Feb. 26, 1946. B. C. CHANDLER ET AL 2,395,461

METHOD OF FORMING METAL BONDED ABRASIVE ARTICLES

Filed April 20, 1944

Fig. 1.

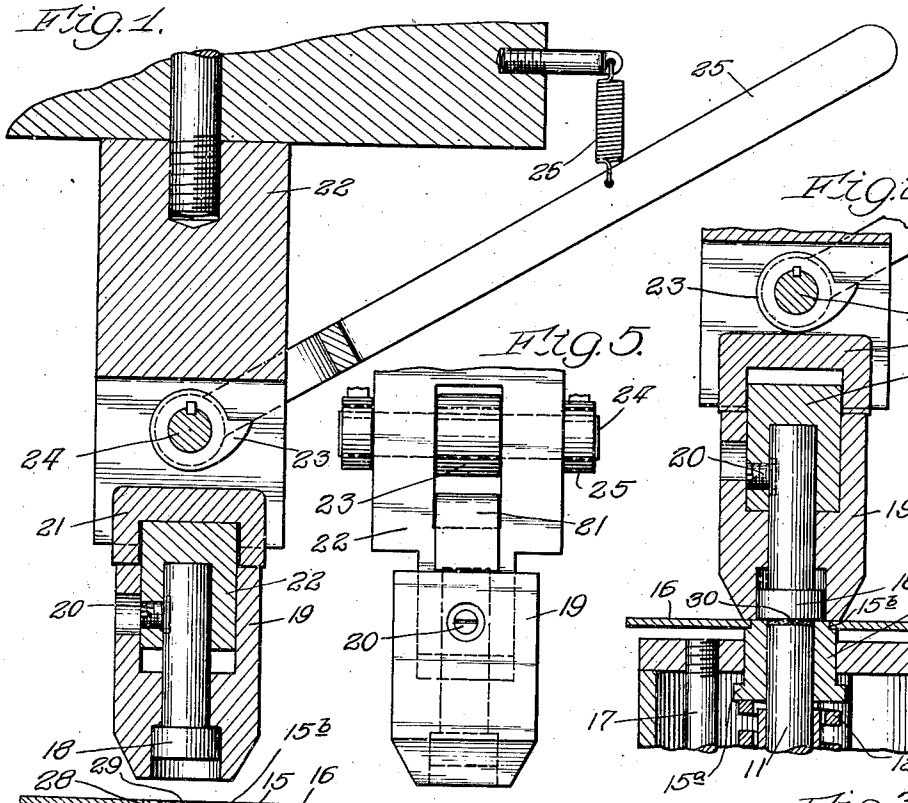



Fig. 5.




Fig. 2.




Fig. 4.

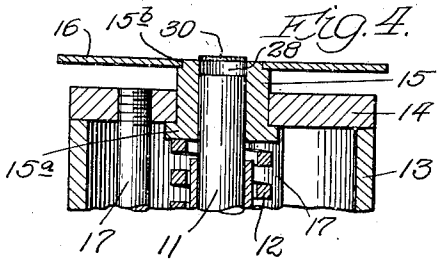
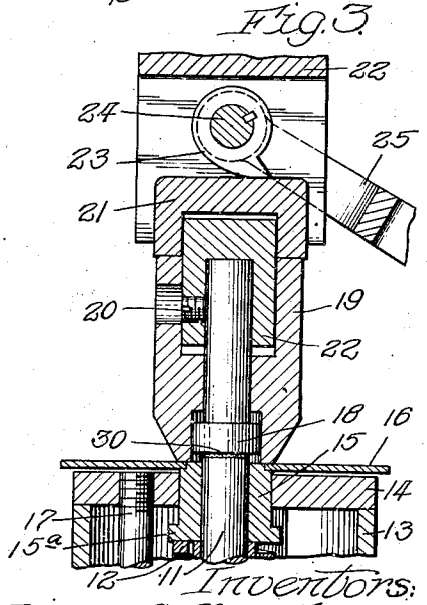



Fig. 3.




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# UNITED STATES PATENT OFFICE

2,395,461

## METHOD OF FORMING METAL BONDED ABRASIVE ARTICLES

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Application April 20, 1944, Serial No. 531,928

2 Claims. (Cl. 51—293)

This invention relates to a die block and a method of pressing cylindrical objects therein and more particularly to a method of forming diamond dust discs.

The formation of suitable drilling materials from diamond dust particles has long presented a serious problem. In the co-pending application of Bruce C. Chandler and William Oscar Bell, Serial No. 503,938, filed September 27, 1943, a method of forming highly satisfactory diamond dust drills with a powdered metal binder is described. In that method the material is formed to suitable shape within a rubber die.

That method, however, is not adaptable to all shapes of drills, particularly to thin cylindrical drills.

The ordinary die is quite unsuitable for pressing such cylinders not only because of the lack of adhesiveness of the diamond particles but because the metal tends to clog and bind in the die cavities. In accordance with the present invention, disc shaped drills are formed within a cylindrical die cavity after which the side walls of the cavity are moved axially of the cylinder to clear one end thereof while retaining pressure on the disc, after which pressure is released.

The invention is illustrated in the drawing in which Figure 1 is a vertical elevation partially in section of a suitable apparatus for carrying out the invention; Figure 2 is a similar view after pressure has been applied to the plunger; and Figure 3 is a similar view after the stripping apparatus has been actuated to strip the side walls from the cylinder; Figure 4 is a similar partial view after pressure has been released; and Figure 5 is a partial sectional elevation along the line 5—5 in Fig. 1.

The device comprises a suitable metal base 10 containing an adjustable block or plug 11, the upper face of which serves as the bottom of the die cavity. A top support 14 is carried on the base by a series of supporting tubes 13 and is secured thereto by a suitable number of clamping screws 17. The die bushing 15 surrounds the upper end of the block 11 and defines the side walls of the die cavity. The die bushing is provided with a collar 15a at its base which limits the upward movement of the bushing by engagement with the top support 14. A spring 12 normally urges the die bushing against the top support 16. A top platform 16 is carried on an annular shoulder 15b of the die bushing. There is sufficient clearance between the platform 16 and the support 14 to permit the desired movement of the die bushing.

The necessary pressure for forming the discs is provided by a plunger 18 which is suitably actuated in any desired manner. The plunger is carried in a frame 22 which also carries a stripping fork 21, and a stripping cam 23 mounted on a stripping shaft 24. A lever 25 is mounted on the stripping shaft and is normally held up by the spring 26. It will be noticed that on downward movement of the lever 25 the cam 23 is brought into engagement with the stripping fork 21 and forces it downwardly against the stripping member 19. A set screw 20 is provided in the frame 22 to hold the plunger in position therein.

In operating the device, the die cavity 28 is filled with a suitable mixture of powdered metallic binder, such as nickel, and diamond dust in suitable volumetric relationship. Normally the diamond dust will not occupy more than 40% by volume of the space after compression. Preferably the diamond dust is about 18% by weight and the metal powder about 82% by weight. After the cavity has been approximately filled with the powder, a small amount of nickel powder is scattered on top to avoid crushing the diamonds and to provide a better cutting drill. Power is then applied to the plunger and it is pressed downwardly engaging the powdered material and also the edges of the die bushing 15 as shown in Figure 2. In this motion the lower frame moves away from the stripping fork 21. On the other hand, the platform 16 and the die bushing 15 are forced downwardly to make up for the compression of the disc.

After the desired pressure has been applied it is maintained while the lever arm 25 is pressed downwardly, bringing the cam 23 into engagement with the fork 21 and pressing it against the stripping member 19. This in turn forces the die bushing 15 still further down, as shown in Figure 3, until the side walls of the die cavity have cleared one end thereof. When this happens, the disc 30 which has been formed expands slightly so that on release of the pressure, as shown in Figure 4, the disc is carried upwardly by the die bushing and rests on top thereof so that it may readily be removed by the fingers.

The foregoing detailed description has been given for clearness of understanding only and no unnecessary limitations should be understood therefrom.

What we claim as new, and desire to secure by Letters Patent is:

1. The method of forming a coherent cylindrical body from a finely divided mass of metal

powder binder and diamond dust, which comprises applying heavy pressure to the mass while confining it in a cylindrical chamber, whereby the mass is pressed into a coherent body, then moving the side walls from the mass, while maintaining substantially the forming pressure on the mass, whereby the cylindrical body expands slightly laterally, and then releasing the pressure.

2. The method of forming a coherent cylindrical body from a finely divided mass, which comprises applying heavy pressure to the mass while confining it in a cylindrical chamber, whereby the mass is pressed into a coherent body, then moving the side walls from the mass, while maintaining substantially the forming pressure on the mass, whereby the cylindrical body expands slightly laterally, and then releasing the pressure.

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WILLIAM OSCAR BELL.