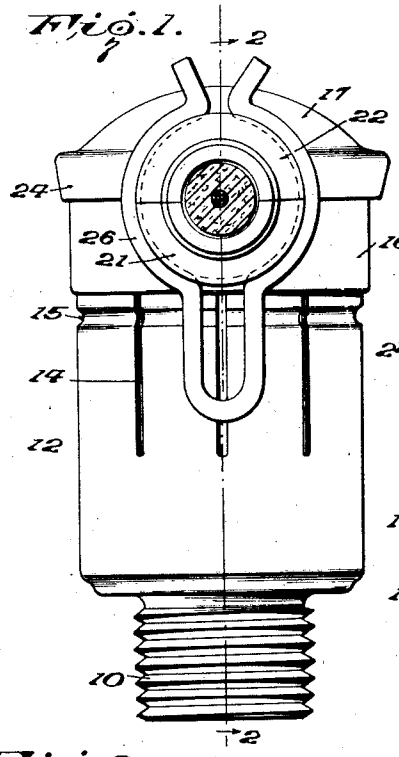
Jan. 16, 1934. E. B. NOWOSIELSKI 1,943,739

SPARK PLUG

Filed May 7, 1930

Fig. 1.



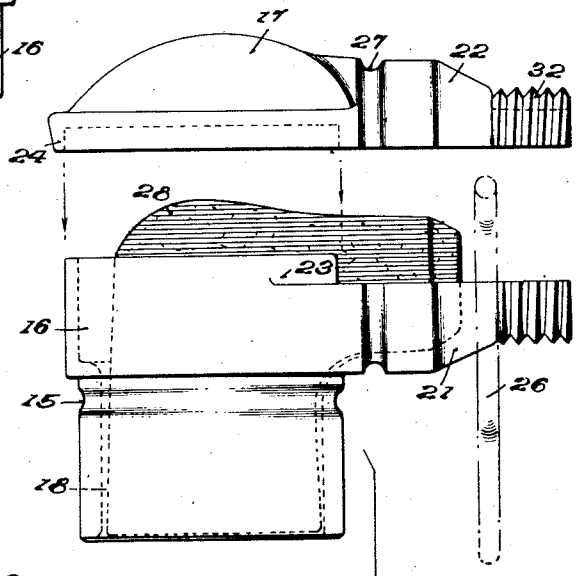


Fig. 2.

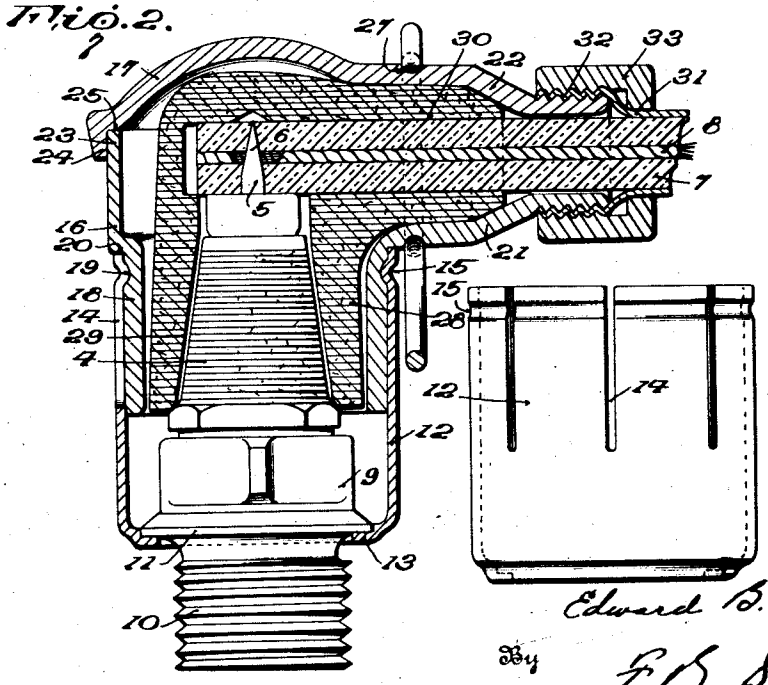


Fig. 3.

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SPARK PLUG

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12 Claims. (Cl. 123—169)

This invention relates to ignition systems for internal combustion engines, and more particularly to means for shielding spark plugs.

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

Another object is to provide a novel spark plug shield which is both mechanically and electrically strong, and is capable of long service under severe conditions of usage.

A further object is to provide a novel shield for spark plugs which is simple in structure, relatively inexpensive to manufacture, and which may be quickly and easily attached to or detached from the plug.

Still another object is to provide a novel spark plug shield which consists of a minimum of individual parts so as to simplify manufacture and assembly, and which allows ready removal of one or more of the parts for purposes of inspection and replacement without disturbing the assembly of the remaining parts.

A still further object is to provide a novel spark plug shield which is so constructed as to allow connection of the ignition cable to the electrode of the spark plug in a horizontal plane, and which may be readily rotated about the plug to any desired angular position so as to avoid the necessity for any sharp bends in the cable which are conducive to insulation failures.

These and other objects will appear more fully from a consideration of the detailed description of the invention which follows. Although only one embodiment of the present 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 limitation of the scope 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 indicate like parts throughout the several views, there is disclosed therein a novel shield for a spark plug of extremely simple construction which may be readily attached to or detached from any of the well known types of spark plugs. As shown in Fig. 2, the shield has been illustrated in combination with a spark plug 4 having a positive electrode 5, the upper extremity of which is sharpened to a point 6, which is adapted to pierce the insulation 7 and conductor 8 of an ignition cable supplying current to the spark plug in the usual manner. Body portion 9 of the spark plug 4 is threaded as at 10 for engagement with the engine cylinder (not shown) and is provided with the usual flange 11 which normally contacts with a compressible gasket (not shown) inserted between the flange and the engine cylinder in order to make the joint gas-tight.

The shield, which is applied to the spark plug in order to prevent interference with other sensitive electrical apparatus and to mechanically protect the spark plug from accidental blows and the effects of the weather, is extremely simple in structure, comprising only five separate parts. In the form shown, a substantially cylindrical metallic sleeve 12 forms the lower portion of the shield and is adapted to surround the body portion of the spark plug. Sleeve 12 also provides the means of attaching the shield to the spark plug, and for this purpose is provided with an inwardly turned lip or flange 13 which is adapted to engage the underside of flange 11 of the plug and to be securely held between said flange and the engine cylinder when the plug is inserted therein. Sleeve 12 is also provided with a yielding upper portion having a plurality of circumferentially spaced longitudinal slits 14 extending downward from the upper end of said sleeve for substantially half its length. This yielding portion formed by slits 14, together with a circumferential indentation 15 which is formed in sleeve 12 just below its upper end, cooperate with other parts of the shield in a manner later to be described to provide means of rapid and easy assembly and disassembly of the shield structure.

The main metallic portion of the shield, which coacts with sleeve 12 to form the complete shield, is in the form of an elbow having a substantially cylindrical portion which cooperates with sleeve 12 and surrounds the upper portion of the spark plug, including electrode 5, and a boss projecting at right angles to the cylindrical portion having a bore which is adapted to form the entrance for the ignition cable. As shown, this metallic elbow is divided into two parts along a plane passing through the axis of the boss and perpendicular

to the axis of the cylindrical portion, and comprises a body member 16 and a cap member 17.

The lower portion 18 of body member 16 is substantially cylindrical in shape and is adapted to telescope within the upper yielding portion of sleeve 12, these parts being so machined that they may be assembled with a sliding frictional fit, slits 14 allowing a slight expansion of the upper portion of sleeve 12 so as to receive portion 18 of body member 16, and indentation 15 cooperating with a groove 19 formed in the surface of portion 18 to lock these parts together in a readily breakable frictional connection. The upper portion of body member 16 is of slightly larger diameter than portion 18, thus forming a shoulder 20 which is adapted to rest upon the upper edge of sleeve 12. Projecting at right angles to the cylindrical portion of body member 16 is the lower half 21 of the boss previously mentioned, the upper half 22 being integral with cap member 17. The boss thus formed by halves 21 and 22 is of varying diameter, being smallest at its outer end at which point its bore is of substantially the same diameter as that of the ignition cable. This frictional telescoping engagement between the elbow and sleeve also allows angular adjustment of the elbow about the longitudinal axis of the plug.

Although the plane of division between cap member 17 and body member 16 lies in the axis of the boss, body member 16 is provided with a cylindrical extension 23 projecting above this plane and adapted to engage, with a frictional fit, a flange 24 around the circular part of cap member 17, and to abut a shoulder 25 formed in the interior of said cap member. Cap member 17 and body member 16 may be held together by any suitable means, such as a strong spring clip 26, general characteristics of which are clearly shown in Fig. 1 of the drawing. The inside diameter of the circular portion of clip 26 is slightly less than the exterior diameter of the largest portion of the boss formed by halves 21 and 22, and is adapted to engage a groove 27 formed around said boss closely adjacent the cylindrical portion of the elbow.

The remaining element of the shield consists of an insulating elbow 28, formed of any suitable matrial, such as porcelain, which is disposed within the metallic elbow but entirely disconnected therefrom. The shape of the outer surface of elbow 28 corresponds in general to that of the interior of the metallic elbow, the circumference of the arm which extends into the boss of the metallic elbow, however, being preferably of substantially the same diameter as the bore of the boss so as to insure a snug fit at this point. Elbow 28 is provided with a vertical bore 29 conforming in general to the shape of the upper portion of spark plug 4 and of sufficient diameter to provide adequate clearance therefrom, and with a horizontal bore 30 intersecting vertical bore 29 and adapted to receive the ignition cable to be connected to electrode 5 of spark plug 4. If desired, elbow 28 may be split into two parts along the axis of bore 30 in a manner similar to that in which the metallic elbow is divided, but it is preferable that this piece be cast as an integral member, as shown in Fig. 2.

The manner of assembly of the shield is as follows: Spark plug 4 is placed within sleeve 12 with flange 11 resting on lip 13, and is then threaded into the engine cylinder block in the usual manner, thus tightly clamping lip 13 between flange 11 and the engine cylinder. Body member 16 of the metallic elbow is then placed around spark plug 4 and secured to sleeve 12 by telescoping cylindrical portion 18 within the upper portion of the sleeve, and forcing body member 16 downward until indentation 15 engages groove 19 and the upper edge of sleeve 12 abuts shoulder 20. The flexible metal shield 31 of the ignition cable is then skinned back the required distance to allow the end of the cable to be inserted in bore 30 of insulating elbow 28, and the elbow 28 is placed over the top of spark plug 4 and forced downwardly until point 6 of the electrode 5 penetrates the cable and makes contact with conductor 8, the lower surface of the horizontal arm of the insulating elbow 28 then resting in the bore of lower half 21 of the boss of the metallic elbow. Cap member 17 is then placed over insulating elbow 28 and completes the metallic shield, spring clip 26 being forced into place in groove 27 from the outer end of the boss.

If desired, the outer end of the boss may be threaded as at 32 to facilitate the bonding of cable shield 31 to the spark plug shield. The bonding may be effected by expanding the skinned-back portion of the cable shield over threaded portion 32 and forming a secure mechanical and electrical connection between these parts, either by means of a nut 33, as shown in Fig. 2, or by securely wrapping several turns of wire around shield 31 over threaded portion 32 of the spark plug shield and soldering the ends of said wire to the respective shields.

There is thus provided by the present invention a novel shield for spark plugs which may be easily and quickly assembled and disassembled and which is adapted for use with any of the well known types of spark plugs. The shield is light in weight, relatively inexpensive to manufacture, and comprises a minimum of parts, each of which is easily separable from the others for inspection or replacement. Adequate means are provided for thoroughly insulating the ignition cable and the positive electrode of the spark plug from the metallic parts of the shield, thus providing for electrical shielding without impairment of the charge igniting function of the spark plug. The use of this shield also results in a cooler running spark plug, the large metallic surface offering greater opportunity for dissipation and conduction of heat away from the hotter portions of the spark plug. The novel shield disclosed herein permits the ignition cable to enter the shield and to be connected to the spark plug terminal in a horizontal plane, and also provides that the elbow portions of the shield may be rotated about the plug, slippage taking place between cylindrical portion 18 of the body member 16 and sleeve 12, 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 assembly of the shield is, as has been described, extremely simple and requires the use of no tools, with the exception of the ordinary spark plug socket wrench. The shield is also particularly well adapted for easy and efficient bonding of the cable shield.

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. For example, the cylindrical portion 18 of the metallic elbow may telescope over the upper yielding portion of sleeve 12 instead of within said portion as shown, and

it may also be preferable to provide the yielding portion of the readily breakable connection between these elements of the shield in the elbow instead of in the sleeve. It is also to be expressly understood that the construction of the spark plug shown is illustrative only, and that the shield is adapted for use with any of the usual types of plugs, including those in which the electrical connection between the ignition cable and the positive electrode is formed in ways different from that illustrated herein. Similarly, 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. A shield for a spark plug comprising a substantially cylindrical metallic sleeve having an inturned lip at its bottom adapted to engage the flange of a spark plug and a plurality of longitudinal slits adjacent its upper end, a metallic elbow having a cylindrical portion telescoping and frictionally held within the upper slitted portion of said sleeve and a boss projecting at right angles to said cylindrical portion, and an elbow of insulating material within said metallic elbow adapted to insulate the positive terminal and ignition cable of a spark plug from the metallic parts of the shield.

2. A shield for use with spark plugs of the type having a flanged body and a protruding positive electrode, comprising a substantially cylindrical sleeve having an inturned lip adapted to engage the flange of a spark plug, a metallic elbow having a cylindrical portion frictionally telescoping within said sleeve and an arm extending at right angles to said cylindrical portion, a cap for said metallic elbow, resilient means for clamping said cap to said metallic elbow, and an elbow of insulating material within said metallic elbow, one arm of said insulating elbow having a bore adapted to surround the protruding positive electrode of the spark piug, and the other arm having a bore to receive an ignition cable to be electrically connected to said positive electrode.

3. A shield for spark plugs comprising a substantially cylindrical metallic sleeve having an inturned lip at its bottom adapted to engage the flange of a spark plug, a metallic elbow having a cylindrical portion telescoping within the upper portion of said sleeve and a boss projecting at right angles to said cylindrical portion, and an elbow of insulating material fitting loosely within said metallic elbow, one arm of said insulating elbow having a bore adapted to surround the upper portion of the spark plug, and the other arm having a bore to receive an ignition cable therefor.

4. A shield for spark plugs comprising a substantially cylindrical metallic sleeve having an inturned lip at its bottom adapted to engage the flange of a spark plug and a plurality of longitudinal slits adjacent its upper end, a metallic elbow having a cylindrical portion telescoping within the upper slitted portion of said sleeve and a boss projecting at right angles to said cylindrical portion, said boss having a bore circular in cross section, and said elbow being divided into a body portion and a cap portion along a plane passing through the axis of said bore and perpendicular to the axis of the cylindrical portion, and an elbow of insulating material within said metallic elbow adapted to surround the positive electrode and ignition cable of the spark plug.

5. A shield for use with spark plugs of the type having a flanged body and a protruding positive electrode to which a shielded ignition cable is adapted to be connected, comprising a substantially cylindrical sleeve having an inturned lip adapted to engage the flange of the spark plug and a plurality of longitudinal slits adjacent its upper end, a metallic elbow having a cylindrical portion frictionally telescoping within the upper slitted portion of said sleeve, and a boss projecting at right angles to said cylindrical portion, the outer end of said boss being threaded to facilitate bonding of the shield of the ignition cable thereto, and an elbow of insulating material within said metallic elbow adapted to insulate the positive terminal and ignition cable of the spark plug from the metallic parts of the shield.

6. In a spark plug shield, a sleeve having a yielding portion at the upper end thereof, and a metallic elbow having telescopic engagement with said portion and held in operative position thereby for angular adjustment, said elbow including separable upper and lower portions, and yielding means surrounding said separable portions for retaining them in operative engagement.

7. In a spark plug shield, a sleeve having a yielding portion at the upper end thereof, and a metallic elbow having telescopic engagement with said portion and held in operative position thereby for angular adjustment, said elbow including separable upper and lower portions, and yielding means surrounding the horizontal arm of said elbow for retaining said separable portions in operative engagement.

8. In a spark plug shield, a sleeve, an elbow having telescopic engagement with said sleeve, said elbow being formed in two parts, and a resilient clamping means surrounding the portions of said parts constituting the horizontal arm of the elbow for retaining said parts in operative engagement.

9. In a spark plug shield, in combination with a substantially cylindrical metallic sleeve having an inturned lip at its lower end adapted to engage the flange of a spark plug, an elbow of insulating material having one arm thereof extending within said metallic sleeve, said arm having a bore adapted to surround the positive electrode of the spark plug, and the other arm having a bore to receive the ignition cable to be electrically connected to said positive electrode, a second metallic member partly enclosing said elbow, and yielding means surrounding said last named member and adapted to retain said member in proper relation to said elbow and sleeve.

10. In a shield for a spark plug of the type employed for controlling ignition in an internal combustion engine, in combination with a substantially cylindrical metallic sleeve having means at its lower end for attachment to the spark plug at a point adjacent the engine engaging portion of said plug, an insulating member extending within said metallic sleeve, a metallic cap member extending around said insulated member, and yielding means surrounding said cap member and adapted to retain said member in proper relation to said insulating member and sleeve.

11. In a spark plug shield, in combination with a substantially cylindrical metallic sleeve having a portion adapted to engage the base of a spark plug, said sleeve also having a yielding portion

at the upper end thereof, said yielding portion being spaced from the body of the plug, a cooperating shielding element surrounding the upper portion of the plug and formed at its lower end for telescopic engagement with the yielding portion of said sleeve, said shielding element including separable upper and lower portions, and resilient clamping means surrounding said separable portions.

12. A shield for a spark plug comprising an angular metallic element one portion of which is adapted to surround the upper portion of the plug, a cooperating cylindrical element serving to yieldably hold said first named element in proper relation to the plug, a metallic cap registering with said first named element, and a resilient member acting to hold said cap in proper relation to said first named element.

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