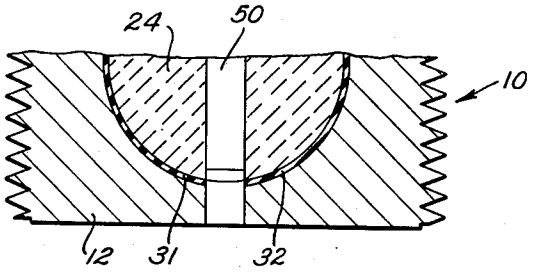


Fig. 2.

INVENTOR.
MARION MALLORY

BY

WILSON, SETTLE & CRAIG
ATTORNEYS

United States Patent Office

3,133,223

Patented May 12, 1964

3,133,223

SPARK PLUG

Marion Mallory, Detroit, Mich., assignor to The Mallory Research Company, Detroit, Mich., a corporation of Michigan

Filed Feb. 20, 1961, Ser. No. 90,353
1 Claim. (Cl. 313—130)

This invention relates to spark plugs for use in internal combustion engines, and more particularly to spark plugs of the "crawl" type in which the area of the insulator exposed to the mixture of gases in the cylinder is reduced to a minimum.

Spark plugs of the crawl type have heretofore been proposed. In such plugs, the spark, instead of jumping an air gap from the electrode to ground, flashes over the surface of the insulator.

One problem encountered with such plugs has been that the insulator surface has tended to become coated with moisture and other materials contained in the combustible mixture of the engine cylinder. This coating has provided a low resistance path for current and has resulted in a leakage of current from the electrode to ground. Such leakage occurs at low voltage and does not provide the desired high-temperature spark to cause combustion of the combustible mixture at the proper time. In such plugs, a relatively large area of the inner end of the insulator is exposed to the fuel mixture and the electrode extends from the inner end of the insulator to a point a short distance therebeyond.

It is, therefore, an object of my invention to provide a spark plug of the crawl type in which only a very small portion of the insulator surface is exposed to the fuel mixture, thus preventing current leakage and assuring the proper electrical flash to cause ignition of the fuel mixture.

Other objects of this invention will appear in the following description and appended claim, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

FIGURE 1 is a side elevational view in section of my improved spark plug.

FIGURE 2 is an enlarged cross sectional view of the lower portion of my improved spark plug.

Before explaining the present invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also, it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

As will be noted in the figure, my spark plug **10** comprises an annular metallic shell **12**, the inner end **14** being externally threaded for securement of the plug on an engine cylinder head. When so secured, the shell forms a ground. The shell **12** is provided with a bore therethrough comprising a first enlarged section **16** having a shoulder **18**, a second reduced section **20** which is spherically contoured at **22** to receive the inner end of an electrical insulator body **24** and a third reduced section **26** which extends from bore section **20** to the inner end of the shell. A wrench-engageable head **28** is provided on the shell for threading the shell into the engine cylinder head.

The electrical insulator body **24**, which is preferably fabricated from porcelain, is received in the shell. An annular shoulder **30** is provided on the insulator to seat on the shoulder **18** of the shell. The inner end of the insulator is contoured to mate with the bore section **20**. A thin film of a sealing compound is provided on the inner end **32** of the insulator to block the flow of current over the surface thereof. The upper end **34** of the insulator extends outwardly from the shell.

The insulator body has a bore therethrough comprising a first enlarged section **40**, a second reduced section **42** and a third reduced section **44**. The bore section **40** is internally threaded at **46** to threadingly receive electrical terminal **48**. An electrode **50** is secured within the insulator bore. The upper end **52** of the electrode is separated from the lower end **54** of the terminal to provide an air gap **55** therebetween. This gap acts as a spark gap to intensify the voltage applied to the electrode during operation of the spark plug. An annular enlargement **56** is provided intermediate the ends of the electrode and seats against a shoulder **58** formed by the juncture of bore sections **42**, **44**. The inner end **60** of the electrode terminates at a point short of the inner end of the insulator bore section **44** to provide a recess **62** in the bore separating the shell **12** from the electrode.

The insulator **24** is secured within the shell **12** by cement **64**. The upper end of the shell is turned down at **66** to secure the cement in place. The electrode **50** is secured in place by cement **68** to thus secure the entire assembly.

In operation, a voltage is applied to the terminal **48**, jumps the gap **55** to the electrode and causes a relatively high voltage to be present at the inner end **60** of the electrode. This voltage eventually overcomes the resistance of the insulator walls **70** to cause a spark to flash from the electrode to the shell with resultant ignition of the cylinder fuel mixture.

Because of the small surface area **70** of the insulator exposed to the fuel mixture, a surface film does not form on the insulator to reduce the resistance of the insulator gap. Current cannot leak back up over the insulator because of the sealing compound around the lower end of the insulator. It may be noted at this point that instead of a sealing compound, a gasket may be provided around the lower end of the insulator to serve as a block to current leakage over the insulator surface.

It will be noted that the inner end of the insulator terminates at a point short of the inner end of the shell **12**. In this way, the shell **12** covers the entire inner end of the insulator excepting for the bore opening. The bore opening can be, if desired, made smaller than the diameter of the electrode to further increase the resistance of the insulator gap.

Having thus described my invention, I claim:

In a spark plug comprising an annular metallic shell having an inner end with external threads for the securement of the plug on an engine cylinder head; said shell having a bore therethrough; an electrical insulator body secured within the bore of the shell; the inner end of the insulator body terminating at a point short of the inner end of the shell; said insulator body having a bore therethrough; an electrical terminal secured in the bore of the insulator body at the outer end thereof; the improvement comprising the provision of electrically-insulating sealing material on the inner end of the insulator; said sealing

material extending over the insulator body surface from the bore opening; an electrode in the insulator bore terminating at a point short of the inner end of said bore to provide a recess in said bore separating the shell from the electrode; the insulator surface defining said recess forming the shortest electrical path between the shell and the electrode whereby normal spark plug flash will travel across said surface.

References Cited in the file of this patent

UNITED STATES PATENTS

1,100,650	Besson	June 16, 1914
1,340,899	Klever	May 25, 1920
1,368,358	Schwetger	Feb. 15, 1921
1,420,159	Stephenson	June 20, 1922
2,272,558	Hall	Feb. 10, 1942