July 27, 1948. M. S. HOOK 2,446,007

SPARK PLUG COVER

Filed Dec. 11, 1944

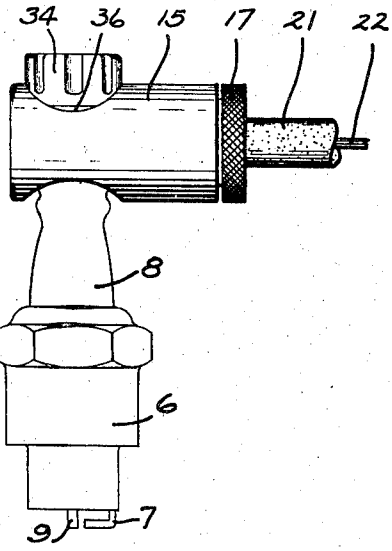


Fig. 1.

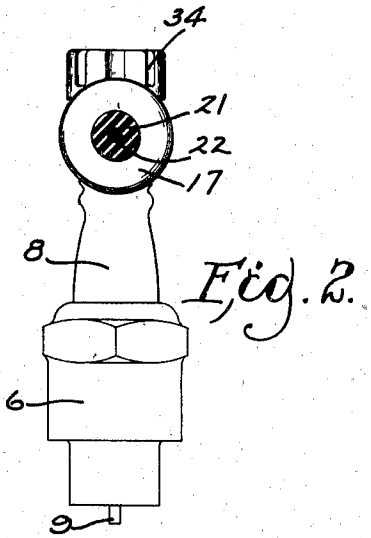


Fig. 2.

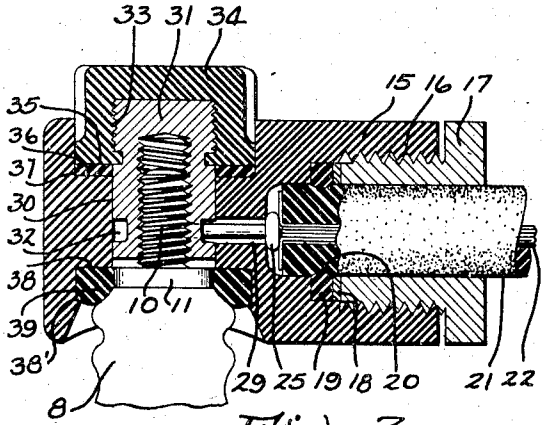


Fig. 3.

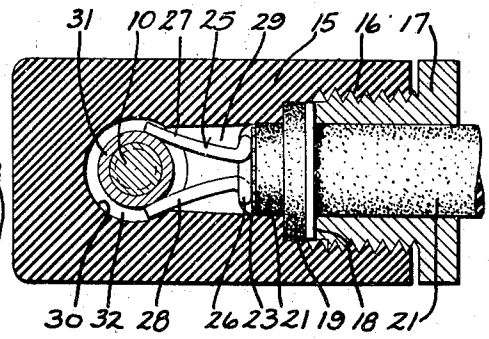


Fig. 4.

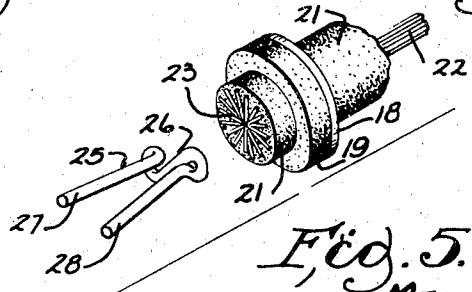


Fig. 5.

INVENTOR
MELVIN S. HOOK
BY
Wheeler, Wheeler & Wheeler
ATTORNEYS.

Patented July 27, 1948 2,446,007

UNITED STATES PATENT OFFICE

2,446,007

SPARK PLUG COVER

Melvin S. Hook, Gurnee, Ill., assignor to Outboard, Marine & Manufacturing Company, Waukegan, Ill., a corporation of Delaware

Application December 11, 1944, Serial No. 567,686

7 Claims. (Cl. 174—77)

1

This invention relates to improvements in spark plug covers.

It is a primary object of the invention to provide a novel, simple and inexpensive spark plug cover of compact form and unusual effectiveness in completely excluding moisture from the electrical connection to the plug and from the joint between the plug electrode and the porcelain.

It is a further object of the invention to provide a spark plug cover of such size, location and construction as to minimize heat deterioration and consequent leakage by spacing the spark plug cover as far as possible from the metal base of the spark plug.

Other objects of the invention will be apparent to those skilled in the art upon analysis of the following disclosure.

In the drawings:

Fig. 1 is a side elevation of a spark plug to which is applied a spark plug cover embodying the invention.

Fig. 2 is a side elevation of the parts shown in Fig. 1.

Fig. 3 is an enlarged view taken in vertical section through the spark plug cover.

Fig. 4 is an enlarged view taken in horizontal section through the spark plug cover.

Fig. 5 is a view in perspective showing details of the contact clip and lead terminal separately.

Like parts are identified by the same reference characters throughout the several views.

Conventionally, a spark plug includes a metal base at 6 carrying the grounded electrode 7. Insulated by the porcelain 8 from the metal base is the center electrode 9 provided at its upper end with a threaded terminal 10 on which a nut 11 engages the porcelain.

My improved spark plug cover comprises a body portion 15 which, in this embodiment, is of generally cylindrical form. One of its ends is interiorly socketed and threaded at 16 to receive the gland nut 17. Under pressure of the gland nut, transmitted through washer 18, the resilient dielectric gasket 19 is deformed and caused to press inwardly at 20 upon the insulating cover of rubber or the like at 21 which encloses the bundle of wires 22 comprising the ignition lead. It is desirable that the lead should not be fabric covered as the fabric would carry moisture through the sealing gasket 19.

At the end of the insulation 21, the wires are fanned out at 23 as best shown in Fig. 5 to engage a spring clip 25, the intermediate portion of which is formed at 26 to constitute a head from which the legs 27 and 28 diverge. The leg portions of

2

the clip extend through the aperture 29 of the insulating body and are spread against escape as clearly shown in Figs. 3 and 4. The head portion 26 of the clip remains in the base of the bore into which the lead is inserted, the head being in electrical contact with the fanned out ends 23 of the lead wires.

Extending transversely through the body portion 15 of the spark plug cover is a bore 30 intersected by aperture 29 and accommodating a nut 31 which has, at the level of aperture 29, an annular groove 32 engaged by the legs 27, 28 of the spring clip 25. The spring clip not only affords an electrical connection between the lead and the terminal coupling nut 31, but also serves to lock the terminal nut within the body portion 15 of the spark plug cover to be handled unitarily therewith. The interlocking engagement between the clip legs 27, 28 and the groove 32 of the terminal nut precludes the terminal nut from material axial displacement in either direction longitudinally of bore 30 in which it rotates.

The terminal nut is a metallic insert preferably provided at 33 with knurling about which a dielectric handle 34 is molded. The lower surface of the handle 34 constitutes a shoulder at 35 which engages a gasket 36, preferably of synthetic rubber, which is clamped in the bottom of counter bore 37 to seal hermetically the joint between the nut and the body of the device.

An opposite downwardly opening counter bore at 38 undercut at 38' receives and retains another gasket 39 within which the ring nut 11 of the spark plug is receivable. This gasket seats on the extreme end of the porcelain 8 of the plug, and bears against the ring nut 11 and the portions of body 15 which lie at the end and side of the counter bore 38 to hermetically seal the joint between these parts.

The mechanical retention of the terminal nut by the clip 25 is merely to prevent loss of the nut during handling. In use, the wires have no mechanical load. The tightening of the nut seats both gaskets 36 and 39.

It will be apparent from the foregoing that the body 15, gland 17, spring clip 25, and the terminal coupling nut 31, 34 constitute a unit which may be sold and handled either with or without the gaskets 19, 36 and 39. Although the terminal nut assembly cannot escape from the bore 30, it is freely rotatable therein. In the course of terminal nut rotation for screwing it on to or removing it from the terminal 10, the entire spark plug cover is applied to or removed from the spark plug.

The connection between the spark plug cover and the high tension lead may be made either prior to or subsequently to the mounting of the cover upon the spark plug. With the gland nut 17 loosened, the lead is pushed through the gland to engage the fanned out wires at 23 forcibly with the head 26 of the spring clip 25. Thereupon the gland is tightened to resist any normal tension tending to pull the lead from the cover.

The space enclosed within the three seals provided by the gaskets 19, 36 and 39 is desirably small in its capacity to prevent "breathing." The three gaskets completely prevent moisture from creeping into the interior of the device from above or below or along the lead. Since the entire spark plug cover and lead are supported at the extreme end of the spark plug, the device makes maximum use of the dielectric capacity and low heat transmission capacity of the spark plug porcelain 8.

The terminal nut insert 31 and the spring clip 25 are made of brass or other electrically conductive material. The body portion 15, the terminal nut handle 34 and the gaskets 19, 36 and 39 are preferably dielectric and the several gaskets are preferably elastically deformable rubber or synthetic rubber. The gland nut 17 and its washer 18 may be either metallic or nonmetallic.

In practice, my improved spark plug cover will completely exclude moisture from the electrode terminal of the spark plug even though the spark plug and cover are submerged in water. The spark plug cover as herein disclosed is not only desirable on outboard motors and marine engines, but is of general application to internal combustion engines for automotive and aviation and industrial purposes. The possibility of leakage and arcing between the high tension conductors and ground due to salt, moisture, dust or other foreign matter on the spark plug porcelain is eliminated.

With all of its advantages, the spark plug cover is nevertheless simple in design and economical of manufacture.

I claim:

1. A spark plug cover for housing an electrical connection from an insulated high tension lead to a spark plug and comprising a dielectric body having a first bore extending through said body and a second bore opening into said body and communicating with said first bore, said body being provided with counter bores about the second bore and both ends of the first bore, annular gaskets in the respective counter bores, a terminal nut rotatable in the first bore and provided with a shoulder engaging its associated gasket, said nut having an annular groove in registry with the inner end of said second bore, a bifurcated contact clip in the second bore having leg portions engaged in the groove of the terminal nut whereby to provide electrical connections thereto while mechanically interlocking said terminal nut against axial displacement in the first bore, said contact clip having a head portion exposed in the second bore in spaced relation to a third annular gasket therein, said body having a shoulder in said second bore against which said gasket seats, and a gland nut threaded in said body in the counter bore of said second bore for applying pressure to said third gasket, high tension lead wires having end portions embedded in impermeable insulation and extending through said gasket, with the ends of the wires exposed and fanned out in pressure relation to the head of said contact clip.

2. A spark plug cover having a body portion impervious to moisture and lead wires sealed in one end of the body, a bore extending through the body transversely of the lead wires with its ends counterbored to provide spaced annular shoulders on opposite sides of the axis along which the lead wires enter, compressible annular gaskets seated against said shoulders, a coupling nut rotatable in said bore and having an electrically conductive portion in position for threaded engagement with the upper end of the central terminal of the spark plug, said nut having a dielectric cap portion fitted to one of the counterbores and adapted to apply clamping pressure to said gaskets, one of said gaskets being adapted for sealing engagement with the body at the inner end of its associated counterbore and the other of said gaskets being adapted for sealing engagement with the porcelain end of a spark plug when the central terminal of such plug is in threaded engagement with said nut, and an electrically conductive clip having a forked end in pressure contact with the conductive portion of said nut and having a head portion with which said lead wires are engaged.

3. In a spark plug cover, the combination with an apertured body portion impervious to moisture and covering the ends of high tension lead wires in sealing relation thereto, a sealing gasket at one end of the body aperture adapted to bear on the porcelain head of an ordinary spark plug, a coupling nut seated in the body aperture and said nut having a dielectric exposed portion and an electrically conductive inner portion of less diameter encircled by a compressible sealing gasket between the dielectric portion and the body, and a forked connecting clip having a head portion in electrical contact with the lead wires and its fork arms in electrical contact with the conductive portion of the nut, said nut having a socket in which the terminal of an ordinary spark plug may have threaded engagement, whereby rotation of the nut in one direction may apply sealing pressure to both of said gaskets while moving into threaded engagement with said terminal.

4. A cover applicable to a conventional spark plug having a porcelain insulator and projecting terminal screw for providing a sealed high tension connection to said screw, said cover comprising a body having first and second bores intersecting at right angles, the first bore having counterbores at both ends and the second bore having a counterbore opening to one side of said body, first and second compressible moisture-resistant annular gaskets seated in the respective counterbores of the first bore, the first said gasket being formed to engage a spark plug insulator adjacent its upper end with the terminal screw of the spark plug extending into said first bore, a nut having an electrically conductive portion rotatably mounted in said first bore and a dielectric head portion forming a shoulder engageable with the second of said gaskets, said head portion projecting from said body for manipulation of said nut, a third gasket of deformable material in the counterbore of the second bore, and a packing gland threaded to said body in said last mentioned counterbore for compressing said third gasket upon an insulated high tension lead in said last mentioned counterbore, said second bore opening into the first bore at the level of the

electrically conductive portion of said nut whereby to provide access for electrical connection to said conductive nut portion and thereby to the spark plug terminal from such a lead.

5. A device applicable to the end of a high tension lead for unitary handling therewith and for establishing a moisture-sealed electrical connection exclusively about the extreme end of a conventional spark plug having a porcelain insulator and an electrical terminal projecting therefrom, said device comprising the combination with a body having a terminal-receiving bore opening through the body and provided at both ends with a counterbore, together with a high tension bore opening laterally from the first mentioned bore and also provided with a counterbore, a nut having an electrically conductive portion adapted for threaded engagement with the spark plug terminal and rotatably fitted in said terminal-receiving bore, said nut having a dielectric head of larger diameter than its conductive portion and disposed in one of the counterbores of the terminal-receiving bore, the other counterbore of the terminal-receiving bore being provided with sealing means formed for engagement with the upper end of a spark plug insulator, an electrical conductor extending through the high tension bore into the terminal-receiving bore of said body and mechanically interlocked with the electrically conductive portion of said nut, said last mentioned nut portion being provided with an opening in which said conductor is engaged, whereby said nut is keyed in said terminal-receiving bore, together with means comprising a deformable gasket, and a packing gland in threaded connection with said body in the counterbore of said high tension bore for holding in said last mentioned bore an insulated high tension lead in engagement with said conductor, the aforesaid nut constituting means for simultaneously holding said body at the end of a spark plug while effecting sealed electrical connection within said body to the spark plug terminal.

6. The combination set forth in claim 5 in which said conductor comprises a bifurcated member and the opening in the electrically conductive portion of said nut constitutes an annular groove in which the bifurcated ends of said conductor are divergently engaged to key said nut to said body against axial withdrawal therefrom while permitting rotation of said nut respecting said body for engagement with and disengagement from a spark plug terminal.

7. As a new article of manufacture, a conductor adapted for use in a spark plug cover to effect electrical high tension connection to a spark plug nut while keying said nut within said cover, said member comprising a pair of legs mutually spaced at one end and mutually integrally connected at the other end with a transverse head constituting an integral convolution of the material of said legs, said convolution lying in a plane at right angles to the plane in which said legs are disposed and having surfaces transverse to said legs against which the fanned wires of an insulated high tension lead are engageable.

MELVIN S. HOOK.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,050,885	Welch	Jan. 21, 1913
1,139,973	Herz	May 18, 1915
1,167,820	Herz	Jan. 11, 1916
1,191,162	Dixon	July 18, 1916
1,298,799	Schmidt	Apr. 1, 1919
1,595,031	Steiner	Aug. 3, 1926
1,862,876	Wright et al.	June 14, 1932
1,912,980	Hoogendorn	June 6, 1933
2,177,509	Abbott	Oct. 24, 1939

FOREIGN PATENTS

Number	Country	Date
25,802/1905	Great Britain	Oct. 18, 1906
155,066	Great Britain	1920
290,820	Great Britain	May 24, 1928
746,326	France	Mar. 7, 1933