Jan. 24, 1967 H. P. HOPP 3,299,504

METHOD OF APPLYING SPARK PLUG GASKETS

Filed Oct. 11, 1963

Fig. 1

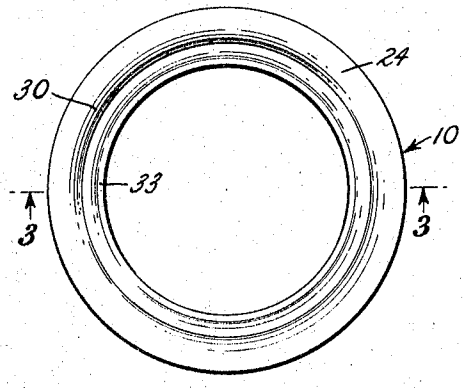
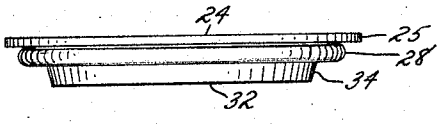


Fig. 2



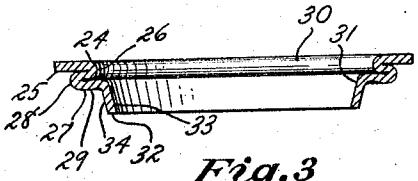


Fig. 3

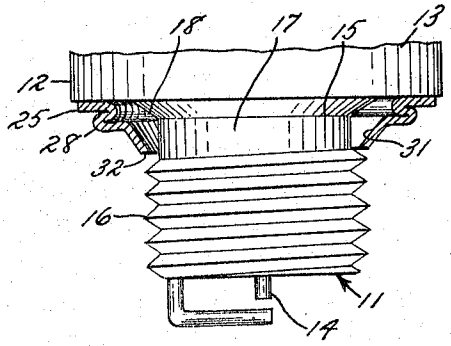


Fig. 6

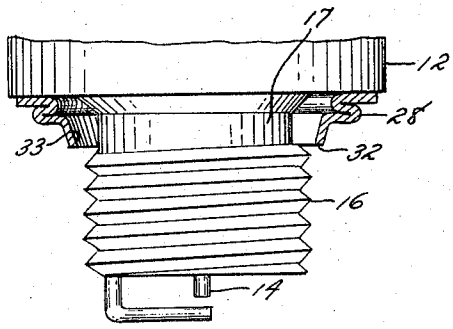


Fig. 4

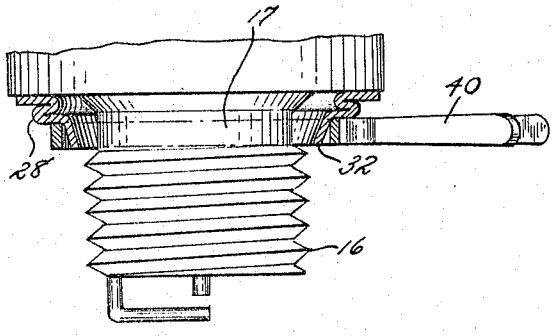
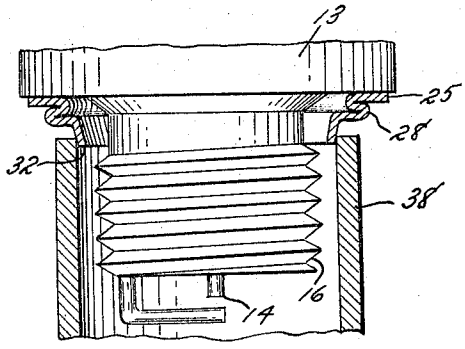


Fig. 7

Fig. 5



United States Patent Office 3,299,504 Patented Jan. 24, 1967

3,299,504

METHOD OF APPLYING SPARK PLUG GASKETS

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Filed Oct. 11, 1963, Ser. No. 315,610
1 Claim. (Cl. 29—511)

This application is a continuation-in-part of my copending application Serial No. 116,858, filed June 11, 1961, now abandoned, entitled, Pressure-Locked Spark Plug Gaskets.

This application relates generally to the field of sealing gaskets, and more particularly to a method of applying an improved spark plug gasket of a lockable type.

Spark plug gaskets, in the prior art, have been of a deformable type, usually formed from copper or plated steel. In either case, the material is annealed after the gasket has been formed, so that when a spark plug is engaged within a cylinder head of an engine, the gasket is readily deformed under compression to effect a seal between the spark plug and the cylinder head. Upon removal of the spark plug for cleaning or replacement, the gasket has usually remained on the exposed surface of the cylinder head, necessitating separate removal before a new gasket may be employed to seal the replaced plug.

In recent years, the wide use of overhead valve type internal combustion engines has made the replacement of spark plugs a far more difficult operation than has heretofore been the case. In may cases, the spark plug opening in the head is completely concealed from the view of the mechanic, so that the spark plug and attached gasket must be manually inserted blindly into the proper opening using the fingers of one hand. Such operations have resulted in the loss of gaskets prior to engagement of the spark plug with the opening in the cylinder head, and, in some instances, the replacement of a spark plug with a new gasket disposed upon an old one, so that the spark plug does not become properly seated within the combustion chamber.

Attempts have been made to provide so-called screw-on gaskets having projections or a continuous thread thereupon which permit the gasket to be threadedly engaged upon the lower cylindrical portion of the spark plug body, so that the same will remain in proper position during the engagement of the spark plug with the cylinder head. While such construction has been adequate to maintain the gasket upon the spark plug during such engagement, and is the only type of gasket which can be used where the plug body is threaded throughout the entire length of the lower shank portions, such gaskets have tended to remain in place on the cylinder head when the spark plug is unthreaded, owing to the cementitious action of rust, corrosion and the like, which normally occurs while the spark plug is in service. Such devices have an added disadvantage in that a separate operation, that of threading the gasket upon the plug, is necessary before the plug may be installed.

In my copending, now abandoned, application for United States Letters Patent Serial No. 21,317, filed April 11, 1960, entitled Self-Locking Spark Plug Gasket, there is disclosed a gasket construction which may be slipped over the threaded shank of a spark plug prior to installation, and which will deform when tightened within a cylinder head in such manner that a locking flange will engage the undercut area at the outer end of the threaded shank to permanently lock the gasket thereupon. While this construction represents an improvement over conventional gaskets, it has been found desirable, particularly in the case of spark plugs having undercut threaded shank portions, to provide a gasket which may be mechanically

locked upon the undercut portion prior to installation of the plug within a cylinder head, so as to avoid all possibility of loss or misalignment of the gasket on the shank prior to such installation. Such gaskets are preferably installed upon the plug body without the necessity of manually threading the gasket, and in such manner that the portions of the gasket which ultimately provide a sealing action remain unaffected during installation of the gasket, whereby no additional hardness is introduced into the sealing portions to require subsequent annealing.

Another object of the invention lies in the provision of a method of assembling a lockable spark plug gasket of the class described which is provided with an internal locking flange disposed at a small angle with respect to the principal axis of the gasket, so as to be readily engaged by a cylindrically shaped tool which may impart a small degree of centripetal distortion to the locking flange sufficient to accomplish a locking action, and which movement is accomplished in the absence of contacting the remaining portions of the gasket, so as to introduce no distortion or hardness which would deleteriously affect the formation of a proper seal when the spark plug is installed.

A feature of the invention lies in the fact that only a minute degree of mechanical distortion is necessary to engage the locking flange upon a spark plug, as contrasted with considerable distortion necessary in the case of prior art devices.

These objects and features, as well as other incidental ends and advantages, will more fully appear in the progress of the following disclosure, and be pointed out in the appended claim.

In the drawing, to which reference will be made in the specification, similar reference characters have been employed to designate corresponding parts throughout the several views.

FIGURE 1 is a view in elevation of an embodiment of the invention.

FIGURE 2 is a side elevational view thereof as might be seen from the upper portion of FIGURE 1.

FIGURE 3 is a central sectional view as seen from the plane 3—3 in FIGURE 1.

FIGURE 4 is a fragmentary sectional view showing the action of an installing tool upon the locking flange portion of the embodiment, wherein the same is distorted to engage the plug body.

FIGURE 6 is a similar sectional view showing the shape of the embodiment after subsequent removal of the tool therefrom.

FIGURE 7 is a sectional view showing an alternate form of gasket-locking tool.

In accordance with the invention, the device, generally indicated by reference character **10**, is shown in the drawing (FIGURES 4 and 5) for use in conjunction with a conventional spark plug **11**, including a metallic body **12** forming an upper cylindrical member **13** in which an electrode **14** is mounted, and a lower threaded cylindrical member **15** having a continuous thread **16** engageable within a correspondingly threaded portion in a cylinder head (not shown). The thread **16** terminates at the upper portion thereof to form an undercut portion **17** which may include a tapered fillet **18**.

The device **10** is preferably formed by progressive die stamping operations well-known in the art, and includes a sealing element **24** of annular configuration, the element **24** having a first sealing member **25**, a first bend portion **26**, a second sealing member **27**, a second bend portion **28**, and a third sealing member **29**. During installation of the spark plug **11**, the sealing element **24** will be compressed along a principal axis of compression to effect a seal between the metallic body **12** of the spark plug **11** and a cylinder head of an internal combustion engine.

Extending inwardly or centrally of the sealing area defined by the sealing element **24** is a third bend portion **30** supporting a locking flange **31** of generally frustoconically shaped configuration best seen in FIGURES 1, 2 and 3. The flange **31** includes an edge surface **32**, an inner surface **33**, and an outer surface **34**. From a consideration of FIGURE 3, it will be observed that both the third bend portion **30** and the flange **31** are outside of the sealing area formed by the sealing element **24**, and are thus not subject to distortion during installation of the plug **11** in a cylinder head. The taper angle of the outer surface **34** with respect to the principal axis of compression of the device **10** may vary depending upon the type of tool employed for installation of the same upon a spark plug **11**, from 0° to 45°, as extreme limits, and preferably within the range of 5° to 30°. The inside diameter of the flange **31**, as measured across the edge surface **32**, is preferably sufficient to just clear the major axis of the threads **16** on the plug **11**, so as to permit slidable engagement without the necessity of manually threading the device **10** upon the threads **16**. In this condition, a cylindrically-shaped tool **38** (see FIGURE 5) is moved axially with respect to the axis of the plug **11** to contact the outer surface **37** along an arc spaced from the inner surface **33**. Owing to the initial close fit prior to distortion of the flange **31**, a very small degree of movement of the tool **38** will result in a substantial inward displacement of the edge **32** to move the same behind the uppermost portion of the thread **16** and permanently lock the device **10** upon the plug **11**.

In installed condition, the plug may then be manually handled, installed or removed with respect to a cylinder head without fear of loss of the device **10**, which may rotate independently of the undercut portion **17**, but which will nevertheless remain permanently attached upon the plug **11**. During the securing of the device **10** upon the plug **11**, distortion of the flange **31** by the tool **38** will result in a small degree of tool hardening of the metal forming the flange **31**, but this effect is not transmitted past the bend portion **30**, and owing to the fact that both the bend portion **30** and the flange **31** are disposed inwardly of the sealing area, the sealing element **24** including the sealing members **25**, **27** and **29** remains in a soft highly annealed condition to effect a complete seal without difficulty.

Referring to FIGURE 7, there is shown an alternate form of tool which may be employed where the angular relation of the outer surface with respect to the axis of compression is between 0° and 5°, under which condition the use of the tool **38** is not suitable owing to the limited surface presented for contact therewith. The tool **40** is of generally planar configuration, and is applied to the surface **34** at right angles with respect to the axis of the plug **11** to result in inwardly moving the flange **31** to obtain a result as described hereinabove. A tool of this type may be conveniently formed as a pair of pliers, or, where high production is desired, as the operating portions of a press or similar machine.

It may thus be seen that I have invented novel and highly useful improvements in locking-type spark plug gaskets, in which there has been provided a means for effectively securing a gasket in permanently installed

condition with respect to a plug, the installation being accomplished without in any manner increasing the temper of the material ultimately forming the sealing portion of the gasket. By disposing the locking flange such that the surfaces of the same are substantially parallel to the axis of compression, very little distortion is required to accomplish a locking effect, thus minimizing the amount of any tempering effect imparted to the metal forming the gasket. The instant construction is to be distinguished from prior art types of gaskets in which the locking effect is obtained by the same members which accomplish the ultimate sealing of the plug with respect to the cylinder head, and which by their very nature cannot be pre-installed upon a spark plug without materially affecting the temper of the portions of the gasket which accomplish the sealing action upon installation of the plug with respect to a cylinder head.

I wish it to be understood that I do not consider the invention limited to the precise details of structure shown and set forth in this specification, for obvious modifications will occur to those skilled in the art to which the invention pertains.

I claim:

The method of permanently installing in captive relation a compressible annular spark plug gasket upon a spark plug having a threaded end thereon and an undercut portion which is free of threads adjacent said threaded end which comprises the steps of:

(a) providing an annular gasket having a principal axis of compression, said gasket including a sealing portion comprising in cross section an S-shaped sealing member with a radially extending portion adapted to abut the metallic body of a spark plug and a locking flange comprising a generally axially extending portion connected to said S-shaped sealing member at the opposite end from said radially extending portion;

(b) placing said gasket concentrically upon said threaded end portion of said spark plug in such manner that said radially extending sealing portion abuts the body of the spark plug and said locking flange overlies said undercut portion thereof;

(c) providing a tool having an operative surface of effective diameter less than that of said sealing member; and

(d) mechanically deforming said locking flange by applying only a continuous circumferential force by means of said tool to an effective internal diameter less than the major diameter of said threaded end, in such manner that said sealing member is not contacted.

References Cited by the Examiner

UNITED STATES PATENTS

2,127,969	8/1938	Dingwerth	29—520
3,029,084	4/1962	Gobb	277—236 X

OTHER REFERENCES

1,079,577, 4–1960, German application (Kiekert).

CHARLIE T. MOON, *Primary Examiner.*