Oct. 8, 1940. J. H. L. DE BATS 2,216,908

INDUSTRIAL DIAMOND WHEEL

Filed July 16, 1936

Fig. 1.

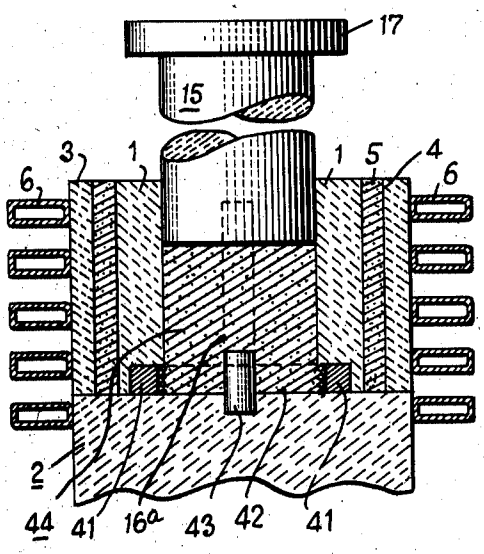


Fig. 2.

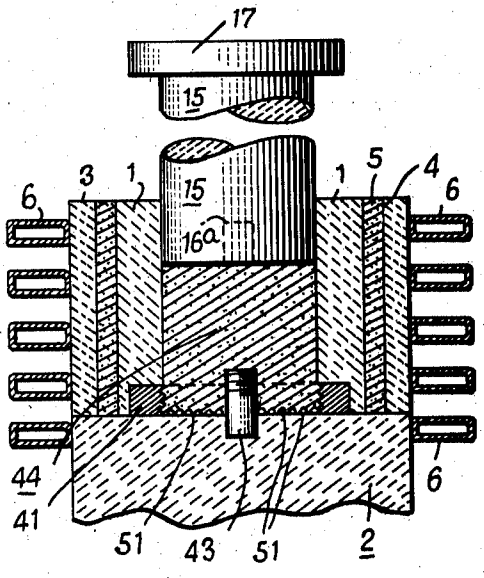


Fig. 3.

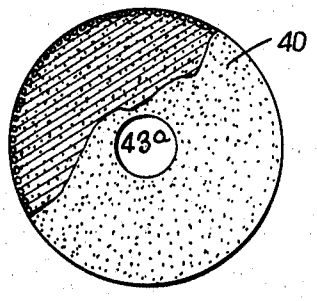
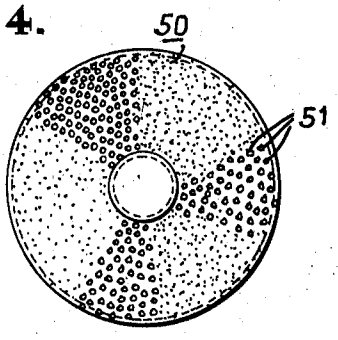


Fig. 4.



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INDUSTRIAL DIAMOND WHEEL

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Application July 16, 1936, Serial No. 90,857

1 Claim. (Cl. 51—309)

This invention relates to cutting and polishing disks and rotary or circular saws and polishing and grinding devices utilizing surfacings of hard carbides, and the like, with or without diamonds in suitable particle size and quantity applied to and held on the grinding, cutting, or polishing surfaces of a wheel or tool by cementing or securing means including thermoplastic resins and artificial resins.

This application is a continuation-in-part of my application, Serial No. 751,768, filed November 6, 1934, for Refractory articles, etc.

A feature of novelty of this invention is the preparation of diamond studded saws and finishing grinding wheels.

Other features of novelty include the preparation of hard abrasive surfaced grinding, cutting and polishing wheels of various sizes and shapes with hard carbides, such as tungsten carbide with or without associated diamond powders and molded in a composite mass.

Still another feature of novelty includes the use of hard abrasive particle masses alone or in admixture with ground diamonds mixed with various plastic materials and applied as surfacings to preformed cutting, grinding and polishing wheels of usual and ordinary construction.

These and other desirable features and advantages of the present invention will be described in the accompanying specification and illustrated in the drawing, certain preferred methods and structures being shown by way of example only, for since the underlying principles may be incorporated in other specific structural devices and processes, it is not intended to be limited to the ones here shown, except as such limitations are clearly imposed by the appended claim.

In the drawing like numerals refer to similar parts throughout the several views of which

Fig. 1 is a vertical section, partly in elevation, of an apparatus for making abrasive wheels having a diamond-studded rim or periphery;

Fig. 2 is a view similar to Fig. 1, showing the method and apparatus for forming abrasive-faced wheels, and

Figs. 3 and 4 are plan views, partly in broken section, of wheels formed in the apparatus of Figs. 1 and 2.

Considering the invention in its general aspect, the process involves the treatment of pure molybdenum carbide, tungsten carbide or other pure refractory carbide materials, either alone or in suitable admixtures, under conditions adapted to form and densify the same. In the preferred practice of the invention a powdered mass of tungsten or molybdenum carbide is placed within a graphite cylinder or crucible having a fixed or removable bottom generally conformed to the shape of the article which is to be produced. Where an apertured article is to be produced, a core member, such as a graphite or carbon rod, may be centered in the bottom plate. A plunger of graphite, carbon or other suitable material is provided with a centered aperture to receive the rod, if used, and is fitted in the crucible or cylinder and on the top of the graphite plate.

The cylinder with its contained forming parts and refractory carbide material, is usually set on an insulating base, such as a carbon block. In addition, a quartz cylinder is placed around the graphite cylinder or crucible, and the space therebetween filled with insulating material such as powdered carbon, placed therein to protect the quartz sheath from the heat of the graphite. Where an induction furnace is used the usual exciting coil may be disposed around the quartz cylinder or sheath. While an induction furnace is shown and described herein, other suitable apparatus, such as resistance furnaces may be used. The whole assembly, including the furnace parts, may be placed in or incorporated as part of a percussion or high-speed hydraulic press, or the like, so as to permit the press to rapidly work or operate the graphite plunger when the mass has been heated.

In operation, a current is passed through the coil of the induction furnace or the heating elements of a Globar or Hoskins furnace and creates sufficient heat in the interior of the mass to heat the graphite crucible and associated forming parts. Owing to the closure of all parts by graphite, the material under treatment is fully protected from the atmosphere. When the material under treatment has been heated to a sufficient degree, say of the order of 1500° C. to 2200° C., and above, depending upon the composition of the material and bulk of the mass contained in the crucible, the current or supply of heat is withdrawn, or cut off, and the press operated to rapidly forge, compress or compact the binder-free refractory carbides contained in the crucible. At furnace heats of an order to heat the carbide material to temperatures at least as high as 1500° C., and even up to 2500° C., and more, a pressure of 1 to 3 tons and above per square inch, depending upon the size of the article to be formed, may be applied to the plunger by means of the press so as to forge and thoroughly consolidate and compact the tungsten car-

bide or other pure refractory carbide material. The amount of reduction obtainable may amount to 50–60%, and above. The thoroughly heated material is forged as rapidly as possible in order to prevent surface carburization of the carbide materials in contact with the graphite or carbon walls of the mold or forming members.

Not only may molybdenum carbide, tungsten carbide and like refractory compounds be used alone for various purposes herein disclosed, but mixtures of the same with other refractory carbides may be used. Desirable results may be obtained by adding or incorporating tantalum carbide, titanium carbide, vanadium carbide, chromium carbide and other like refractory compounds, either singly or in any desired admixture. Mixed 100% carbide articles containing 90–95% tungsten carbide and 10–5% chromium carbide, have excellent wear and abrasion-resistant qualities and are suitable for a number of purposes.

The pure 100% refractory carbides may be used as binder or matrices for diamonds and other abrasive materials, the mixture of diamonds and matrix powder being furnaced in the manner disclosed above, and compressed, as shown, or removed from the furnace and drop-forged in a suitable drop-forging apparatus, as more specificaly set forth and claimed in my application Ser. No. 712,473, filed February 23, 1934, for Improved drop-forged refractory tools and method of making same.

Referring now more specifically to the drawing, the mode of operation of the features of the present invention will be described with particular reference thereto.

A crucible or cylinder **1**, preferably of graphite, is mounted in a base **2**, usually of block carbon. A quartz shield **3** is disposed about the cylinder **1** and on the block **2** and is spaced from the cylinder to provide a chamber or channel **4** which may be filled with an insulating material **5** such as powdered carbon. A coil **6** of an induction furnace may be disposed about the quartz shield. In Fig. 1, an apparatus is shown set up for the preparation of peripheral surfaced wheels.

Referring again to Figs. 1 and 2, there is shown an improved apparatus and method for forming peripherally surfaced abrasive wheels **40** or abrasive-faced wheels **50**, as shown in Figs. 3 and 4 respectively. In the apparatus shown in Fig. 1 a backing ring **41** of graphite may be internally lined with a plurality of diamonds **42** of suitable size and secured thereto in any desired manner. The ring **41** is set into a shoulder cut out of the bottom of the graphite furnace or crucible member **1**. A centering pin or core member **43** may be set up in the carbon block **2** to serve to form a central aperture for the finished disk **40**. The graphite plunger **15** of the apparatus is provided with a central aperture or well **16***a* adapted to engage the core pin or member **43** when the plunger is moved to the final compressed position. The body of the wheel is formed by compressing a discrete mass **44** of any suitable material such as a refractory 100% carbide material, or mixture of the same, after which the materials are brought to a desired heat and then forged. The resulting product will have a central aperture **43***a* formed by the pin **43**, a compressed body portion **45**, and a peripheral facing or studding of diamonds **42** of any suitable size.

The abrasive-faced disk or wheel **50** may be prepared by setting a plurality of diamonds **51** in the bottom of the furnace chamber formed in the graphite mold or crucible **1**, the 100% refractory carbide material **44** or other like hard material being compressed in place after heating in the manner previously described. These wheel, disk or grinding members may be formed of any desired composition, as noted above, depending on the purposes and uses to which they are to be put.

It will now be appreciated that there have been provided novel grinding, abrading and polishing members including wheels, disks, cylinders and the like in both massive and small models and sizes, which members may be made entirely of hard carbide materials such as tungsten carbide and equivalents and with or without admixed diamond particles.

While certain novel features of the invention have been shown and described and are pointed out in the annexed claim, it will be understood that various omissions, substitutions and changes in the forms and details of the devices illustrated and in its operation may be made by those skilled in the art or without departing from the spirit of the invention.

It is to be understood further that this invention is not to be limited by any theory of operation expressed or by any example given, and that it includes modifications and variations falling within the appended claim.

I claim:

As an article of manufacture a diamond surfaced dressing wheel having a surface of particulate diamonds embedded in a forged carbide mixture comprising 90 to 95 per cent tungsten carbide and 10 to 5 per cent chromium carbide.

JEAN HUBERT LOUIS DE BATS.