

June 12, 1934.

E. B. NOWOSIELSKI

1,962,968

IGNITION DEVICE

Filed Aug. 9, 1930

Fig. 1.

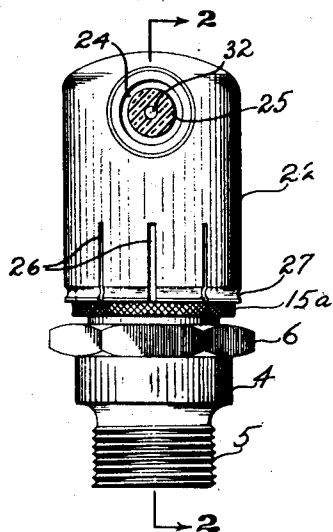


Fig. 3.

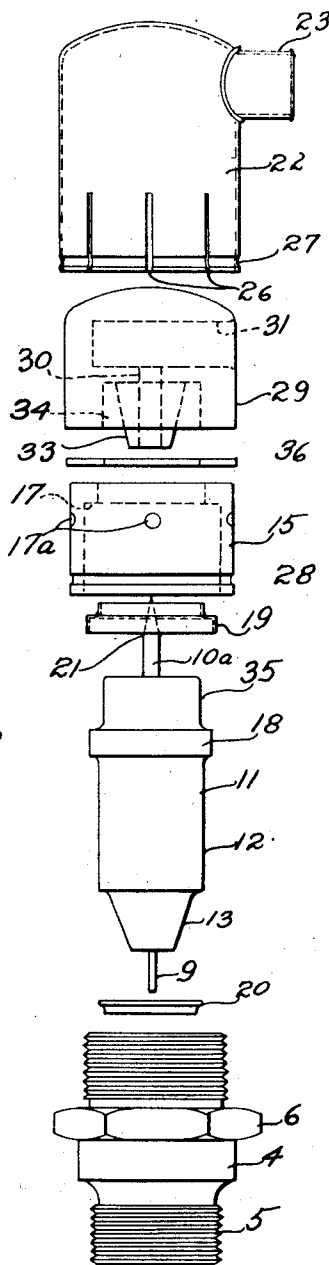
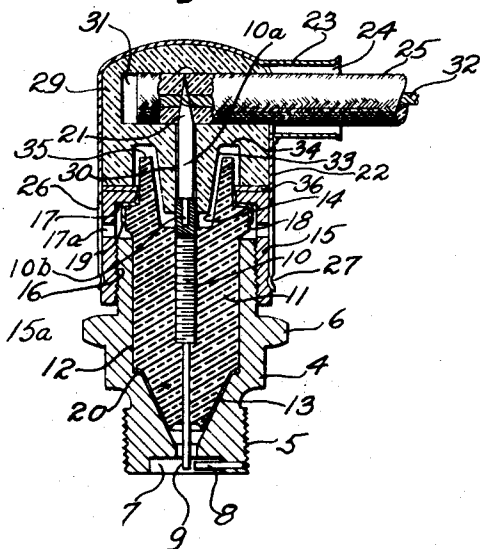


Fig. 2.



INVENTOR

Edward B. Nowosielski.

BY *F. B. Smith*
ATTORNEY

UNITED STATES PATENT OFFICE

1,962,968

IGNITION DEVICE

Edward B. Nowosielski, Bloomfield, N. J., assignor to Eclipse Aviation Corporation, East Orange, N. J., a corporation of New Jersey

Application August 9, 1930, Serial No. 474,225

17 Claims. (Cl. 123-169)

The present invention relates to ignition devices for internal combustion engines, and more particularly to novel means for shielding spark plugs.

One of the objects of the invention is to provide novel means as a part of the structure of a spark plug for efficiently shielding all of the electrical parts of said plug to prevent interference with the operation of other sensitive electrical apparatus, such as radio equipment, for example.

Another object is to provide a novel and quickly detachable connector and shield for a spark plug whereby said shield constitutes a part of the structure of the plug.

Another object is to provide a novel improved form of spark plug embodying a shield therefor whereby said shield constitutes a part of the plug structure to maintain the various other parts of the spark plug in assembled relation and to provide for quick assembly and disassembly of the plug for purposes of inspection and replacement of said parts.

A further object is to provide an ignition device of novel construction embodying a spark plug and shielding means for said plug which constitutes a part of the structure thereof, whereby said shielding means may be adjusted to any angle or position about the axis of said plug, as desired.

A still further object is to provide an improved spark plug structure including a shield, whereby the number of individual parts is reduced to a minimum, thus reducing the cost of manufacture and simplifying assembly, and which is both mechanically and electrically strong and is capable of long service under severe conditions of usage as, for example, in aircraft engines.

Other objects and advantages of the invention will appear more fully hereinafter from consideration of the detailed description which follows.

Although only one embodiment of the invention is described and illustrated in the accompanying drawing, it is to be expressly understood that this drawing is for the purpose of illustration only, and is not to be construed as a definition of the limits of the invention, reference being had for this purpose to the appended claims.

In the drawing:

Fig. 1 is an end view of one embodiment of the present invention;

Fig. 2 is a sectional side view taken on line 2-2 of Fig. 1; and

Fig. 3 is a drawn-out side view of the embodiment of Fig. 1 showing the separate parts thereof

and indicating the manner of cooperation therebetween when assembled.

Referring now to the drawing, wherein like reference characters refer to like parts throughout the several views, and particularly to Fig. 2, the device comprises a body portion 4 which is threaded at 5 for engagement with an engine cylinder (not shown) and provided with the usual flange 6 which is adapted to contact with a gasket (not shown) inserted between the flange and the engine cylinder in order to make the joint gas-tight. The body portion is counter-bored at 7, and the negative electrode 8, which is carried by the body portion in any suitable manner, extends into said bore to substantially the center thereof for cooperation with the sparking end 9 of the positive electrode 10. The latter is embedded in an insulator member 11 of some suitable insulating material such as porcelain, and which, in the form shown, is provided with a central cylindrical portion 12, a frusto-conical portion 13 surrounding the sparking end of the electrode 10, and with a frusto-conical recess 14 surrounding said electrode adjacent its other end. The insulator member 11 is held in position in the body portion by means of a sleeve 15 which is threaded at 16 for engagement with said body portion and provided with an inwardly projecting lip or flange 17 which engages the shoulder 18 of said insulator. The sleeve 15 is knurled at its lower end as indicated at 15a to facilitate assembly thereof with the body 4, and is provided with circumferentially spaced apertures 17a to permit circulation of air around the insulator 11 to cool the latter. A metallic bushing 19, preferably of copper or other suitable malleable material, is inserted between the shoulder 18 and the lip 17 to prevent breaking of the insulator when the sleeve member 15 is screwed tightly on the body portion 4. A similar bushing 20 is inserted between the lower end of the cylindrical portion 12 of the insulator and the body portion 4 for the same purpose, and also to form a gas-tight seal. The electrode 10 is adapted to cooperate with an extension 10a which is provided with a tapered portion 21 terminating in a sharp point for piercing an insulated ignition cable, as will be apparent hereinafter, and is also provided with a pin 10b for insertion in a bore in said electrode 10. The tapered portion 21 may be threaded, if desired, to hold the extension 10a more firmly in the cable. Due to the separability of parts 10 and 10a it is unnecessary to separate the extension 10a from the cable each time the plug is dis-

sembled and the cable does not have to be pierced each time the plug is assembled after the first assembly.

A metallic casing 22 is provided of some suitable shielding material, such as aluminum, and coats with sleeve 15 to constitute a shield for the spark plug. Said shield is in the form of a cylinder having a boss 23 projecting at right angles thereto, said boss being provided with a bore 24 for the reception of an ignition cable 25. The shield is also provided with a yielding lower portion having a plurality of circumferentially spaced longitudinal slits 26 extending upward from the lower end of the shield for substantially half its length. This yielding portion formed by slits 26 cooperates with other parts of the plug to provide means of rapid and easy assembly and disassembly of the spark plug structure. Said shield is so formed, as by stamping, that it may be assembled with a sliding frictional fit with the sleeve 15, slits 26 allowing a slight resilient expansion of the lower portion of the cylindrical casing so as to receive sleeve 15, and indentation 27 on the casing cooperating with a circumferential groove 28 formed on the exterior surface of sleeve 15 to lock these parts together in a readily breakable frictional connection. The frictional telescoping engagement between cylinder 22 and sleeve 15 also permits angular adjustment of the cylinder about the longitudinal axis of the plug so as to avoid the necessity of any sharp bends in the ignition cable, which are conducive to insulation failures.

The remaining element of the spark plug structure consists of a high potential insulating member 29 formed of any suitable material, such as porcelain, which is disposed within the metallic casing 22 but entirely disconnected therefrom. The shape of the outer surface of the insulating member 29 corresponds in general to that of the interior of the metallic housing and is provided with a vertical bore 30 of sufficient diameter to provide adequate clearance for the electrode extension 10a and with a horizontal or transverse bore 31 extending through said member and intersecting the vertical bore 30 for the reception of the cable 25. If desired, said insulating member 29 may be split into two parts along the axis of bore 30, but it is preferable that this piece be formed as an integral member, as shown in Figs. 2 and 3. When the insulated cable 25 is passed through the bore 24 of the casing 22 and inserted into the transverse bore 31 of the insulator member 29, it is adapted to be pierced by the sharp point 21 on the electrode extension 10a so that the latter makes an electrical contact with the stranded wire 32 of the ignition cable. The insulator member 29 is also formed with a frusto-conical portion 33 which is adapted to cooperate with the frusto-conical recess 14 in the insulator member 11 and is further provided with an annular recess 34 surrounding the frusto-conical portion 33 and adapted to receive the end portion 35 of the insulator 11, thereby forming a baffle between the insulators 11 and 29 to prevent moisture and foreign material coming in contact with electrode 10 when said insulators are held in assembled relation by means of the casing 22 and to prevent overheating of the insulator 29. A metallic washer 36 is interposed between the insulator 29 and the sleeve 15.

The parts may be assembled as follows: The metallic washer 20 is placed into the body portion

4 and the insulator member 11 is inserted therein so that the end 9 of electrode 10 cooperates with the negative electrode 8. The metallic washer 19 is then placed over the shoulder 18 of the insulator 11 and sleeve 15 is screwed onto the body portion to firmly hold said insulator in position. The insulator 29 is placed into the casing 22 in such position that the opening of the transverse bore 31 is adjacent the bore 24 of the boss 23, and the cable 25 is inserted into the bore 31. The electrode extension 10a is then inserted into the bore 30 and pushed or screwed into the cable 25 so as to pierce the insulation of said cable thereby coming into electrical contact with the stranded wire 31. This latter assembly is placed over the insulator 11 with washer 36 interposed therebetween and secured to sleeve 15 by telescoping the lower portion of the casing 22 over said sleeve and forcing said casing downward until indentation 27 engages groove 28, thereby clamping the shield to the body of the plug, causing the pin 10b to enter the bore in electrode 10 to make an electrical connection between the spark plug and the ignition cable, and holding the insulator 29 firmly in position with the insulator 11.

There is thus provided a novel spark plug structure including a shield, which may be easily and quickly assembled and disassembled and which is adapted for use with any type of internal combustion engine, preferably on aircraft, where high frequency discharges of the spark plug produce undesirable interference with other electrical equipment, such as radio receivers, for example. The shield constitutes a part of the spark plug structure and is light in weight, relatively inexpensive to manufacture, and comprises a minimum of parts (namely two), each of which is easily separable from the other parts of the plug structure for inspection or replacement. Adequate means are provided for thoroughly insulating the positive electrode of the spark plug from the metallic parts of the shield, thus providing for electrical shielding without impairing the charge-ignition function of the spark plug.

From actual use of this shield, it has been found that a cooler spark plug is obtained, the large metallic surface offering greater opportunity for dissipation and conduction of heat away from the hotter portions of the spark plug, and the apertures 17a affording a circulation of air around the insulator 11. The novel spark plug disclosed herein permits the ignition cable to enter the shield thereof and to be connected to the spark plug terminal in a horizontal plane and also provides that the shield may be rotated about the longitudinal axis of the plug, circumferential slippage taking place between the metallic casing 22 and the sleeve 15, thus enabling the cable to be adjusted to any angular position and to avoid the necessity for sharp bends therein, which are well-known to be conducive to insulation failures. The manner of mechanically and electrically connecting the cable to the spark plug is extremely simple and efficient.

It will be obvious that the invention is not limited to the form described and illustrated in the drawing, but is capable of a variety of mechanical embodiments. Various changes may be made in the form, details of construction, and arrangement of the parts, without departing from the spirit of the invention, and reference is therefore to be had to the appended claims for a definition of the limits of the invention.

What is claimed is:

1. An ignition device comprising in combination, a spark plug structure including a member arranged for attachment to a cylinder of an engine and having an electrode therein; a cooperating electrode assembly fitted within said member and comprising an electrode surrounded by an insulator having a cylindrical central portion, a frusto-conical portion adjacent to the sparking end of said second electrode, and a frusto-conical recess at the other end, said electrode having a removable extension one end of which is pointed for piercing a cable, a second insulator provided with a conical projection adapted to fit within the recess of said first insulator and having a longitudinal bore extending there-through for receiving said extension and a transverse bore intersecting said first bore arranged for the reception of an insulated ignition cable, means for holding said first insulator within said body portion of the plug, shielding means for the plug adapted to frictionally engage said last-mentioned means and to fit over said second insulating member for holding the latter in assembled relation with the first insulating member, said shielding means being adapted for rotation about the longitudinal axis of said plug and an insulated ignition cable extending into the transverse bore of said second insulating member through said shielding means and in electrical contact with the electrode extension.

2. An ignition device comprising in combination, a spark plug structure including a shell arranged for attachment to a cylinder of an engine and having an electrode, a cooperating electrode assembly carried by said shell and including a second electrode adapted to form a spark gap with said first electrode, a shield surrounding the upper portion of said shell and means adapted for frictional engagement with said shield and threaded engagement with said shell to complete the shielding of said plug structure.

3. A spark plug structure comprising a member arranged for attachment to a cylinder of an engine and having an electrode therein, a cooperating electrode assembly including a second electrode adapted to form a spark gap with said first electrode and a pair of insulators one of which carries said second electrode, the other of which is adapted to form a baffle with the first insulator and to receive an ignition cable in a transverse bore formed therein, and a removable extension on said second electrode, said extension having one end thereof projecting into said cable at a right angle to the axis thereof and intermediate the ends of said transverse bore.

4. A spark plug structure comprising a member arranged for attachment to a cylinder of an engine and having an electrode therein, a cooperating electrode assembly including a second electrode adapted to form a spark gap with said first electrode, and a pair of insulators one of which carries said second electrode and the other of which is apertured transversely to receive an ignition cable for connection to said second electrode, a longitudinally extending aperture in said second insulator, and a piercing member extending through said longitudinal aperture to engage said cable laterally, said piercing member being in contact with said second-named electrode at its other end.

5. A spark plug structure comprising a member arranged for attachment to a cylinder of an engine and having an electrode therein, a cooperating electrode assembly including a second

electrode adapted to form a spark gap with said first electrode and a pair of insulators one of which carries said second electrode and the other of which is apertured transversely to receive an ignition cable for connection to said second electrode, a longitudinally extending aperture in said second insulator, and a piercing member extending through said longitudinal aperture to engage said cable laterally.

6. A spark plug structure comprising a member arranged for attachment to a cylinder of an engine and having an electrode therein, a cooperating electrode assembly including a second electrode adapted to form a spark gap with said first electrode and a pair of insulators one of which carries said second electrode and the other of which is adapted to partially fit within the first insulator to form a baffle and provided with a transverse bore to receive an ignition cable for connection to said second electrode, means for holding said first insulator in operative relation with the first mentioned member, and a removable extension on said second electrode, said extension having one end thereof projecting into said cable at a right angle to the axis thereof and intermediate the ends of said transverse bore.

7. A spark plug structure comprising a member arranged for attachment to a cylinder of an engine and having an electrode therein, a cooperating electrode assembly including a second electrode adapted to form a spark gap with said first electrode and a pair of complementary insulators adapted to partially fit one within the other to form a baffle, one of said insulators constituting a support for said second electrode and the other being provided with a transversely disposed bore for the reception of an insulated ignition cable for connection to said second electrode, a sleeve adapted for engagement with said first mentioned member and having an interned annular lip or flange for engagement with a shoulder on said first insulator for holding the latter firmly in position, and an electrical shield adapted for frictional engagement with said sleeve to hold said second insulator in operative relation with the first insulator, thereby forming a unitary structure which may be easily and quickly assembled and disassembled.

8. An ignition device comprising in combination, a spark plug structure including a member arranged for attachment to a cylinder of an engine and having an electrode therein, a cooperating electrode assembly including a second electrode adapted to form a spark gap with said first electrode, and a pair of insulators one of which carries said second electrode, the other of which is adapted to form a baffle with the first insulator and to receive an ignition cable in a transverse bore thereof, and an extension on said second electrode, said extension having one end thereof projecting into said cable at a right angle to the axis thereof and intermediate the ends of said transverse bore.

9. A spark plug structure comprising a member arranged for attachment to a cylinder of an engine and having an electrode therein, a cooperating electrode assembly including a second electrode adapted to form a spark gap with said first electrode and a pair of insulators one of which carries said second electrode and the other of which is adapted to form a baffle with the first insulator and to receive an ignition cable for connection laterally to said second electrode, means for holding said first insulator in operative relation with the first mentioned member, and an

electrical shield adapted for frictional engagement with said last mentioned means to hold said second insulator in operative relation with the first insulator, thereby forming a unitary structure which is adapted for quick assembly and disassembly.

10. A spark plug structure comprising a member arranged for attachment to a cylinder of an engine and having an electrode therein, a cooperating electrode assembly including a second electrode one end of which is adapted to form a spark gap with said first electrode and the other end of which is counterbored, a terminal extension for said second electrode provided with a sharp taper at one end for piercing an ignition cable and with a pin at the other end for insertion into said counterbore, a pair of insulators one of which surrounds and supports said second electrode, and the other of which is provided with a longitudinal bore for receiving said electrode terminal extension and with a transverse bore for receiving an ignition cable, a sleeve threaded internally for engagement with the first mentioned member and having an inturned annular lip or flange adapted to engage a shoulder on the first insulator for holding the latter firmly in position, and a metallic electrical shield adapted for sliding frictional engagement with said sleeve to hold said second insulator in operative relation with the first insulator, thereby forming a unitary structure which may be quickly assembled and disassembled and providing angular adjustment of the structure to receive a cable from any direction in a plane perpendicular to the longitudinal axis of the plug.

11. An ignition device comprising in combination, a spark plug structure including a member arranged for attachment to an engine cylinder, an electrode assembly fitted within said member and comprising a centrally disposed electrode having a removable extension, an insulator having a longitudinal bore extending therethrough for receiving said extension, and a transverse bore intersecting said first bore and arranged for reception of an insulated ignition cable, and a pointed end on said extension adapted to pierce said ignition cable laterally.

12. A spark plug structure comprising a member mounted for attachment to a cylinder of an engine and having an electrode therewithin, a second electrode adapted to cooperate electrically with said first electrode, a body of insulating material surrounding said second electrode, a metallic sleeve held fast to said first named member, means integral with said sleeve for holding said insulating body in position within said first named member and a metallic shielding element surrounding the upper portion of said insulating body but spaced therefrom, said shielding element being formed at its lower end for frictional engagement with said metallic sleeve.

13. A spark plug structure comprising a shell mounted for attachment to a cylinder of an engine and having an electrode therewithin, a second electrode adapted to cooperate electrically with said first electrode, a body of insulating material surrounding said second electrode,

a metallic shielding element surrounding the upper portion of said insulating body, said shielding element being of a diameter considerably larger than the diameter of that portion of the insulating body which it surrounds, a second body of insulating material interposed between said first named insulating body and said shielding element, and means for operatively connecting said shielding element with said shell, said last named means also serving to maintain said first named insulating body in proper position with respect to said shell and second electrode.

14. A spark plug structure comprising a member mounted for attachment to a cylinder of an engine and having an electrode therewithin, a second electrode adapted to cooperate electrically with said first electrode, a body of insulating material surrounding said second electrode, a metallic shielding element surrounding the upper portion of said insulating body, said shielding element being of a diameter considerably larger than the diameter of that portion of the insulating body which it surrounds, and a second body of insulating material interposed between said first named insulating body and said shielding element, and means including a sleeve threadedly engaging said shell, and frictionally engaging said shielding element for holding said first named insulating body against displacement with respect to said electrode and shell.

15. An ignition device comprising in combination, a spark plug structure including a member arranged for attachment to a cylinder of an engine and having an electrode therein; a cooperating electrode surrounded by an insulator having a recess at one end, said second electrode having an extension one end of which is pointed for piercing a cable, a second insulator provided with a projection adapted to fit within the recess of said first insulator and having a longitudinal bore extending therethrough for receiving said extension and a transverse bore intersecting said first bore, and an insulated ignition cable extending into said transverse bore for electrical contact with the electrode extension.

16. A spark plug structure comprising a member arranged for attachment to a cylinder of an engine and having an electrode therein, a second electrode adapted to form a spark gap with said first electrode, and a pair of insulators one of which carries said second electrode, the other of which is adapted to receive an ignition cable in a transverse bore formed therein, said second electrode having one end thereof projecting into said cable at a right angle to the axis thereof.

17. A spark plug structure comprising a member arranged for attachment to a cylinder of an engine and having an electrode therein, a second electrode adapted to form a spark plug gap with said first electrode, an insulator which is adapted to receive an ignition cable in a transverse bore formed therein, and a removable extension on said second electrode having one end thereof projecting into said cable at a right angle to the axis thereof.

EDWARD B. NOWOSIELSKI.