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⑦① Applicant: Fabbrica Italiana Magneti Marelli S.p.A.
Piazza San Ambrogio 6
Mailand(IT)

⑦② Inventor: Longhi, Eliseo
via Kennedy 3
Rovagnate (Como)(IT)

⑦④ Representative: Klausner, Erich et al,
c/o Ufficio Internazionale Brevetti Ing. C. Gregorj S.p.A.
Via Dogana 1
I-20100 Milan(IT)

⑤④ Ignition spark plug for internal combustion engines, particularly motor vehicle engines.

⑤⑦ The spark plug is of a type in which the assembly of metal body (20) and ceramic insulation (10) is achieved by means of rimming the body.

According to the invention, the finished body of the spark plug, including collar (24) of reduced thickness (s) is obtained by a pressing operation.

Application : spark plugs for internal combustion engines, especially for motor vehicle engines.

Advantages : the stamped body provided with a collar does not require any successive turning operation, hence production costs are reduced due to savings in labor and material.

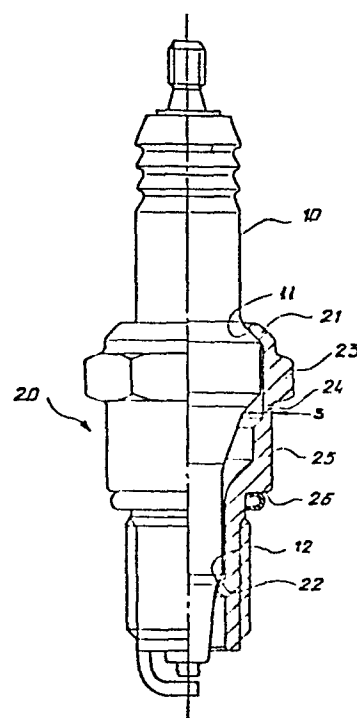


Fig. 1

DESCRIPTION OF THE INVENTION

This invention relates to an ignition spark plug for internal combustion engines, particularly for motor vehicles, in which the assembly between metal body and ceramic insulation is obtained by rimming the body. As
5 it is known, in spark plugs of this type the insulating material is locked in tight seal relation on the inside of the body by means of rimming the top end of the body on the insulator while the latter rests with a conical surface on a corresponding internal seat of the body
10 itself.

The rimming operation can be obtained either by hot or cold working but in any case, to achieve a tight seal, the body is provided, under the hexagon, with an annular part of reduced section referred to infra as "collar" the
15 function of which will also be explained hereafter.

In the case of rimming by hot working, the body is heated by allowing current to pass through it and the final rimming operation is effected as soon as the collar, in this case preheating collar, becomes incandescent.

20 After rimming the body cools and, in shrinking, the collar exerts a tightening action of the body on the insulator, thereby ensuring a tight seal.

In the case of cold rimming, on the other hand, tight sealing is ensured thanks to the permanent plastic deformation which the collar undergoes during said operation.

5 With the known fabrication technique, the collar is obtained in the already pressed metal body by externally machining the body at a point below the hexagon. The machining makes it possible to obtain an annular undercut in the body, but mainly to obtain a collar of
10 very accurate thickness.

 The part of the body comprised between the collar and the external seat maintains instead a greater thickness to provide a resting surface for the body on the engine, by means of a gasket.

15 Therefore, in addition to the pressing operation, the body requires adequate and successive finishing, i.e. turning, with a resulting increase in production costs of the spark plug.

 The purpose of this invention is to provide a spark
20 plug of the above mentioned type, but which does not require additional turning of the body, thereby affording a saving on labor and material.

 According to this invention the above objective is achieved with a spark plug the finished body of which, in all
25 its parts, including the collar, is obtained by pressing.

According to the invention, the spark plug has a body in which the outer diameter of the collar is equal to the outer diameter of the part comprised between the collar and the outer rest seat of the body and in which
5 the internal diameter of the collar is greater than that of conventional spark plugs, which contributes substantially to determine the thickness of the collar itself.

In this matter, the fabrication cost of the spark plug is approximately 30 percent lower because the only
10 operation required is the pressing operation, which is now possible because the outer surface of the body comprised between the hexagon and the outer rest seat has no incompatible surfaces for an operation of this type.

On the other hand, the sizing of the outer seat
15 is not affected because the outer collar is made thinner to a precise value which occurs at the expense of the widening of its port (i.e. the port at the level of the hexagon) and does not involve the underlying part of the body the thickness of which remains adequate.

20 The invention will now be described in conjunction with the attached drawings which show one preferred but not limitative form of embodiment of the invention.

In the drawings :

Fig. 1 is a longitudinal view, partially in cross section,
25 of a spark plug provided with metal body according to the invention.

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Fig. 2 shows the metal body of the spark plug of Fig. 1 as obtained by pressing, before threading of the stem and assembly.

With reference to Fig. 1, number 10 identifies the ceramic insulating body of the spark plug and number 20 the metal body in which said insulating body is retained seal tight by rimming the top end or edge 21 of body 20.

The tight seal is provided both between said end 21 and top part 11 of insulator 10 and between internal seat 22 of body 20 and the corresponding conical surface 12 of insulator 10.

To improve sealing, body 20 is provided, below hexagon 23, with an annular part or collar 24 with thickness "s" reduced with respect to that of the remaining part 25 comprised between said collar 24 and outer seat 26 of body 20.

Said thickness "s" is normally in the order of 1 millimeter.

Collar 24 is the part of body 20 that ensures, with its behaviour, a tight sealing of the metal body to the insulator, both in the case of hot and cold rimming.

In the specific case of hot rimming, body 20 is heated by the passage of an electric current between two electrodes connected respectively to edge 21 and outer seat 26.

When the collar becomes incandescent, final rimming is effected by means of a press, so as to cause outer edge 21 to adhere to corresponding part 11 of insulator 10 while internal seat 22 adheres to conical seat 12 of the insulator.

5 Body 20 is then allowed to cool; during this phase, due to shrinkage of the collar which, as stated, is of reduced thickness, a draft is created inside the body which favours blocking of the body to the insulator 10 both by means of edge 21 and inner seat 22.

10 According to the invention, the entire body 20, including annular collar 24, is obtained fully finished with a single pressing operation, and therefore does not require any further turning, and consequent loss of material is also avoided.

15 The finished pressed body is shown in Fig. 2. The above is possible because according to one form of embodiment of the invention, outer diameter D_1 of collar 24 is equal to outer diameter D_2 of the portion 25 of the body comprised between said collar and outer seat 26 and because
20 inside diameter D_3 of the collar and hence of the hole in body 20 at hexagon 23 is greater than that of known spark plugs with conventional metal body.

The equality of diameters D_1 and D_2 ensures that the body portion comprised between hexagon 23 and outer seat 26
25 presents on its external part a cylindrical surface which

adapts well, like all other surfaces of the body, to a pressing operation.

On the other hand, to obtain a thin and accurate collar 24 with thickness "s", the material inside the
5 collar is removed; in other words, a hole of adequate diameter D_3 is provided in its interior, which, as stated, is greater than that in the bodies of conventional spark plugs.

In this way, part 25 of the body still has the
10 necessary thickness to provide a seat 26 of adequate dimensions.

With the fabrication procedure and structure of body 20 according to the teachings of the invention, it is advantageously possible to obtain the finished pressed
15 body of the spark plug with a substantial economic advantage, both because one step is avoided and because it affords a saving of material.

The material saving should be seen in comparison with conventional bodies, in which, to obtain the collar,
20 an annular groove must be cut on the exterior of the body with a resulting waste of material.

The construction data of a body fabricated according to the invention is indicated hereafter, by way of example.

$$D_4 = 20.8 \text{ mm}$$

$D_1 = D_2 = 19 \pm 0.5$ with respect to 20 mm of the traditional value;

$D_3 = 17 \pm 0.5$ with respect to 15.5 mm of the traditional value;

where D_4 is the distance between the planes of hexagon 23 and $D_1 = D_2$ and D_3 are respectively the inside and outside diameters of collar 24.

With a metal body as obtained and press finished having the above dimensions, the following saving was achieved as compared to a body of the same type produced by conventional methods, over the present costs :

Labor saving per body = Lit. 30 approximately

Material saving per body = 8.63 gr, corresponding to Lit. 6 per body, approx.

The total saving on the body amounts to Lit. 36 approx.

Naturally, the stem of the finished body shown in Fig. 2 is successively threaded, then assembled on the insulator and finally rimmed. Rimming is performed with a press, normally in two phases i.e. a first cold phase, by which edge 21 is partially folded and a second phase, while the collar is incandescent, which provides the final rimming of the edge on the insulator.

CLAIMS

1) Ignition spark plug for internal combustion engines ,
said spark plug being of the type in which assembly between
metal body and ceramic insulator is obtained by a rimming
operation, with hot or cold working, characterized in that
5 the finished body, including collar (24) of reduced thick-
ness (s), is obtained by a pressing operation.

2) Ignition spark plug according to claim 1, charac-
terized in that collar (24) and the part of the body (25)
10 comprised between same and outer rest seat (26) have the
same outer diameter ($D_1=D_2$) and in that internal diameter
(D_3) of the collar is greater than that of the bodies of
conventional spark plugs and contributes substantially to
define thickness (s) of the collar.

15

3) Ignition spark plug according to the above preceding
claims, characterized by a finished pressed body having the
following dimensions :

$$D_4 = 20.8 \text{ mm}$$

20 $D_1=D_2 = 19 \pm 0.5 \text{ mm}$

$$D_3 = 17 \pm 0.5 \text{ mm}$$

where D_4 is the distance between the planes of hexagon (23)
and $D_1=D_2$ and D_3 are, respectively, the diameters of the
exterior and interior of collar (24).

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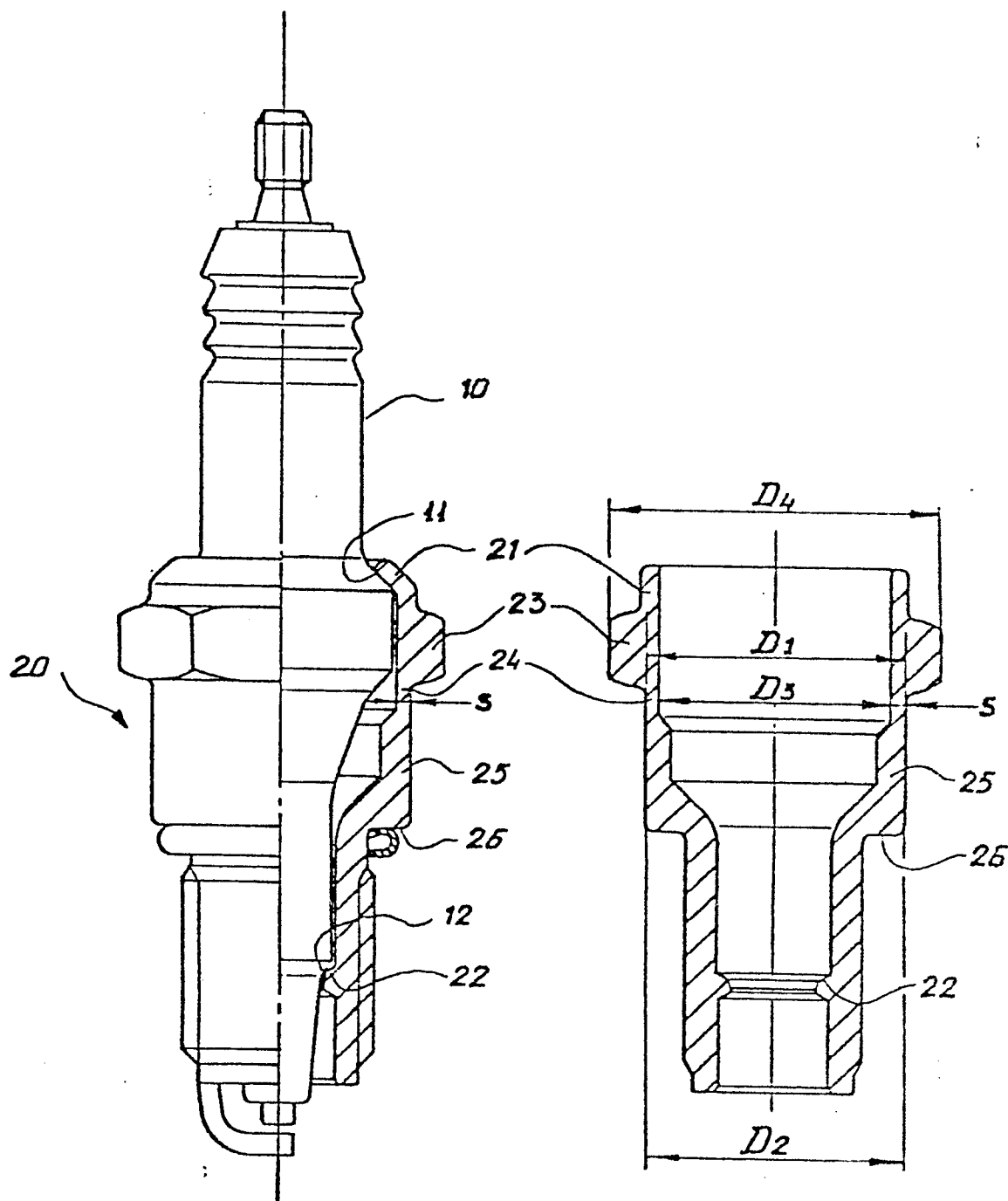


Fig. 1

Fig. 2



European Patent
Office

EUROPEAN SEARCH REPORT

0181476

Application number

EP 85 11 2350

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
A	CH-A- 317 554 (BOSCH) * Page 2, lines 37-54, 73-81; figure 5 *	1	H 01 T 21/02
A	US-A-1 662 878 (BARCUS) * Page 1, lines 49-70; figures 2, 3 *	1	
A	US-A-1 570 320 (SEREWICZ) * Page 1, lines 77-94; figure 2 *	1	
A	DE-C- 433 840 (A.E.G.)		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl. 4) H 01 T B 21 K 21/00
Place of search THE HAGUE		Date of completion of the search 31-01-1986	Examiner BIJN E.A.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			