

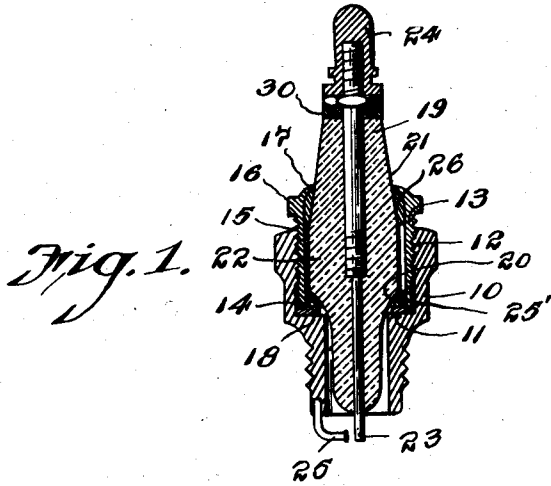
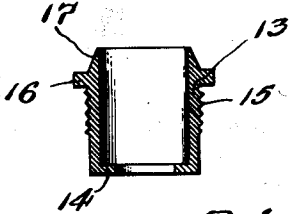
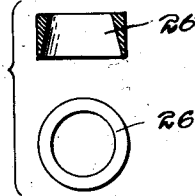
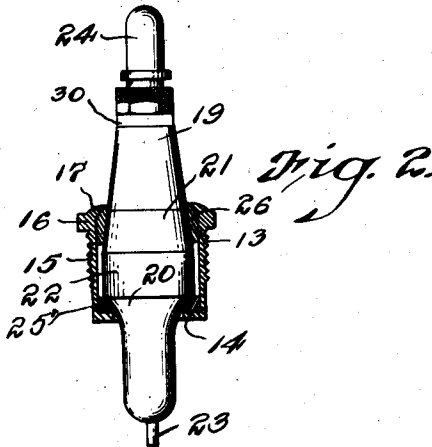
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J. M. SYME

SPARK PLUG.

Filed July 23, 1919



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SPARK PLUG.

Application filed July 23, 1919. Serial No. 312,774.

To all whom it may concern:

Be it known that I, JAMES M. SYME, a citizen of the United States, residing at Fitchburg, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Spark Plugs, of which the following is a specification.

It is a purpose of this invention to enable the construction of a plug in which the porcelain insulating element may be readily secured permanently in a metal mounting, while at the same time the shell and porcelain may be separated for cleaning or examination with facility. It is an important object to give a construction in which the porcelain will be permanently secured in an integral metallic mounting to which it is held secured with a gas-tight joint, while at the same time permitting ready removal of the porcelain in its metal mounting from the shell when desired. A further object is to enable the mounting of the porcelain with a minimum liability of fracture. In attaining this object, one purpose is to provide efficiently for expansion and contraction in such manner as to relieve the porcelain from severe stress such as might tend to fracture its structure; and it is likewise an aim in this direction to enable the formation of the porcelain in such manner that it is adapted to sustain in the most efficient manner the stresses to which it is subjected.

I am aware that the mounting of porcelains in bushing elements having integral flanges, one of which is spun in toward the porcelain to secure it has been previously disclosed, and it is my aim to improve upon the details of construction of such mountings, with a view to increasing the efficiency of the plug in use; cheapening its cost, both for materials and manufacturing operations, and to present a plug which will be comparatively small in size and adapted to general uses in various forms of motors. It is one advantage of my invention that a gas-tight joint is effected upon a porcelain without severe compression of parts of the porcelain between opposed shoulders.

Additional objects, advantages and features of invention will appear from the construction, arrangement and combination of parts hereinafter described and shown in the drawings, wherein,

Fig. 1 is a vertical longitudinal sectional

view of a plug constructed in accordance with my invention,

Fig. 2 is a detail of the porcelain and gland assembly,

Fig. 3 is a detail of the gland, before assembly,

Fig. 4 is a detail of one of the gaskets.

There is illustrated a plug including a shell 10, which may be of any usual form although in the present instance it is formed with a shoulder 11 intermediately of its bore, with a larger interiorly threaded passage 12 extending outwardly thereof, into which a gland element may be screwed. In the present instance my gland 13 is in the form of a cylindrical sleeve with quite thin walls, having an integral inturned flange 14 at its inner end, and provided on the outer upper part only with projected threads 15 adapted to engage those upon the interior of the shell as mentioned. This gives a clearance between the inner part of the gland and the sides of the passage 12. At the outer end of the gland a hexagonal nut portion 16 is formed, above which there is projected a longitudinal extension 17, the inner face of which is initially alined with the interior of the gland, while its outer sides are inclined inwardly toward the upper part, giving in effect a tapered flange which may be readily spun in toward a porcelain as will be explained. The flange 14 above mentioned has a seat face at the lower outer side so that a gasket 18 may be readily compressed between the flange and the shoulder 11 of the shell when the gland is screwed into the latter. The body of the gland 13 is of such length that the nut portion 16 will lie a distance outwardly of the shell 10 when the gland is in place.

Within the gland there is disposed a porcelain 19, centrally enlarged, the inner and outer parts being sloped or tapered longitudinally as at 20 and 21 respectively, the diameter of the enlargement 22 being slightly less than the interior diameter of the gland 13. An electrode 23 is mounted in the porcelain with suitable terminal connection 24, while an electrode 25 is mounted upon the shell 10 in a familiar way. The taper of the outer part of the porcelain is very gradual, the angle at the projected apex of the sloping parts being one of about 15 degrees.

Between the inner sloping sides 20 of the

porcelain and the flange 14 of the gland, there is interposed a suitable gasket element 25', while at the outer part of the porcelain which is very gradually tapered adjacent the enlargement, an aluminum annulus or gasket 26 is located. This gasket is initially of cylindrical form upon its exterior, while its interior part is tapered to fit snugly upon the porcelain 19, and within the gland 13 its outer and thicker part falling just within the extension 17, in this instance. The annulus extends for a considerable distance longitudinally of the plug and differing in this respect from gaskets before used in similar situations. It acts like a wedge when engaged in final position.

In the production of the device, porcelain and its electrode may be formed in any satisfactory way. Before or after engagement of the gland 13 in the shell, the porcelain is inserted therein with a suitable washer 25' interposed between the porcelain and the shoulder 11. The aluminum ring 26 is then slipped upon the porcelain in the proper manner, and with a suitable spinning machine or other means, the longitudinally extending flange 17 is upset or swaged, being turned inwardly forcibly against the outer end of the ring 26 which is then or thereby pressed longitudinally inward, and wedged between the porcelain and gland within the enlargement 16. The metal of the gland bears forcibly against the outer end of the ring 26, which is pressed inwardly upon the porcelain until a snug joint is formed. The edge portion of the flange 17, preferably comes close to the porcelain, but not in contact therewith; the packing of the ring 26 between the sides of the porcelain and the inner side of the gland being largely depended upon to serve as an air-tight joint, the wedging of the ring 26 being accomplished not so much by the pressure of the metal in the flange 17 itself, as by the pressure exerted through this metal by the spinning or other swaging machine, the strength of the metal in the flange 17 being ample to retain the ring 26 in tight fit as desired. The nut portion 16 will then be located around the ring 26, enabling considerable pressure to be developed between the gland and the porcelain without liability of fracturing the gland, notwithstanding that the latter may be made extremely thin in its inner body portion. It should be observed that the intumed or peened part 17 does not itself hold the porcelain either against longitudinal or lateral movement as in prior devices and it is possible to use thinner material in the element 17 than in previous parts for like purposes. It is also possible to use less force for this device in its production, thus avoiding risk of fracture in manufacture on that account, as, in case of slight inequalities in the surface of the porcelain, the heav-

ier structure requiring great force for its forming would involve fracture, where the lighter structure will not. The strain of compression of the porcelain by the wedge ring does not fall upon the peen flange 17, but against the reinforcement 16. Likewise, the strain of the gas thrust against the body of the porcelain is not sustained by the outer part of the element 17, but through the ring 26 is communicated to the thicker base portion of the element 17, and owing to the extremely gradual taper of the porcelain, a wedging effect of the porcelain in the ring is produced tending to press the ring against the sides of the gland forcibly and gaining support in that manner as well as by retention by ring and flange 17. This construction is also of great advantage, since the gas thrust against the porcelain is not sustained by projections upon the porcelain, but is sustained by the body of the porcelain with a surface bearing over a considerable part of the porcelain within the ring 26.

The porcelain is permanently retained in the gland in this manner and yet the gland and porcelain may be at any time readily removed from the shell in order that the inner end of the porcelain may be wiped off, this part usually accumulating a considerable amount of carbon, which might in time serve to short circuit the plug, unless removed. In the removal and replacement of the porcelain in this manner, it is apparent that no disturbance of the porcelain and its line of support will occur and any excessive force applied in screwing the gland into place will only eventuate in a tight bearing between the inner extremity of the gland and the shoulder 11 within the shell, involving no change in the bearing between the gland and the porcelain. For this reason the plug will have marked advantages on account of the inexperience of many users, who have a tendency to screw up nuts tighter than necessary, especially where they bear upon porcelain, and it also obviates in a plug with a removable porcelain the liability that after gaskets have been once accommodated to the porcelain, a change in relative position of the parts will cause the gasket to bear with unequal force at different parts of the porcelain and develop a fracture. Also, the wearing of the surface of the porcelain by repeated removal is eliminated by my invention.

In practice, the gasket 11 has been formed of copper and asbestos in the ordinary way, while the ring 26 has been formed of aluminum, the terminal element 24 being formed of brass, with a lead gasket interposed, next to the porcelain, as at 30. The bushing 13 may be formed of soft iron, or other materials, suitable for the purpose.

At the inner line of support of the porce-

lain, where the engaged part of the porcelain will be subjected to the greatest amount of heat there is a possibility of expansion of the porcelain both laterally and longitudinally, first, by compression of the gasket and second, by lateral yielding of the metal of the gland, owing to its thinness and the space outwardly thereof within the shell 10. Also, the gasket 18 will permit yielding of the shell slightly. Owing to radiation of heat from the outer part of the porcelain and conduction to the ring 26 and gland there adjacent the difference in expansion of the porcelain and gland at the outer part 15 will not be excessive.

What is claimed:

1. In a spark plug, an externally threaded gland element for engagement in a plug shell, said gland having an interior seat at 20 the inner end and also a nut faced enlargement adjacent the outer end, said gland having a thin tapered longitudinal extension outwardly of the said enlargement; a porcelain having an enlargement disposed within

the gland but of less diameter, affording a 25 clearance; a packing element between the enlargement and the seat, said enlargement being tapered, a soft metal sleeve wedge-shaped in section wedged between the porcelain and gland at the outer part, said extension 30 being set in and against the outer end part of the sleeve, to hold it in wedged engagement.

2. In a spark plug, a casing having an outer bore terminating inwardly at a plani- 35 form shoulder disposed at right angles to the bore axis, a gland engaged in the bore and laterally movable upon said shoulder by expansion and contraction, and an electrode insulator fixed in the gland supported 40 at the inner and outer end parts only of the gland.

In testimony whereof I have affixed my signature in presence of two witnesses.

JAMES M. SYME.

Witnesses:

BENJAMIN F. BROWN,
LEDA B. AUBREY.