Feb. 14, 1933. C. F. BIRGBAUER 1,897,546

CUTTING DEVICE

Filed March 15, 1930 2 Sheets-Sheet 1

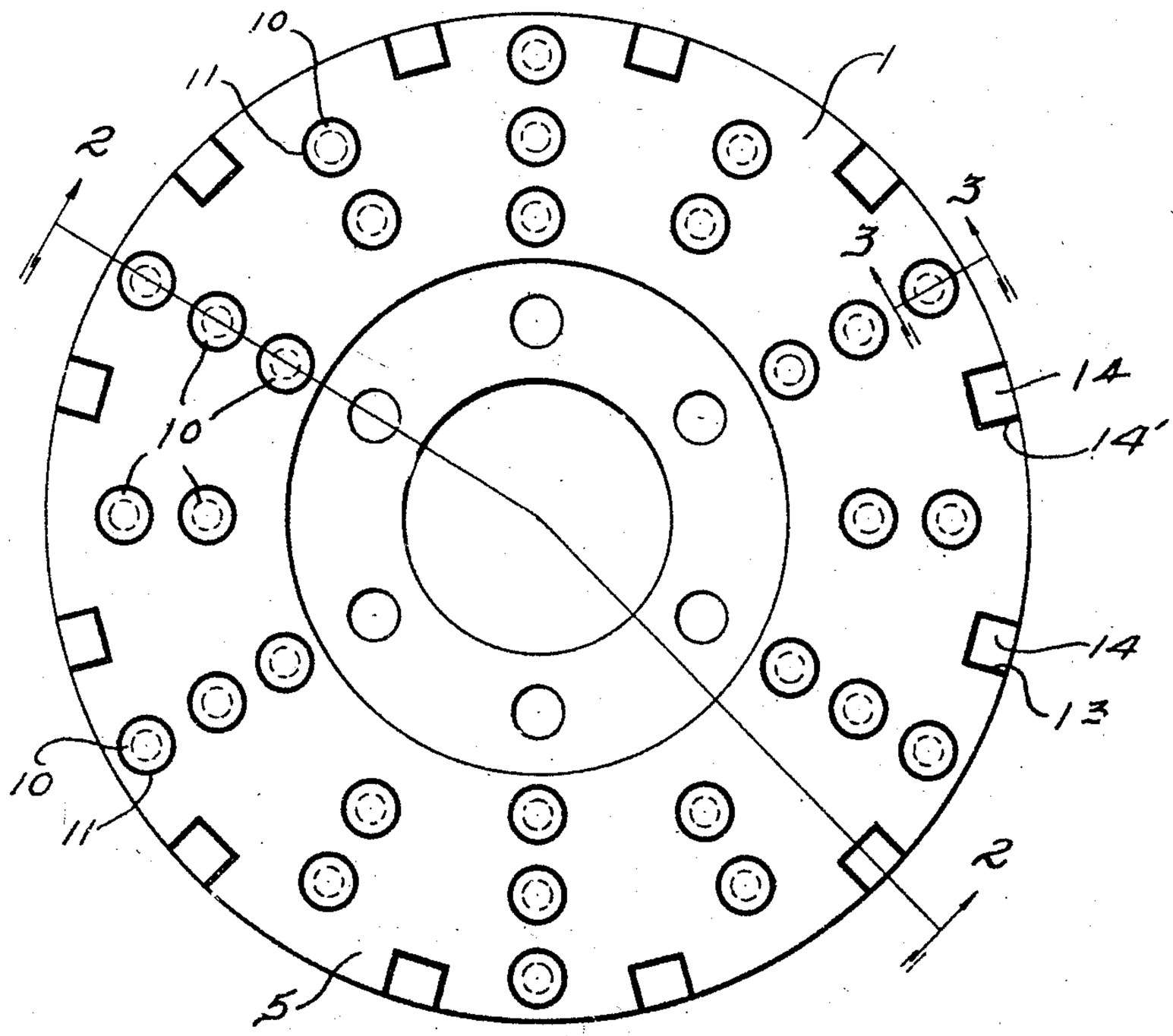

Fig. 1.

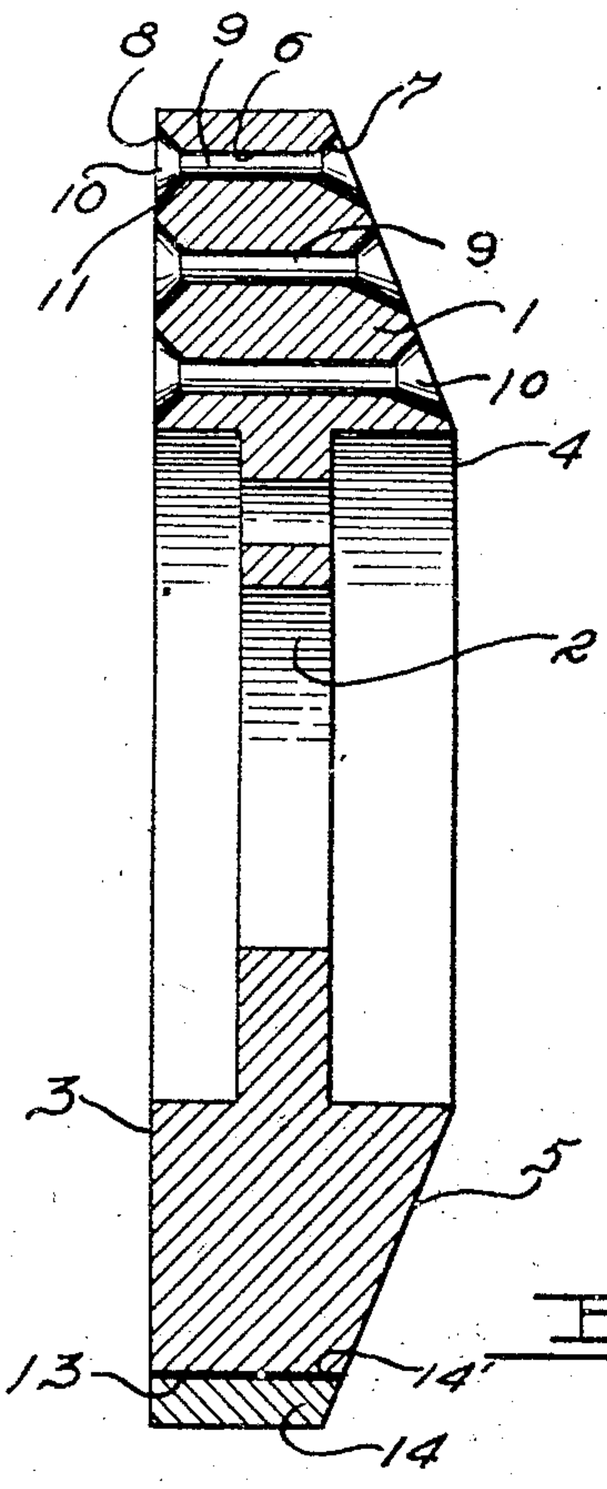

Fig. 2.

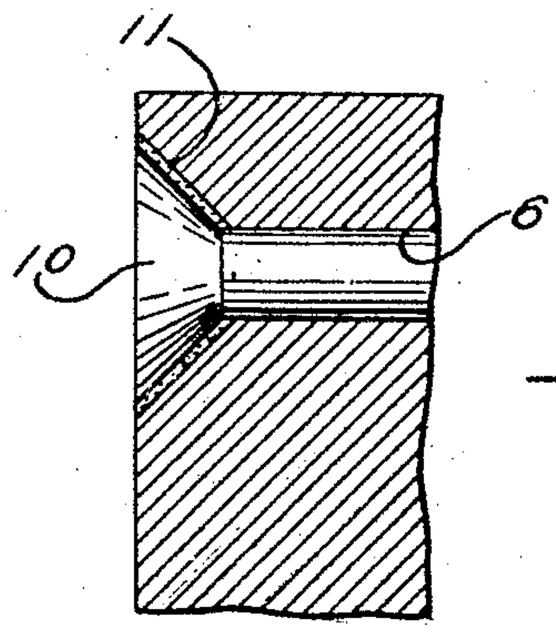

Fig. 3.

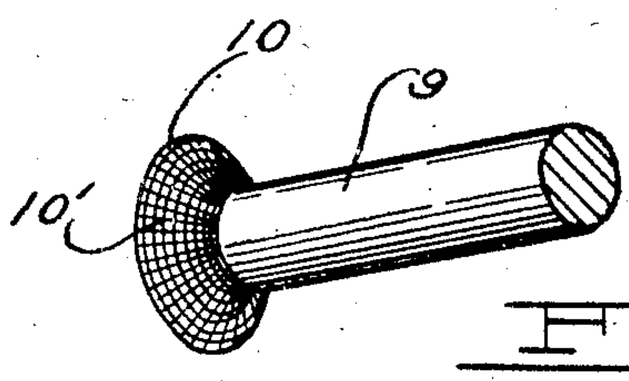

Fig. 4

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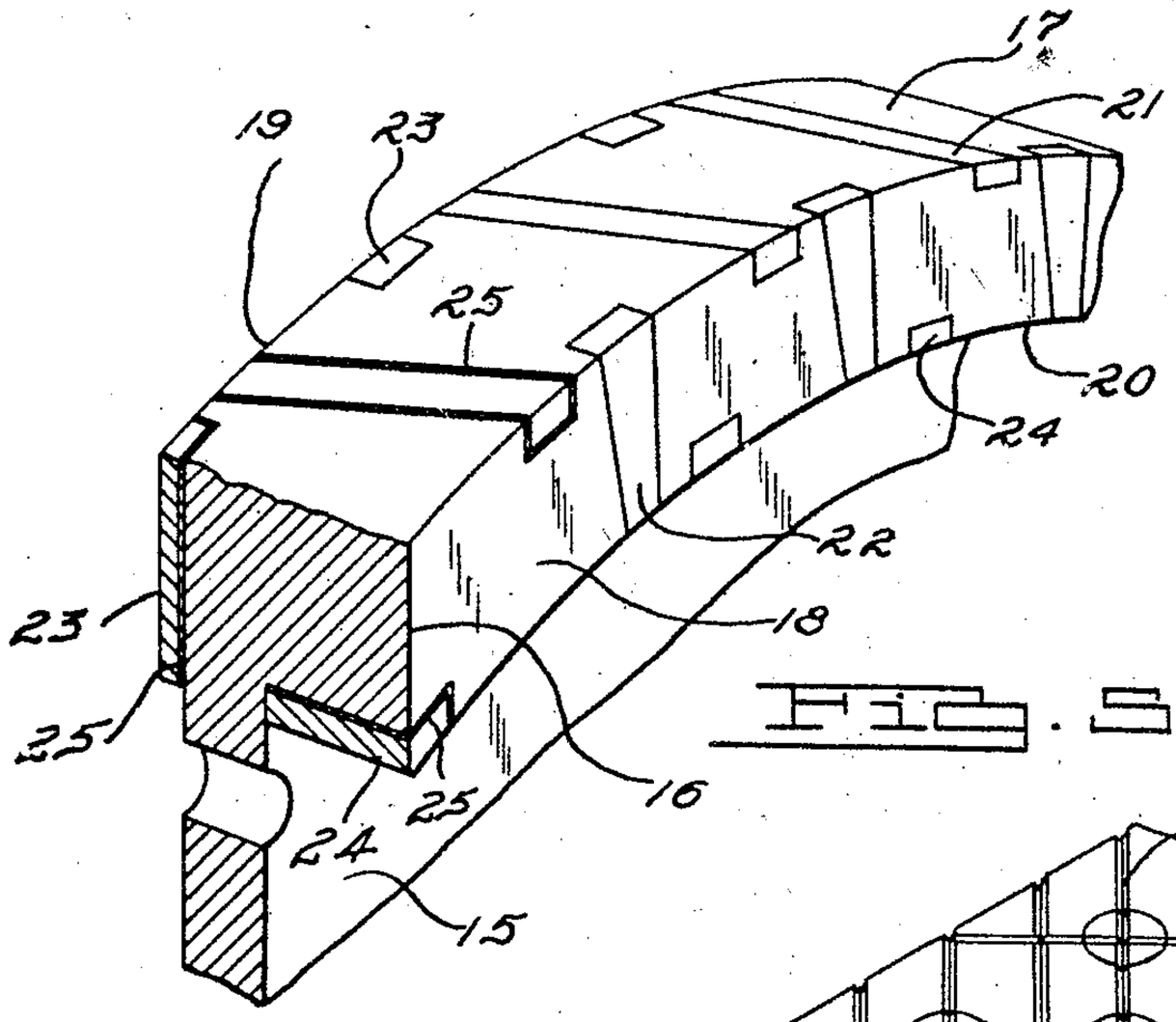

Fig. 5

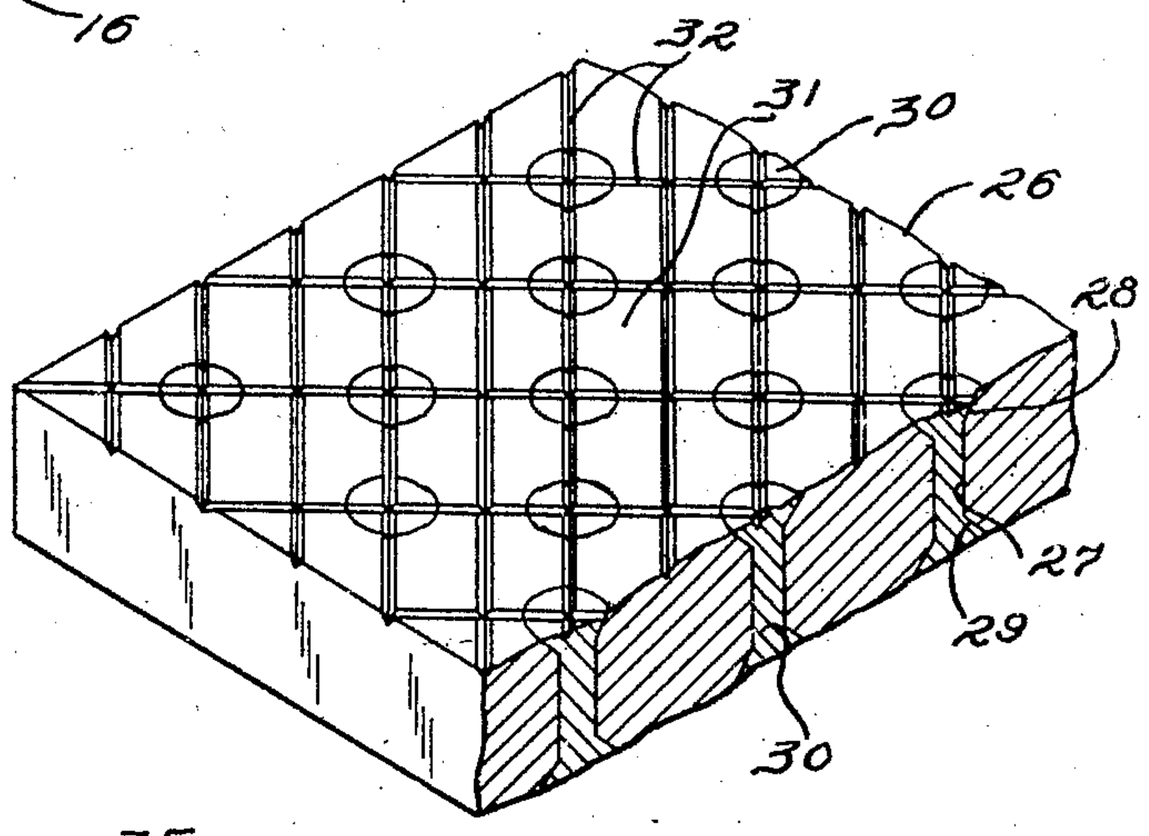

Fig. 6.

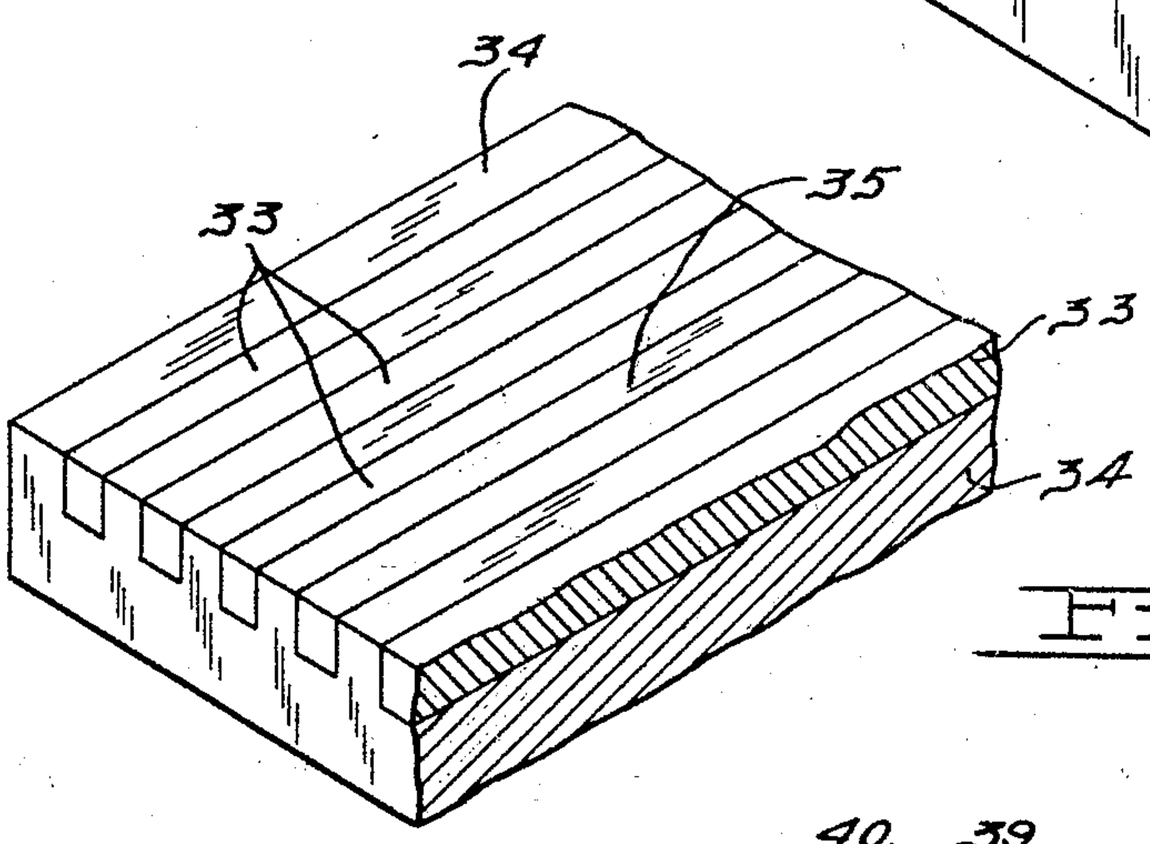

Fig. 7.

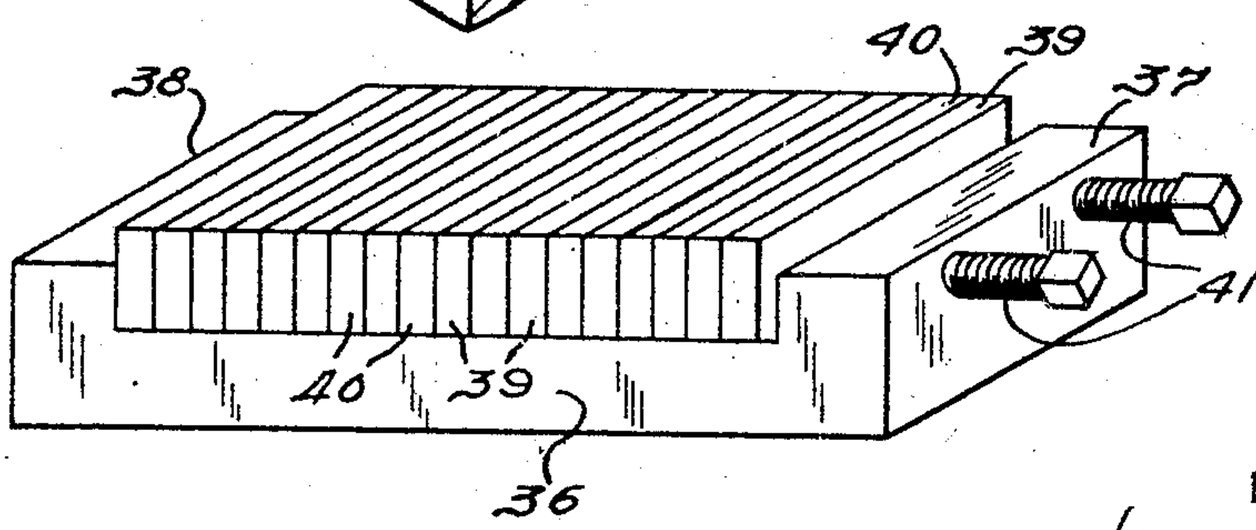

Fig. 8.

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UNITED STATES PATENT OFFICE

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CUTTING DEVICE

Application filed March 15, 1930. Serial No. 436,188.

The main objects of this invention are to provide improved grinding, cutting or lapping devices, particularly of the type on which granular abrasives, such as diamond dust or the like, are employed; to provide means for efficiently holding diamond dust or other granular abrasives on the working surfaces of devices of this kind so as to increase their speed of cutting; to provide a device of this kind having soft, comparatively ductile, metallic surface portions into which a granular abrasive will readily become embedded during operation of the device; to provide improved means for retaining a supply of abrasive material in close proximity to the working surfaces of devices of this type and which abrasive material becomes available for use as the working surfaces wear during operation; and to provide working area of a substantially hard metallic support with comparatively soft metal inlays or other areas for receiving abrasive material.

Heretofore, it has been customary to employ granular abrasives such as diamond dust in a vehicle like oil on substantially homogeneous cast iron working surfaces of cutting devices. Cast iron or the type capable of holding substantial deposits of diamond dust is not conveniently available, and even when such material of the best grade attainable for this purpose is used only a small amount of the dust can be held on the working surface. As a result, cutting operations on extremely hard substances are very slowly accomplished.

I have found that by providing the working surfaces of cutting members with areas of comparatively soft and ductile material it is possible to retain substantially large deposits of diamond dust or other abrasive substances on the working surfaces. The dust readily becomes embedded in the soft areas of the working surfaces, which thus holds it in place, and thereby materially speeds up the cutting operation. The cutting efficiency may also be improved by providing metal inlays in the body part or support on which the working surface is formed and placing a film of abrasive and oil between adjacent surfaces of the inlays and the body part.

An illustrative embodiment of my invention is shown in the accompanying drawings, in which:

Figure 1 is an elevation of a grinding wheel embodying my invention.

Figure 2 is a section taken on the line 2—2 of Figure 1.

Figure 3 is an enlarged section taken on the line 3—3 of Figure 1.

Figure 4 is an enlarged, perspective view of a plug of the type used in the wheel shown in Figure 1.

Figure 5 is a fragmentary, perspective view of a grinding wheel embodying a modified form of my invention.

Figure 6 is a perspective view, partly in section, showing a further development of my invention.

Figure 7 is a perspective view, partly in section, showing another form of my invention.

Figure 8 is a perspective view of another form of my invention.

In the form shown in Figures 1 to 4, inclusive, the cutting device comprises a metal disc 1 preferably formed of cast iron or other suitable, hard metal material, in which a central aperture 2 is provided for receiving a drive shaft (not shown). The left side 3 of the disc 1 as viewed in Figure 2 may be substantially normal to the central axis of the aperture 2. The right hand side 4 may be provided with a beveled portion 5. In the outer portion of the disc 1 a plurality of series of apertures 6 may be formed which extend from the beveled side 5 to the normal side 3. These apertures preferably have enlarged tapered extremities 7 and 8 on the beveled and normal side of the disc respectively. Rivets 9 of the type illustrated in Figure 4 are shown disposed in the apertures 6 with their head portions 10 seated in the tapered extremities 8 and their opposite ends peaned over so as to fill the enlarged extremities 7 of the apertures 6.

These rivets are preferably formed of copper, but any soft metal which is substantially ductile, such as aluminum, brass, bronze, lead, tin, zinc, and alloys of the above metals may be employed. Before the rivets are in-

serted in the apertures 6, the inner surfaces of the head 10 are preferably smeared with a mixture of diamond dust and oil so as to deposite a film 11 thereon. Other granular abrasive such as carborundum for example may be used in place of diamond dust. The wall of the enlarged extremities 7 which receive the peaned ends of the rivets 6 are also coated with a film 12 of oil and abrasive before the ends of the rivets are peaned over. In order to insure the retention of a greater amount of abrasive between the heads of the rivets and the walls 7, the heads of the rivets may be knurled on their tapered faces, as at 10′ in Figure 4, the result being obvious. Members other than rivets may, of course, be employed.

The periphery of the disc 1 may be provided with spaced rectangular grooves 13 in which inlays or inserts 14 of metal of the type described may be secured. A film 14′ of diamond dust or other abrasive, preferably mixed with oil, is also provided between the adjacent surfaces of the inlays 14 and the groove 13.

When the device is in operation, a film of abrasive in oil is applied to the working surfaces. The granular particles of diamond dust or other abrasive is rolled along the working surface of the device due to contact of the work thereon until they reach the soft metal areas into which they are forced and become embedded, remaining exposed to the work which is placed against the device. Headed members such as screws or rivets may be inserted in apertures in the periphery of the disc, if desired, in place of the inserts shown.

In the form of my invention shown in Figure 5, a wheel or disc 15 is provided having a side flange 16 on which are formed a peripheral working surface 17, side working surfaces 18 and 19, and an inner peripheral working surface 20. Formed in the working surfaces 17, 18, 19 and 20, respectively, are tapered grooves in which tapered inlays 21, 22, 23 and 24 are received. The inlays 21 preferably extend diagonally of the periphery of the wheel with respect to the axis of rotation thereof, as shown. These inlays are formed of copper or other suitable soft metal. Films 25 of diamond dust or other abrasive, and oil, are preferably provided between the adjacent surfaces of the inlays and the walls of the groove.

In the form shown in Figure 6, a block or support 26 is provided with a plurality of systematically spaced apertures 27 having enlarged extremities 28 and 29. The apertures are filled with copper 30 or other suitable ductile metal. The working surface 31 of the block 26 may have scores or grooves 32 formed therein which act to vary the speed of cutting.

In the form of my invention shown in Figure 7, a plurality of bars 33 of copper or equivalent material are seated in parallel grooves formed in a cast iron support 34, the upper surfaces of the bars being exposed at the working surface 35 of the support. A film of abrasive is preferably provided between the contacting faces of the bars 33 and the grooves in the support.

In the form shown in Figure 8, a support 36 comprising end flanges 37 and 38 between which copper and cast iron bars 39 and 40 are alternately arranged. The bars 39 and 40 are firmly clamped together by bolts 41 which are threaded in apertures formed in the flange 37. A film of abrasive is preferably provided between the contacting surfaces of the bars 39 and 40, in the manner previously described.

With the structures shown in Figures 5, 6, 7 and 8, the supports may be reciprocated relative to the work or the work may be moved relative to the supports. In each case films of abrasive materials in oil or other vehicles may be provided between the adjacent surfaces of the different metal. In this manner a supply of abrasive material is retained in close proximity to the working surfaces of the device, and such surfaces are also provided with a coating or film of abrasive. If desired, the device may be made up of parts formed of a single metal with films or deposits or abrasive between adjacent surfaces of assembled parts.

It will be apparent from the above that any shape of tool may be provided with areas of soft, abrasive embedding material acting to catch and hold the abrasive applied to the working surface of the tool, and that numerous configurations of and methods of providing such areas may be employed without affecting the broader aspects of the present invention.

Although but several specific embodiments of my invention have been shown and described, it is understood that various changes in the size, shape and arrangement of parts may be made without departing from the scope of my invention, and it is not intended to limit my invention other than by the terms of the appended claims.

I claim:

1. A composite cutting member comprising a hard metal body part, soft metal inlays in said body part, said cutting member having a working surface comprising exposed areas of said hard and soft metals, granular abrasive between adjacent surfaces of said body part and said inlays, and a film of granular abrasive on said working surface.

2. A composite cutting member comprising an iron body part, spaced copper inlays in said body part, said body part and inlays having flush machined working surfaces, and diamond dust packed between the adjacent

surfaces of said copper inlay and said iron part.

3. A composite cutting member comprising an iron body part, spaced rivets having counter-sunken tapering heads in said body part, said rivets being formed of a soft metal, and diamond dust empacked between said heads and said body part.

4. A composite cutting member comprising a hard metal body part, soft metal inlays in said body part, said cutting member having a working surface comprising exposed areas of said hard and soft metals, and a film comprising oil and diamond dust between the adjacent surfaces of said body part and said inlays.

5. A composite cutting device comprising juxtapositioned metal members and a film-like layer of finely comminuted abrasive material empacked between adjacent surfaces of said members.

6. A cutting device comprising a metal body part, metal inlays in said body part, and diamond dust empacked between adjacent surfaces of said body part and said inlays.

7. A composite cutting member including a hard metal body part, soft metal inlays in said body part, said cutting member having a working surface comprising exposed aligned areas of said hard and soft metals, and abrasive material between adjacent surfaces of said body part and said inlays.

8. A composite cutting member including a metal body part having apertures therein, spaced rivets having countersunken tapering heads in the apertures of said body part, and abrasive material impacked between said heads and said body part.

9. A cutting device including a metal body part having spaced recesses therein, a metal inlay seated in each recess having one side spaced slightly from an adjacent side of said recess, and a layer of abrasive material impacked between said spaced sides of said inlay and recess.

10. A composite cutting device including a plurality of juxtapositioned metal bars having aligned exposed surfaces providing a substantially continuous metallic working face, and a film-like layer of abrasive material between adjacent sides of said bars.

11. A composite cutting device including a base portion, a plurality of adjacent metal bars on said base portion, abrasive material between said bars, and means on said base portion firmly clamping said bars together.

12. A composite cutting device including a plurality of alternate hard and soft metal bars having aligned surfaces, abrasive material between said bars, and means firmly clamping said bars together.

13. A composite cutting device including a base portion having a channel therein, a plurality of alternate hard and soft metal bars between the sides of said channel having aligned surfaces, means co-acting between one of said bars and the adjacent side of said channel for releasably clamping said bars together, and a cutting film including a granular abrasive material and a binder on said aligned surfaces.

14. A grinding wheel including a metal body portion having spaced transverse grooves in its periphery open at the opposite sides thereof, a metal inlay in each groove having a side surface and end surfaces substantially flush with the periphery and sides of said body portion respectively, said inlays being smaller in cross section than said grooves and being located centrally therein, and layers of abrasive material between the adjacent surfaces of said inlay and the sides of said grooves exposed at the periphery and sides of said body portion.

15. A grinding wheel including a soft metal body portion having spaced transverse grooves in its periphery open at the opposite sides thereof, a metal inlay comprising soft metal in each groove having a side surface and end surfaces substantially flush with the periphery and sides of said body portion respectively, said inlays being smaller in cross section than said grooves and being located centrally therein, and layers of abrasive material between the adjacent surfaces of said inlay and the sides of said body portion.

16. A grinding wheel including a circular hard metal body portion having transverse grooves in its periphery extending diagonally with respect to the axis of said body portion, soft metal inlays in said grooves having surfaces aligned with the peripheral surface of said body portion, and abrasive material between the surfaces of said grooves and the registering surfaces of said inlays.

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