Jan. 12, 1937. J. J. MASCUCH 2,067,614

SPARK PLUG BUSHING AND SHIELD

Filed Nov. 10, 1933

Fig. 1.

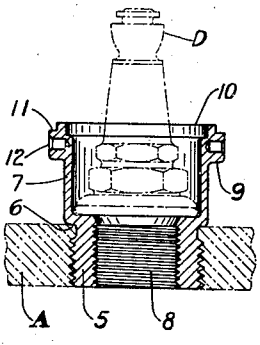


Fig. 2.

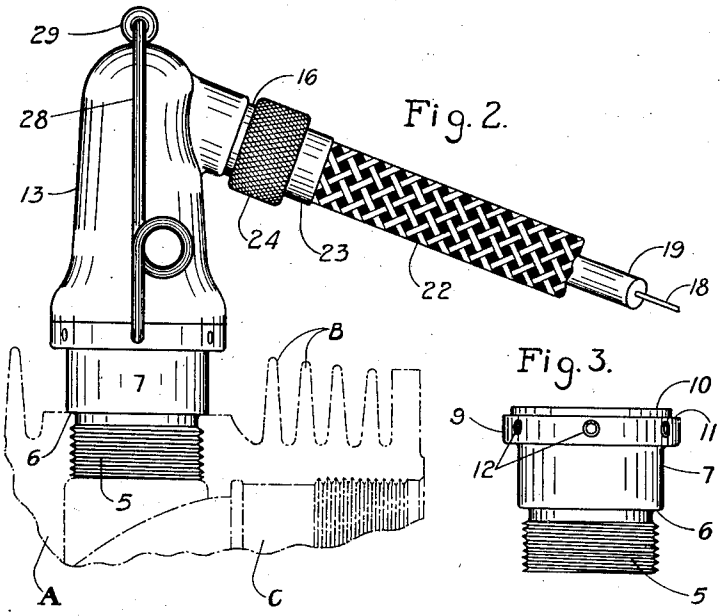


Fig. 3.

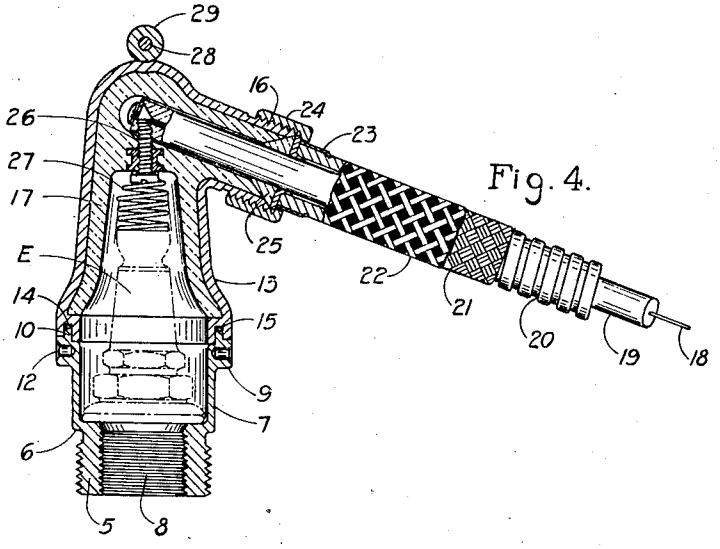


Fig. 4.

INVENTOR.
JOSEPH J. MASCUCH.
BY C. C. Cousins
ATTORNEY

Patented Jan. 12, 1937 2,067,614

UNITED STATES PATENT OFFICE

2,067,614

SPARK PLUG BUSHING AND SHIELD

Joseph J. Mascuch, Newark, N. J.

Application November 10, 1933, Serial No. 697,382

8 Claims. (Cl. 123—169)

This invention relates to a spark plug bushing and shield.

In aircraft practice it is common to place a bushing in the spark plug opening of a cylinder head. This is particularly true where aluminum or other alloys are used for the cylinder heads. The purpose of the bushing is to prevent wear on the threads of the spark plug opening. The top of the bushing is placed flush with the cylinder head and the bushing is provided with internal threads to receive a spark plug.

It is also desirable to provide means to shield the spark plug to prevent interference with radio equipment by reason of electrical emanations from the spark plugs. This can be done by means of a cup screwed into the cylinder head in combination with a cap for the cup provided with a di-electric skirt such as shown in my copending application Ser. No. 481,766. Where a cap is not used trouble will be experienced by reason of flash-overs from the exposed terminal of the spark plug to the cup, unless the cup is spaced sufficiently far from the plug to prevent flash-overs. To do this necessitates a large and cumbersome construction.

It is desirable to provide a structure which may be used merely as a bushing or which may be used as a part of a spark plug shield, in addition to its use as a bushing. Therefore, one object of this invention is to provide a spark plug bushing having a portion extending above the surface of the cylinder head, which bushing may be used with or without a radio shielding cap. A further object of the invention is to provide a bushing extending above the cylinder head, but which will prevent flash-overs from the exposed terminal of the spark plug to the bushing.

It often occurs that an engine is placed in service without radio shielding and it is subsequently desired to apply radio shielding thereto. In order to apply a radio shield it is sometimes necessary, where a bushing is used, to use a spark plug of less than standard size by reason of the size of the spark plug opening, or in the alternative the spark plug opening in the cylinder head must be re-formed to make it larger, in order to use a standard size plug with the radio shield. Therefore, a further object of the invention is to provide a bushing which will permit the use of a standard size spark plug and which will permit the subsequent application of a radio shield without the removal of any parts and without any change in the size of either the plug or the spark plug opening in the cylinder head. A further object of the invention is to provide a radio shielding cap for use with such bushing.

In aircraft engines loss of efficiency is experienced by reason of over-heating at the spark plugs. By reason of the spark plug being in intimate thermal contact with the cylinder head, the heat in the cylinder head is concentrated at the base of the spark plug, which results in loss of power. If the heat of the cylinder head can be prevented from accumulating at the base of the spark plug, the over-heating of the spark plug can be prevented to a considerable extent. Therefore, a further object of the invention is to provide a spark plug bushing which will be a good electrical conductor for the purpose of radio shielding and which will have relatively poor heat-conducting properties so as to impede the conduction of heat from the cylinder head to the base of the spark plug.

The invention consists of the construction, combination and arrangement of parts as herein illustrated, described, and claimed.

In the accompanying drawing, forming part hereof, is illustrated one form of embodiment of the invention, in which drawing similar reference characters designate corresponding parts, and in which:

Figure 1 is a vertical section of a spark plug bushing with the spark plug shown in outline;

Figure 2 is a side elevation of a bushing with a shielding cap thereon, a portion of the cylinder being shown in outline;

Figure 3 is an elevation of a bushing; and

Figure 4 is a vertical section of the bushing and cap shown in Figure 2.

Referring to the drawing, A designates a usual form of cylinder head provided with cooling fins B. The head A may be made of any desired material, but it is common to make the head of aluminum alloy. The head A is carried by the cylinder block C. The head A is provided with a spark plug opening and disposed therein is a bushing 5, having a shoulder 6 adapted to seat against the surface of the head A. The bushing 5 has a cylindrical extension 7 formed as an integral part thereof.

The bushing 5 and the extension 7 may be made of nichrome, so as to impede the passage of heat from the cylinder head A to the spark plug D, as shown in Figure 1, or the spark plug E, as shown in Figure 4. The cooling fins B will assist in cooling the head A, while the spark plug D will be cooled by the air-stream passing thereover. Since the heat in the cylinder head A can-

not readily be transmitted to the plug D, the plug D will not become overheated in use.

The bushing 5 is provided with a screw-threaded bore 8 to receive a standard size spark plug. The bore 8 also may be made of any desired diameter to accommodate the particular size of spark plug. A circumferential shoulder 9 is formed on the cup 7 at a point below the top thereof, thereby leaving a circular flange 10 at the top of the cup 7. The upper part of the shoulder 9 forms a seat 11 to receive a cap hereinafter described. The shoulder 9 is provided with the plurality of openings 12 to receive a cap-holding means hereinafter described.

As shown by Figure 1, the extension or cup 7 does not extend to the top of the spark plug D, but terminates at a point below the exposed terminal of the plug D. The plug D is shown as provided with the ordinary connecting means in common use where no radio shielding is employed. Of course, any other form of plug D may be used. When used without any radio shielding the construction heretofore described will act merely as a spark plug bushing. However, since the top edge 10 of the cup 7 is sufficiently far removed from the terminal of the spark plug D, there can be no flash-overs from the terminal to the cup. There is no resulting disadvantage from using the cup 7 without a radio shield in combination therewith. When it is desired to use a radio shield for the spark plug it is not necessary to remove the bushing 5 or the cup 7 or to employ a different size spark plug. A shielding cap may be applied directly to the cup 7 of the bushing 5 at any time without the necessity of removing the bushing 5.

In Figures 2 and 4 is illustrated a cap for use with the bushing. A metallic shell 13 is provided with a recess 14 on its lower edge. The shell 13 is adapted to seat on the upper side of the shoulder 9, as indicated at 11, while the flange 10 enters the recess 14. A washer 15 is disposed in the recess 14 so that a fluid-tight seal is provided between the shell 13 and the cup 7. At the same time an electrical contact is made between the seat 11 and the shell 13.

The shell 13 is provided with an outlet 16 and a lining of di-electric material 17. The shielding cap which comprises the shell 13 and the insulation 17 may be made as shown in my co-pending application Ser. No. 657,166. The shell 13 also may be cast and the insulation 17 formed therein.

In the outlet 16 is inserted a radio shielded conductor which may be as shown in my co-pending applications Ser. Nos. 657,166 and 657,167, which comprises a conductor 18 having insulation 19. Around the conductor 18 is disposed a conduit formed of an inner sleeve 20 having an intermediate covering of wire 21 and a second protective covering of wire 22. A flanged ferrule 23 is disposed on the end of the conduit and bears against a collar nut 24 secured to the outlet 16. A conical washer 25 is disposed in the outlet to insure a fluid-tight connection and at the same time a continuous electrical conductor is formed from the cup 7 through the shell 13, the nut 24, the ferrule 23, and the conduit formed by the layers 22, 21, and 20. By reason thereof, any electrical emanations improperly released from the spark plug will be absorbed and grounded so that no interference with radio equipment will be possible.

A pointed screw 26 is disposed in the upper portion of the insulation 17 within the shell 13 and is adapted to pierce the insulation 19 to make contact with the conductor 18. A spring contact 27 is secured to the lower end of the screw 26 and is adapted to make contact with the terminal end of a spark plug E. It will be understood that various types of spark plugs may be used and in this event various types of contacts 27 may be used. However, it is common practice to use spark plugs of the type designated by D where no shielding is used, and spark plugs of the type designated by E where a radio shield is used.

A spring bail 28 has its lower ends engaged in the openings 12 and is provided with a rotatable ball 29 on its upper end. Since the openings 12 are in the shoulder 9 of the cup 7, and are securely fixed in place, the shell 13 will be securely held on the cup 7. Since the bushing 5 is screwed into the cylinder head A, the shell 13 will not always be placed on the cup 7 in the same relative position. Therefore, a plurality of openings 12 are provided so that the bail 28 may be selectively disposed in any of several openings 12.

From the foregoing it will be seen that a complete radio shield is provided for the spark plug by using the extension 7 of the bushing 5 as the lower portion of the shield. At the same time, if it is desired to use the spark plug without a radio shield, the bail 28 is swung from the top of the shell 13 and its lower ends removed from the openings 12. The shell 13 thus can be removed and the conductor 18 connected to the spark plug D or E in the ordinary way. When used without the shield spark plug failure cannot be caused by flash-overs from the spark plug terminal to the cup 7 by reason of the fact that the top of the cup 7 is so far removed from the spark plug terminal.

Having thus fully described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. In combination with a spark plug and a cable therefor, a spark plug shield comprising a bushing disposed in the cylinder head around the spark plug and formed with an extension projecting above the surface of the cylinder head and surrounding the base of the spark plug and a cap disposed over the upper part of the plug and in electrical contact with the extension on the bushing.

2. In combination with a spark plug and a cable therefor, a spark plug shield comprising a bushing disposed in the cylinder head around the spark plug and formed with an extension projecting above the surface of the cylinder head and surrounding the base of the spark plug, said extension terminating sufficiently far below the terminal of the spark plug to prevent flashes from the terminal to the extension, and a cap disposed over the upper part of the plug and in electrical contact with the extension on the bushing.

3. In combination with a spark plug and a cable therefor, a spark plug shield comprising a bushing disposed in the cylinder head around the spark plug and formed with an extension projecting above the surface of the cylinder head and surrounding the base of the spark plug, said extension being formed with a seat to receive a cap, and a cap disposed over the upper part of the plug and seated on the extension, and in electrical contact with the extension on the bushing.

4. In combination with a spark plug and a

cable therefor, a spark plug shield comprising a bushing disposed in the cylinder head around the spark plug and formed with an extension projecting above the surface of the cylinder head and surrounding the base of the spark plug, said extension being formed with a seat to receive a cap, a cap disposed over the upper part of the plug and seated on the extension, and resilient means to maintain the cap on the bushing.

5. In combination with a spark plug and a cable therefor, a spark plug shield comprising a bushing disposed in the cylinder head around the spark plug and formed with an extension projecting above the surface of the cylinder head and surrounding the base of the spark plug, said extension being formed with a seat to receive a cap, a cap disposed over the upper part of the plug and seated on the extension, and a bail to maintain the cap on the bushing.

6. A spark plug bushing adapted to be disposed in a cylinder head to surround the base of a spark plug, said bushing being formed with an integral extension projecting above the surface of the cylinder head and surrounding the lower part of a spark plug, and said extension having formed on the upper edge thereof an annular flange to provide a seat and having openings formed therein to receive cap retaining means.

7. In combination with a spark plug and a cable therefor, a spark plug shield comprising a bushing disposed in the cylinder head around the spark plug and formed with an extension projecting above the surface of the cylinder head and surrounding the base of the spark plug, said bushing being adapted for use with or without a cap and said extension terminating sufficiently far below the terminal of the spark plug to prevent flashes from the terminal to the extension when used without a cap, and a cap disposed over the upper part of the plug and in electrical contact with the extension on the bushing.

8. In combination with a spark plug and a cable therefor, a spark plug shield comprising a bushing disposed in the cylinder head around the spark plug and formed with an extension projecting above the surface of the cylinder head and surrounding the base of the spark plug, said extension terminating sufficiently far below the terminal of the spark plug to prevent flashes from the terminal to the extension and said extension being formed with an irregular upper edge to provide a seat for a cap, and a cap disposed over the plug and in electrical contact with the extension on the bushing.

JOSEPH J. MASCUCH.