United States Patent [19]

Bevacqua

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[54] **HIGH VOLTAGE COIL BOOT**

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[52] **U.S. Cl.** ..... **123/148 A,** 123/147

[51] **Int. Cl.** **F02p 9/00**

[58] **Field of Search** ..... 123/148 A, 147

[56] **References Cited**

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[57] **ABSTRACT**

A high voltage coil boot for connecting an ignition coil and a spark plug together comprising a tubular sleeve of resilient electrical insulating material including a collar portion intermediate the ends of the sleeve and having a ramp portion with an air vent to facilitate mounting of the coil onto the boot mounted spark plug. The portion of the collar which prevents disengagement from the coil may be either sawtooth or rounded. With the ignition coil mounted over the boot, the collar is deflected to form an inner annular lip below a spark plug rib to resist disengagement thereof. Portions on each end of the tubular sleeve provide additional sealing and shock mounting.

8 Claims, 5 Drawing Figures

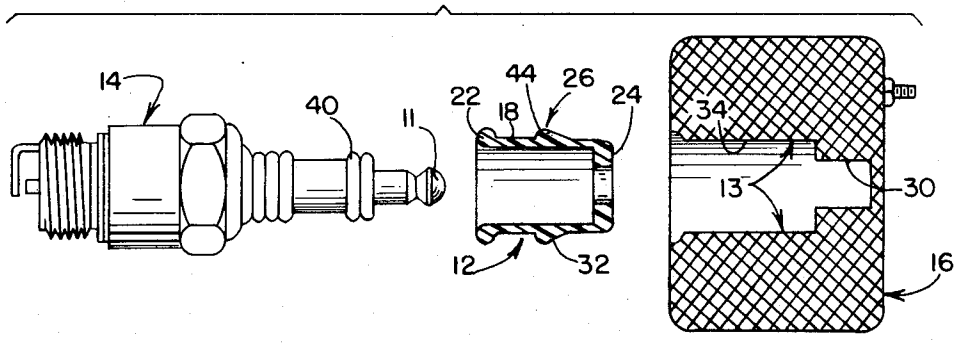


FIG. 1

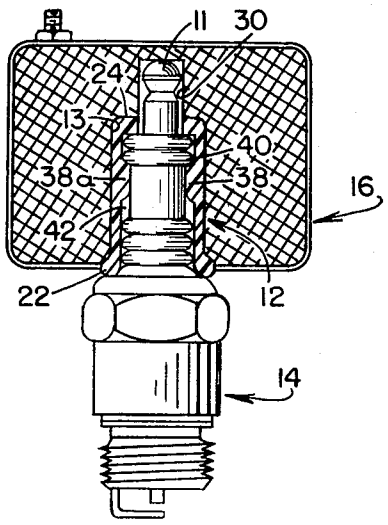


FIG. 4

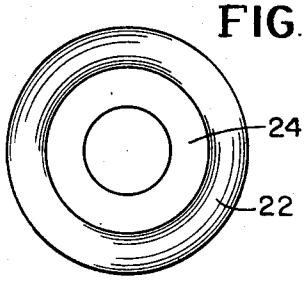


FIG. 2

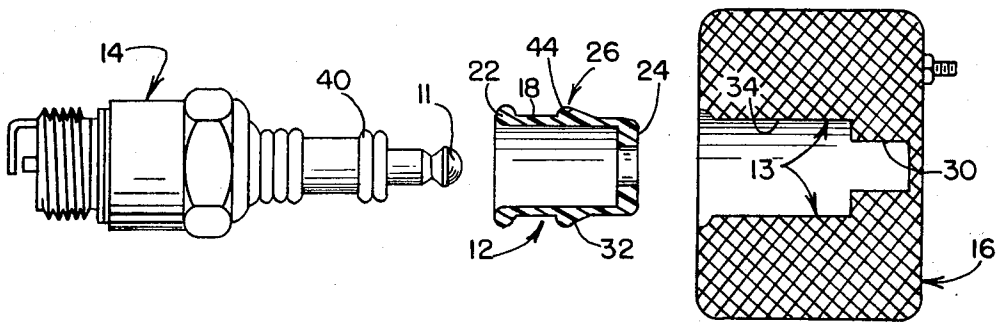


FIG. 5

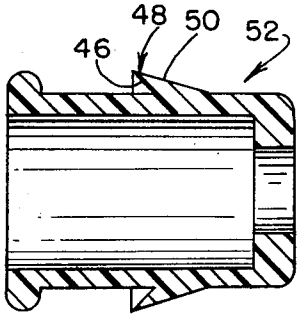
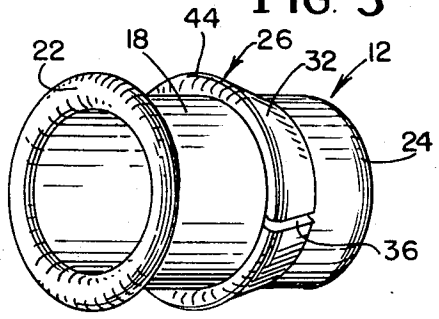


FIG. 3



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HIGH VOLTAGE COIL BOOT

BACKGROUND OF THE INVENTION

In the past attempts have been made to mount coils directly on spark plugs but none has proved too successful. One of the most recurrent problems was spark plug breakage. The shock resulting during operation with the coil mounted on the spark plug was too great. Other attempts included integral engagement of the ignition coil with the spark plug. However, no accommodation was made for the resulting overheating of the coil caused by the direct contact of the spark plug with the coil.

A further problem has evolved from the necessity of sealing the coil mounted spark plugs from moisture and dust. In most applications the apparatus depended on the resilient capacity of elastic materials to cause continued adherence to the spark plug. In time the resilience deteriorated, and sealing became less effective.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an improved shock mounting for a high voltage coil on a spark plug.

It is yet another object of this invention to seal a portion of the spark plug against moisture and dust.

It is still another object of this invention to provide improved heat insulation between the ignition coil and spark plug.

The high voltage coil boot of the present invention is molded of resilient insulating material such as neoprene, and comprises a tubular sleeve which fits onto a spark plug over which the bore of a high voltage coil is mounted. An annular, ring-like base at one end of the sleeve provides sealing and shock mounting between the spark plug coil base and spark plug, while the top of the sleeve provides sealing and shock absorption between the top of the plug and the coil. A collar portion connected to the outer surface of the sleeve intermediate the bottom and top portions thereof, has a ramp with an air vent to ease mounting the coil. Intersecting the ramp is that portion of the collar which prevents disengagement from the coil and may be either sawtooth or rounded in cross-section. With the ignition coil being mounted, the collar portion is deflected inwardly to form a lip on the inside of the sleeve to fit below an annular rib on the periphery of the spark plug, i.e., an annular detent, to prevent the spark plug from being extracted from the sleeve. The lip locks the spark plug to the sleeve and the deflected annular collar locks the sleeve to the coil.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partial cross-section in elevation of a high voltage boot connecting an ignition coil and a spark plug;

FIG. 2 is an exploded, partial cross-section in elevation of the high voltage ignition coil and spark plug of FIG. 1;

FIG. 3 is a perspective view of a high voltage boot in accordance with this invention;

FIG. 4 is a bottom plan view of the boot of FIG. 3; and

FIG. 5 is a partial cross-section of another embodiment of a high voltage coil boot in accordance with this invention.

DETAILED DESCRIPTION

Cutting electrical power losses and radio frequency signals from high tension leads in internal combustion engines utilizing, for example, capacitor discharge ignition systems, requires high voltage coils be in close proximity to the spark plugs. The high voltage coil boot **12** shown in FIG. **1** comprises a sleeve **18** of resilient electrical insulating material such as neoprene and provides a means for connecting a spark plug **14** to an ignition coil **16**. The sleeve **18**, the annular top **24** and bottom **22** (FIGS. **3** and **4**) and collar **26** of the boot **12** are molded as one unit and require no connectors.

The boot **12** fits loosely over the top of the spark plug **14** and is held in place by the top **24** which rests on the spark plug until the ignition coil **16** is secured thereon. The annular bottom ring **22** provides a seal against moisture and dust while its resilience provides a shock mounting for the coil **16**. Of course, the dimensions of an individual boot are determined by the sizes of spark plugs and coil involved.

When the sleeve **18** is initially assembled on the plug, the collar **26** projects from outside the wall of the boot as in FIGS. **2** and **3**, and has a circumference at its greatest diameter approximating that of the annular bottom **22**. As the spark plug mounted boot is inserted into the coil **16**, the ramp **32** of the collar **26** facilitates the assembly of the parts. However, because the diameter of the collar at the base of the ramp portion is greater than the diameter of the bore of the coil an interference fit results between the boot and coil bore **13** at the collar **26** making it difficult to complete insertion. As additional force is applied, the collar **26** is forced inwardly against the spark plug **14** with the air vent **36** preventing the formation of an air cushion, or pocket, above the collar inside the coil core, and consequently insuring a tight seal. When insertion is complete, the spark plug terminal **11** fits into coil clip **30** and provides a necessary electrical contact for operation. The use of electrical insulating material such as neoprene prevents arcing and current drain, and provides heat insulation between the coil and plug by the physical separation of the two.

In the connected state with the spark plug in the boot and the boot in coil bore **13**, the collar **26** is deformed inwardly. A sealing lip **38** (FIG. **1**) projects from the inner wall of the tubular sleeve and fits below a spark plug rib **40**, where a recess **42** acts as an annular detent. This sealing lip **38**, **38***a* results from deflection of the collar portion **26** caused by the structure of the inner wall **34** of the coil bore **13** when the spark plug, boot and ignition coil are connected and prevents disengagement of the spark plug. The sealing lip **38** also provides sealing means for preventing moisture and dust from fouling the spark plug and acts as a shock mounting, in essence, by floating the coil **16**.

The effectiveness of the boot depends upon the relative circumference, resilience and breadth and shape of the collar portion **26** (FIG. **2**) or **48** (FIG. **5**). Disengagement of the spark plug from the coil may be affected by the cross-sectional shape of the collar. FIGS. **2** and **3** show one embodiment where an arcuate por-

tion 44 intersects with ramp 32. Another embodiment shown in FIG. 5 utilizes a sawtooth corner on collar 48. The sharper the intersection of side 46 with ramp 50 of collar 48, the more difficult disengagement of the coil 16 from the spark plug 14 and boot 12 (FIG. 1) or 52 (FIG. 5) becomes. In other words, the smaller the angle at the intersection of side 46 and ramp 50 the more difficult to extract the spark plug.

Additional insulation, sealing and shock mounting is provided by the top 24 which provides a loose fit for the boot around clip 30 of the coil 16 and over the top 11 of the spark plug before the coil is mounted.

What this invention provides, therefore, is a means for successfully mounting a high voltage coil on a spark plug while providing insulation, sealing from moisture and dust, and shock mounting.

I claim:

1. A high voltage coil boot for mounting an ignition coil on a spark plug, comprising a tubular sleeve of resilient electrically insulating material having a collar portion projecting outwardly from said sleeve intermediate the ends thereof, said sleeve being fitted about said spark plug and said collar portion being deflected inwardly against the spark plug with said ignition coil being mounted on said sleeve to form a sealing lip on the inside surface of said sleeve against the spark plug thereby fastening the ignition coil to the spark plug.

2. The high voltage coil boot according to claim 1 wherein said sleeve includes a ring-like base portion, said base portion engaging said spark plug with the ignition coil being mounted to the plug over said boot thereby sealing said coil and plug from moisture and providing a shock mounting.

3. The high voltage coil boot according to claim 2 wherein said sleeve further includes a top portion longitudinally displaced from said base, said top portion providing insulation between said spark plug and said ignition coil and shock mounting said ignition coil to said spark plug.

4. The high voltage coil boot according to claim 1 wherein said collar includes a ramp portion positioned to facilitate the mounting of the ignition coil over said boot and onto the spark plug.

5. The high voltage coil boot according to claim 1 wherein said collar includes a sawtooth corner at its greatest diameter to prevent disengagement of the ignition coil from the boot mounted spark plug.

6. The high voltage coil boot according to claim 1 wherein said sleeve further includes an air vent slot to prevent formation of an air cushion in said ignition coil thereby insuring a tight seal between said boot, said coil and said spark plug.

7. A high voltage coil boot for connecting a spark plug having at least one rib portion about the body thereof to an ignition coil having a bore therein including in combination, a tubular sleeve of resilient electrically insulating material, said sleeve having a collar and being mounted on the body of said spark plug, said collar having a ramp portion and a diameter at the base of said ramp portion greater than the diameter of the bore in the ignition coil, and said coil being mounted to the plug over said ramp portion in an interference fit with said collar thereby deflecting said sleeve inwardly to form a sealing lip engaging the spark plug beneath said rib portion, said sealing lip substantially preventing the removal of the coil from the spark plug.

8. The high voltage coil boot of claim 7 further including said collar having a slot therein to vent air with said coil being assembled to said spark plug over said boot mounted therebetween to prevent formation of an air cushion.

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