Feb. 27, 1951

E. L. DREYER ET AL
METHOD OF MAKING SPARK WHEELS FOR
CIGAR AND CIGARETTE LIGHTERS
Filed Jan. 24, 1950

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Fig. 1.

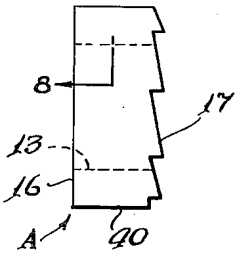


Fig. 7.

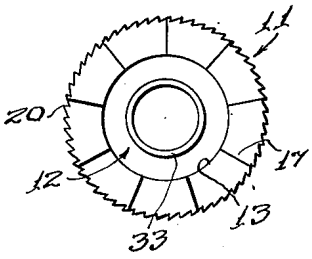


Fig. 2.

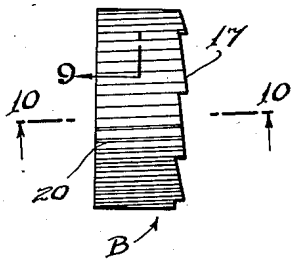


Fig. 5.

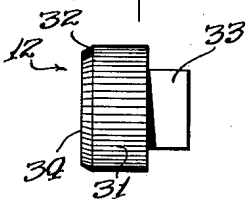


Fig. 3.

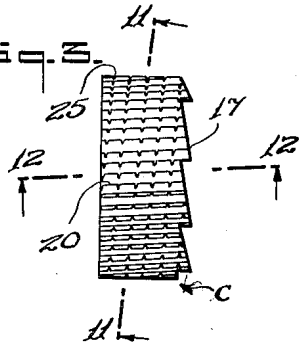


Fig. 4.

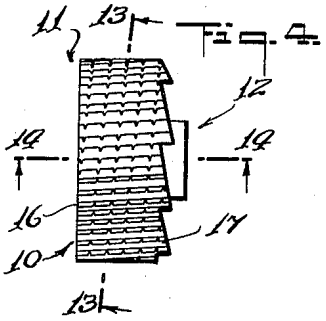


Fig. 6.

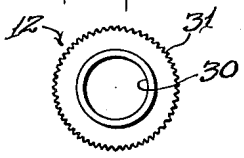


Fig. 8.

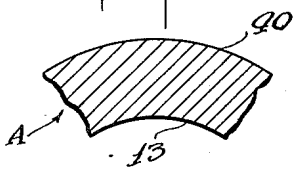
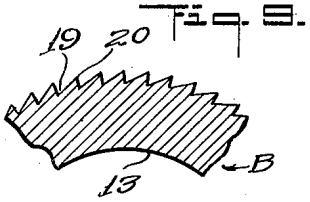


Fig. 9.



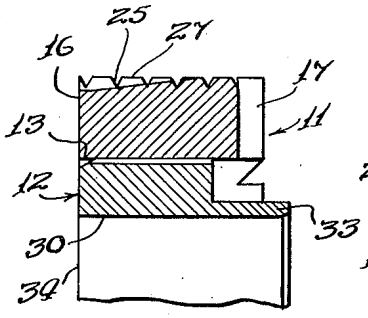


Fig. 11.

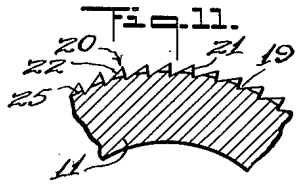


Fig. 13.

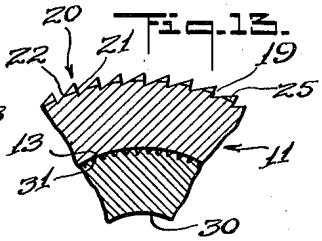


Fig. 14.

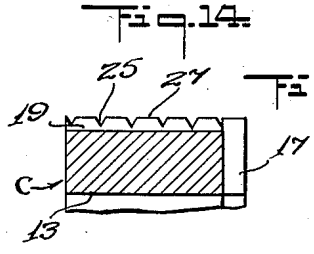


Fig. 10.

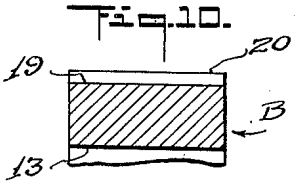


Fig. 12.

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Patented Feb. 27, 1951

2,543,235

UNITED STATES PATENT OFFICE

2,543,235

METHOD OF MAKING SPARK WHEELS FOR CIGAR AND CIGARETTE LIGHTERS

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Application January 24, 1950, Serial No. 140,196

3 Claims. (Cl. 25—156)

1

This invention relates to methods of making spark wheels for cigar and cigarette lighters. It is particularly directed to a method of making a spark wheel of sintered tungsten carbide.

Heretofore sintered tungsten carbide spark wheels for pyrophoric lighters were provided with knurling at the periphery by grinding the knurling after the final sintering operation. Difficulty is experienced with such process because in order to grind the knurling or periphery teeth on said wheels diamond grinding wheels are necessary. Such an operation furthermore is costly. Furthermore, tungsten carbide spark wheels as heretofore constructed were mounted directly on a supporting shaft therefor and the tungsten carbide wheel being rough would wear away the shaft unless the hole in the wheel was lapped, which is likewise a costly operation.

It is therefore an object of this invention to provide a highly improved process for making sintered tungsten carbide spark wheels comprising molding of tungsten carbide powder with ratchet teeth on one side for turning the wheel, thereafter presintering the wheel, thereafter grinding the knurling on the outer surface of the wheel, and thereafter putting the wheel through a final sintering process. The grinding of the knurling on the wheel between the presintering and final sintering process makes it easier and less expensive to grind.

A further object of this invention is to provide a highly improved method of making a spark wheel of the character of sintered tungsten carbide and providing the same with a bushing insert of a metal such as steel or brass which is not as hard as the wheel itself, so that such a bushing will not wear away the shaft and does not require to be lapped.

Yet a further object of this invention is to provide a sintered spark wheel of the character described having knurling made of primary cuts running from longitudinal with the axis of the wheel to 45 degrees with the longitudinal and thereafter cutting or grinding secondary transverse or peripheral cuts from a plane perpendicular to the axis to a plane 45 degrees with the perpendicular, whereby the longitudinal teeth are broken up by the transverse or peripheral cuts and it being a further object of this invention to make the transverse or peripheral cuts of less depth than the longitudinal cuts. The cuts may either be V shaped or ratchet type and the rake of the teeth may be either positive or negative or zero on one side.

Yet another object of this invention is to provide a spark wheel of the character described in which the bushing is knurled on the outside and then forced into the central opening in the sintered tungsten carbide spark wheel causing the hard tungsten carbide to shave off some of

2

the knurling of the bushing for rigidly attaching the bushing to the wheel so that the two will rotate together.

Still another object of this invention is to provide a strong and durable article of the character described which will be relatively inexpensive to manufacture and which shall yet be practical and efficient to a high degree in use.

A still further object of this invention is to provide a highly improved and economic process for making spark wheels of the character described.

Other objects of this invention will in part be obvious and in part hereinafter pointed out.

The invention accordingly consists in the features of construction, combinations of elements, and arrangement of parts, which will be exemplified in the construction hereinafter described, and of which the scope of invention will be indicated in the following claims:

In the accompanying drawings in which is shown various illustrative embodiments of this invention,

Fig. 1 is a top plan view of a spark wheel showing the same after the molding of the tungsten carbide powder or after the presintering furnace stage:

Fig. 2 is a top plan view of the wheel shown in Fig. 1 and showing the same after the longitudinal teeth have been ground therein, after the presintering furnace stage and before the final furnace stage;

Fig. 3 is a top plan view of the wheel shown in Fig. 2 after the transverse cuts have been ground therein;

Fig. 4 is a top plan view of the spark wheel with the bushing inserted therein;

Fig. 5 is a top plan view of the bushing before it is inserted into the wheel;

Fig. 6 is a side elevational view of the bushing;

Fig. 7 is a front elevational view of the structure shown in Fig. 4;

Fig. 8 is a partial cross-sectional view taken on line 8—8 of Fig. 1;

Fig. 9 is a partial cross-sectional view taken on line 9—9 of Fig. 2;

Fig. 10 is a cross-sectional view taken on line 10—10 of Fig. 2;

Fig. 11 is a cross-sectional view taken on line 11—11 of Fig. 3;

Fig. 12 is a cross-sectional view taken on line 12—12 of Fig. 3;

Fig. 13 is a cross-sectional view taken on line 13—13 of Fig. 4; and

Fig. 14 is a cross-sectional view taken on line 14—14 of Fig. 4.

Referring now in detail to the drawing, and particularly to Figs. 4 13 and 14, 10 designates a spark wheel for pyrophoric lighters. The same comprises a wheel 11 and a bushing 12 fixed

therein. The wheel 11 is made of sintered tungsten carbide. It is formed with an axial through opening 13 at its one flat annular surface 16. The surface thereof opposite surface 16 is formed with ratchet teeth 17. At its periphery the wheel 11 is formed with longitudinal V shaped grooves 19 which are inclined to the axis of the wheel. The grooves 19 may have any angle from zero to an angle of about 45 degrees with the longitudinal axis. The grooves 19 form longitudinal teeth 20 between the grooves. The longitudinal teeth 20 each have a leading surface 21 which is either radial or has a positive or negative rake. Earh tooth 20 has an oppositely inclined surface 22 which is tangent to a circle having an axis at the axis of the wheel.

The periphery of the wheel is furthermore formed with a plurality of peripheral or transverse grooves 25 which may be V shaped. The direction of the grooves 25 is shown in Fig. 4 as at an angle to the axis of the wheel. Said grooves may lie in a plane from perpendicular to the axis to an angle of about 45 degrees with the perpendicular to the axis.

It will be noted that the grooves 19 are parallel to one another and that the grooves 25 are likewise parallel to one another particularly the grooves 25 are not as deep as the grooves 19 they may be about one-half as deep. It will be noted that each longitudinal tooth 20 is divided by the grooves 25 into a series of teeth 27. The grooves 19 and 25 may be made by grinding in accordance with the method to be described hereinafter.

The bushing 12 may be made of steel or brass or any other metal which is not as hard as the sintered tungsten carbide of which the wheel 11 is made. The bushing 12 has an axial through opening 30. It is formed with an outer longitudinal knurled surface 31, one end of which may be beveled as at 32. Extending from one side of the enlarged portion 31 is a reduced flange 33. The diameter of the outside of the teeth of the knurling 31 is somewhat greater than the diameter of the opening 13 of the wheel 11. The bushing is forced into the wheel so that the knurling 31 scrapes against the inner surface 13 and some of the knurling is shaved off and the teeth become firmly wedged in the inner surface 13 to firmly secure the bushing to the wheel. It will be noted that one end wall 34 of the enlarged portion of the bushing is substantially flush with the side surface 16 of the wheel. The width of the head or enlarged portion 31 is less than the width of the wheel but the flange 33 extends beyond the ratchet teeth 17 as shown in Fig. 14 of the drawing.

The method of making the spark wheel will now be described. The tungsten carbide is first molded to form the wheel A shown in Fig. 1. The wheel A has a smooth outer surface 40 and the side surface 16. It is also molded with integral ratchet teeth 17 at the opposite side. It is also formed with molded through opening 13. The piece A is then placed in a presintering furnace which is heated to between 600 and 900 degrees centigrade, in the usual manner. After the presintering stage the longitudinal grooves 19 are ground to form the teeth 20 thereby forming the device B, shown in Fig. 2. Thereafter the wheel is ground transversely to form the V shaped grooves 25, thereby forming the piece C, shown in Fig. 3. Thereafter the device C is placed in a final sintering furnace which is heated to from 1400 to 1550 degrees centigrade. After the final sintering stage the bushing 12 is forced into the opening 13 to form the final device 10.

It will be understood that the knurling at the outside of the wheel is ground after the presintering stage and before the final sintering stage. If the knurling were ground after the final sintering stage diamond grinding wheels would be necessary thereby increasing the cost of the device. Furthermore it will be noted that the bushing will form a good bearing for the shaft on which the wheel rotates as it is not as rough as the tungsten carbide of which the wheel is made and the inner surface 30 of the bushing need not be lapped. It has been found that by grinding the longitudinal grooves 19 at an angle to the longitudinal and the transverse or pheripheral grooves 25 at an angle to a plane perpendicular to the axis a highly efficient spark wheel is obtained and this is particularly true when making the grooves 25 of less depth than the grooves 19.

It will thus be seen that there is provided a device in which the several objects of this invention are achieved and which is well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above invention, and as various changes might be made in the embodiment above set forth, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described our invention we claim as new and desire to secure by Letters Patent:

1. A process for making a spark wheel comprising molding tungsten carbide powder to form a wheel with ratchet teeth at one side, thereafter heating the wheel in a presintering furnace, thereafter grinding knurling in the outer surface of the wheel, and thereafter heating the wheel in a final sintering furnace at a higher temperature than in the presintering furnace.

2. A process of the character described comprising molding tungsten carbide powder to form a wheel, then presintering the wheel, then grinding knurling in the exterior surface of the wheel, and then heating the wheel in a final sintering furnace at a temperature higher than the presintering stage.

3. A process of the character described comprising molding tungsten carbide powder to form a wheel having a central through opening and ratchet teeth at one side, then treating the wheel in a presintering furnace at a heat from 600 to 900 degrees centigrade, thereafter grinding longitudinal grooves in the outer periphery of the wheel, thereafter grinding transverse grooves in the outer periphery of the wheel and thereafter treating the wheel in a final sintering furnace at a temperature of from 1400 to 1550 degrees centigrade.

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