Jan. 14, 1941. E. VAN DER PYL 2,229,019

GRINDING RING

Filed Sept. 5, 1939

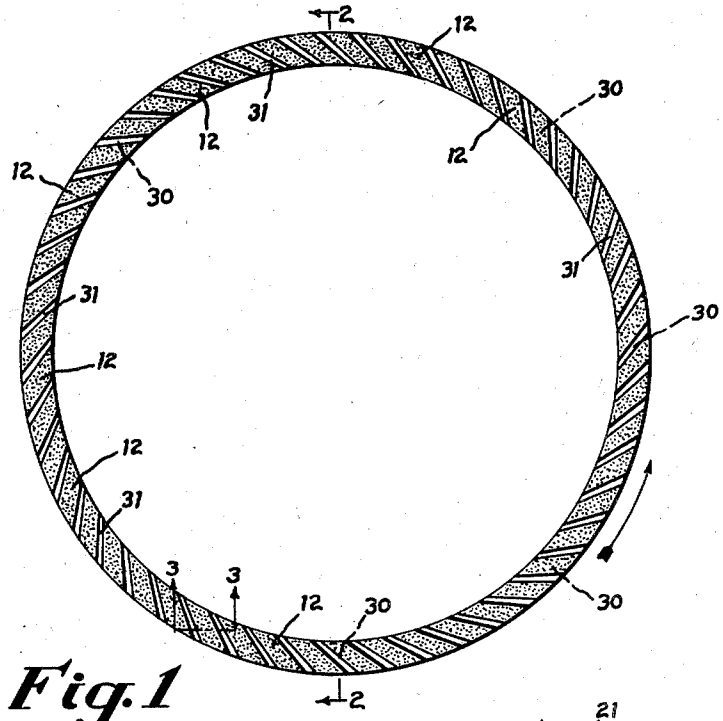


Fig. 1

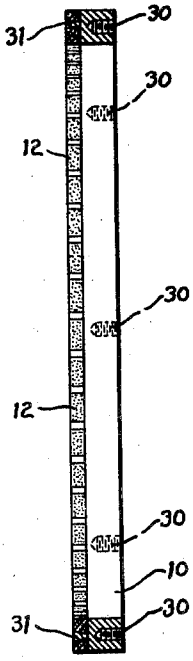


Fig. 2

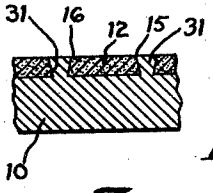


Fig. 3

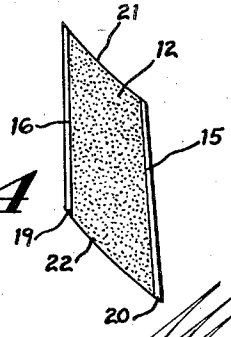


Fig. 4

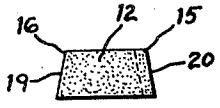
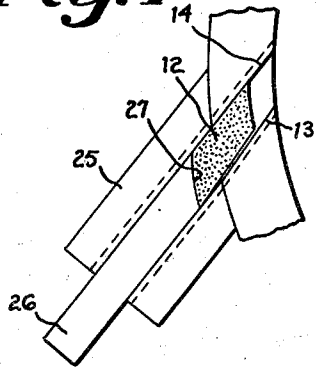


Fig. 5

Fig. 7



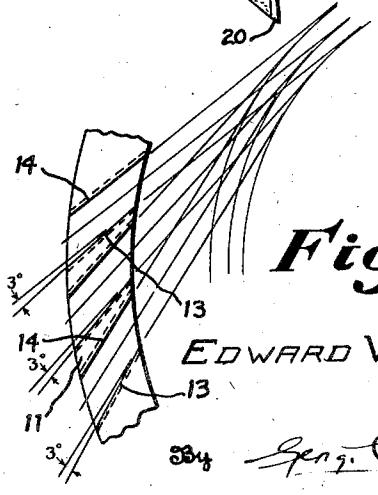


Fig. 6

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Patented Jan. 14, 1941

2,229,019

UNITED STATES PATENT OFFICE

2,229,019

GRINDING RING

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Application September 5, 1939, Serial No. 293,398

1 Claim. (Cl. 51—209)

The invention relates to grinding wheels.

One object of the invention is to provide a grinding wheel of simple construction in which the abrasive is diamonds. Another object of the invention is to provide a construction for the manufacture of a diamond grinding ring using small blocks without any screws or like fastening devices. Another object of the invention is to provide a construction for building up an abrasive ring out of blocks containing diamonds so that all of the diamond material may be used up in abrading. Another object of the invention is to provide an efficient diamond grinding wheel of large diameter which can be easily and quickly manufactured. Other objects will be in part obvious or in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, arrangements of parts, and in the several steps and relation and order of each of said steps to one or more of the others thereof, all as will be illustratively described herein, and the scope of the application of which will be indicated in the following claim.

In the accompanying drawing in which is shown one of various possible embodiments of the mechanical features of this invention:

Figure 1 is a plan view of a grinding ring constructed in accordance with the invention.

Figure 2 is a cross sectional view taken on the line 2—2 of Figure 1.

Figure 3 is a cross sectional view on an enlarged scale taken on the line 3—3 of Figure 1.

Figure 4 is a plan view on a large scale of a unit abrasive block or insert.

Figure 5 is an end view of the abrasive block or insert on the same scale as Figure 4.

Figure 6 is a fragmentary plan view of the grooved ring before the abrasive blocks are inserted, shown on an enlarged scale as compared with Figures 1 and 2, showing construction lines.

Figure 7 is a plan view of a device for inserting the abrasive blocks showing the device in operation.

Referring first to Figures 2 and 6 I provide a bronze ring 10. This may readily be manufactured by first manufacturing a right circular cylindrical ring and then grooving it to provide grooves 11 as shown in Figure 6. These grooves 11 are shaped to receive abrasive blocks or inserts 12 shown in Figures 4 and 5. The grooves 11 are all alike and similarly oriented. That is to say their inner edges 13 projected are all tangent to a given circle which is coaxial with the circle of the ring 10. Likewise their outer edges 14 are all tangent to a given circle which is coaxial with the circle of the ring 10. The grooves are thus nonradial and they are also undercut.

The abrasive blocks 12 fit in the grooves 11 and therefore their shape is the same as that of the grooves 11. Referring to Figures 4 and 5 the edges 15 and 16 are not parallel; thus the blocks 12 are slightly tapered. Furthermore the edges 19 and 20 are not parallel either; thus the blocks 12 are tapered in another dimension. The blocks 12 have inner ends 21 and outer ends 22 which are segments of cylindrical surfaces.

The blocks 12 may be formed in a suitable mold and readily withdrawn from the mold because of the fact that they are tapered. The blocks 12 are abrasive blocks and in the preferred form of my invention are made in accordance with my Reissue Patent No. 21,165. The abrasive preferably is diamonds and the bond preferably is copper with an additional metal adapted to impart friableness to the copper. For example I may provide an alloy of around 80% copper and 20% tin by weight. Preferably I provide copper and tin powders and mix the copper and tin powders with finely divided diamond abrasive for example in the proportions of 25% abrasive by volume to 75% bond by volume. I then charge this mixture into the mold and press under a pressure of the order of ten tons to the square inch. I then remove the formed abrasive block 12 from the mold and sinter it in a furnace supplied with hydrogen flame curtains at a temperature of about 700° C. This sintering although it does not melt the copper sinters it and the tin together into an alloy which alloy has brittle or friable characteristics. The result is an abrasive block 12 the abrasive of which is diamonds and the bond of which is a friable metal bond in accordance with my Reissue Patent No. 21,165. Abrasive bodies so made have been found to have excellent characteristics in many practical grinding operations, particularly for the grinding of the hard carbides such as tungsten, molybdenum and boron carbides.

The foregoing may be widely varied and so far as this invention is concerned metal bonds having different characteristics may be used although I prefer to use a friable bond. In particular an abrasive article may be made from any of the mixtures included in my Reissue Patent No. 21,165 with excellent results in practice.

Having formed a sufficient number of abrasive blocks or inserts 12 to fill all the grooves 11 in the bronze ring 10, I force them into the grooves with pressure in any suitable manner. For example the ring 10 may be placed over a cylinder

upon which it just fits and the blocks 12 may be forced into the grooves from the outside with a special tool. Such a tool is shown in Figure 7 and comprises a slideway block 25 in which is a slide 26 having an end 27 which fits the end of the block 12. The slideway block 25 is placed against the periphery of the ring 10 with a block 12 in the slide 28 and then the slide 26 may be hit with a hammer which will insert the block 12 into the appropriate groove 11. This operation may be repeated until all the grooves 11 are filled with inserts or blocks 12.

Referring to Figure 2, the ring 10 is mounted upon any suitable support by means of screws or bolts extending into threaded holes 30 formed in the ring 10, or any other suitable method of mounting may be adopted. The ring should be rotated in the direction of the arrow (Figure 1) so that the grinding pressure will tend to force the blocks 12 into the grooves 11 in the ring 10. It is noted that the taper is such that it is difficult to force the blocks further than the final position as shown. The dove-tailed shaping of the blocks 12 keeps them from coming out of the grooves 11.

This grinding wheel or abrasive ring is made up without the use of any holding plates from a number of abrasive blocks and a very tight union with the ring 10 is achieved. The ring 12 may be made of bronze, brass, or aluminum, or in certain cases it may be desirable to make the ring 10 out of steel. During grinding the lands 31 between blocks 12 will wear down as the blocks 12 wear down and thus all of the abrasive blocks 12 may be used up. In fact the blocks 12 and lands 31 start flush and end the same way at the conclusion of the useful life of the grinding ring. Owing to the fact that the abrasive is diamonds, however, the ring will last for a great many grinding operations.

One advantage of the invention is that the molding equipment for forming the abrasive portion is very simple and the abrasive parts themselves are very small and can be handled in a small furnace. The final article, however, may be relatively large in size. The ring 10 is of such shape that it can be easily machined. For example a hollow cylindrical casting can be turned and ground on the inside and outside, then cut into rings with a cutting-off tool on a lathe and the grooves 11 formed with a shaper equipped with a suitable indexing device. In this way a ring 10 of great accuracy can be formed at small cost.

By reason of being made of metal, the ring 10 is resilient or malleable enough to allow the inserts 12 to be driven in to a tight fit and it is also strong enough to hold the inserts without danger of the lands 31 breaking off. At the same time the bond of the blocks 12 is hard enough and tough enough so that driving the blocks into place does not deform them excessively.

As shown, every groove is of the same shape, also every land is of the same shape, and also every block is of the same shape. But the lands need not be, and two or more sizes or shapes of blocks and grooves could be used. I prefer that the blocks be all oriented in the same angular direction. Uniformity of sizes and shapes of the grooves and of the blocks gives the advantage of simplicity and it is preferred the entire article be in balance.

It will thus be seen that there has been provided by this invention an article and a method in which the various objects hereinabove set forth together with many thoroughly practical advantages are successfully achieved. As many possible embodiments may be made of the above invention and as many changes might be made in the embodiment above set forth, it is to be understood that all matter hereinbefore set forth, or shown in the accompanying drawing, is to be interpreted as illustrative and not in a limiting sense.

I claim:

A composite abrasive article comprising a metal ring, integral lands formed in a face of said ring leaving grooves therebetween, the grooves being undercut and non-radial and the grooves being tapered in the plane of the ring, and dovetailed tapered metal bonded abrasive blocks the size of the grooves inserted in said grooves with a tight fit, all of said blocks and grooves being oriented in the same angular direction, the sole support for the abrasive blocks being the aforesaid integral lands whereby the abrasive blocks can be driven into the grooves and being metal bonded will not be fractured.

EDWARD VAN DER PYL.