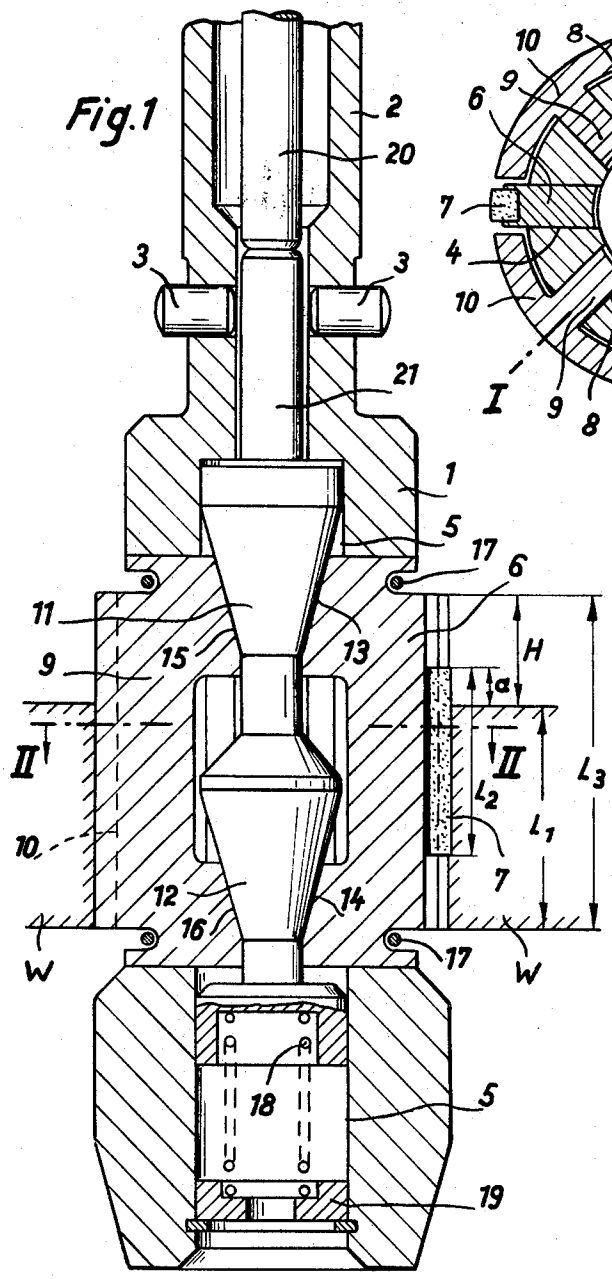
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ELECTROLYTIC ROTARY HONING TOOLS

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Fig. 1



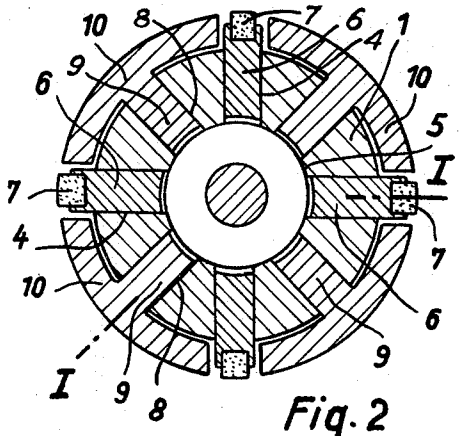


Fig. 2

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ELECTROLYTIC ROTARY HONING TOOLS

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U.S. Cl. 204—212 4 Claims

ABSTRACT OF THE DISCLOSURE

A rotary honing tool for removing material by an electrolytic honing process; honing bit carriers and segmental cathode pieces between the bit carriers in the rotary tool which both can be radially adjusted simultaneously, and an electrolyte continuously flowing through the gaps between the body of the tool and the surface of the workpiece.

The present invention relates to rotary honing tools.

It has already been suggested that, when honing with honing tools having radially movable honing bit carriers in the body of the tool, the removal of material from the workpiece can be accelerated with the assistance of electrolysis. This is achieved in that a continuous flow of an electrolyte is maintained in the gaps between the body of the tool and the surface of the workpiece, the body of the tool being connected to the negative pole of a source of current and forming the cathode, whilst the workpiece is connected to the positive pole of the source of current, so forming the anode.

Honing with the assistance of electrolysis has particular significance when large amounts of material have to be removed as this was previously uneconomical in honing processes due to the length of time involved in machining.

A disadvantage of the above described electrolytic honing process is that the distance between the cathode and the anode becomes greater as more material is removed. This results in an increase in the inter-electrode resistance and thus a decrease in the intensity of current and a reduction in the rate of removal of material with respect to time. This is particularly the case when a comparatively large amount of material, i.e. a thick layer of material, is to be removed from the workpiece.

The invention aims at the avoidance of the fall in the rate of removal of material by electrolysis during the course of the honing process.

According to the present invention, a rotary honing tool comprises a body in which are mounted radially movable honing bit carriers and radially movable segmental cathode pieces of large effective area, means being provided for radially adjusting the honing bit carriers and the cathode ipeces to the same extent. Thus the distance between the anode surface on the workpiece and the cathode surface on the tool can be maintained uniform and constant from the beginning to the end of the process so maintaining the optimal conditions for the electrolytic removal of material.

The tool is preferably used in such a way that the cathode segments always fully overlie the surface of the workpiece. This is achieved by making the length of the cathode segments greater than the length of the workpiece by at least the stroke of the tool as determined by the length of the workpiece, the length of the honing bits and the desired over-run of the honing bits. This ensures that the full length of the workpiece surface serving as the anode is always in juxtaposition to a cathode surface,

and that consequently the entire surface of the workpiece to be machined is effective as an electrode surface.

The invention is further described by way of example, with reference to the accompanying drawings in which:

FIG. 1 is a longitudinal section along the line I—I of FIG. 2, of a rotary honing tool, constructed according to the invention, and

FIG. 2 is a cross section along the line II—II of FIG. 1.

Referring to the drawings, a cylindrical tool body **1** has a shank **2** at one end with laterally projecting pins **3** for bayonet-like connection to a hollow driving spindle (not shown) of a honing machine. Radially movable, flat stone-holders **6** are contained in radial longitudinal slots **4**, which extend through the tool body **1** into an axial bore **5**, and each has a groove in which a ceramic, Bakelite-bonded or diamond coated honing bit **7** is carried. Slides **9**, are movable in radial, longitudinal slots **8** which extend to the axial bore **5** of the tool body **1** between the honing bit carriers **6** and have segments **10** extending over substantially the whole of the sector outside the tool body between the honing bit carriers **6**.

Two cones **11** and **12** which are rigidly connected to one another and similarly directed are guided in the axial bore **5** of the tool body **1** and cooperate with corresponding inclined surfaces **13**, **14** and **15**, **16** on the holders **6** and the slides **9** respectively. The holders **6** and the slides **9** are retained tightly against the cones **11** and **12** by garter springs **17** in the vicinity of their ends and are also thus prevented from falling away from the tool body **1**. The cones **11** and **12** are held in the initial position as shown in FIG. 1 by a spring **18** supported on an axially fixed disc **19** in the bore **5** of the free end section of tool body **1** and can be pushed against the force of the spring **18** by means of a push rod **20** in the driving spindle of the machine, the push rod **20** being actuated by a hydraulic or a mechanical drive and engaging a projection **21** on the cone **11**. Actuation of the push rod **20** pushes the honing bit carriers **6** with the honing bits **7** and the slides **9** with the segments **10**, radially outwards to the same extent until the honing bits **7** come into contact with the wall of the workpiece bore.

The honing tool is insulated from the machine spindle and is connected through a slip ring (not shown) to the positive pole of a source (also not shown) of power of low voltage. The entire honing tool is thus a live conduct or with a very large across section. The honing bits **7**, in so far as they themselves are not insulators, are set into the grooves of the slides **6**, e.g. by means of an adhesive film. Thus current can only flow through the electrolyte flowing between the bore wall and the cylindrical surfaces of the segments **10** on th body of the tool, the cathode being formed by segments **10**, and the anode being formed by the bore wall of the workpiece connected to the positive pole of the source of current. The radial current path through the electrolyte remains constant for every setting of the honing bits **7**, as the segments **10** follow the radial, adjusting movements of the honing bits to the same extent. This ensures a uniform intensity of current and thus a uniform rate of removal of material from the workpiece.

A workpiece W of the length L_1 is indicated in FIG. 1, wherein the honing tool is in the position at the end of a stroke. The tool stroke H is so selected that the honing bits of length L_2 overrun the workpiece on both sides by an amount *a*. In this embodiment the total length L_3 of the segments **10** acting as cathodes is greater, by the stroke length H, than the length L_1 of the workpiece. Accordingly all parts of the workpiece bore are always covered by the segments **10** during the honing process. The entire wall of the workpiece bore consequently remains effective as an electrode surface. As the distance

between electrodes remains uniform the interelectrode resistance, and thus the intensity of current determining the rate of material removal, is constant.

We claim:

1. In a rotary honing tool, a tool body, having radially movable honing bit carriers supported in said body, honing bits on said carriers for the removal of material from a workpiece by honing, segmental form cathode means having an effective area forming substantially the whole circumference area of said honing tool outside the honing bits, said area having an axial length greater than the length of said workpiece to be honed by at least the length of the tool stroke, said stroke being determined by the length of said workpiece, said axial length of said honing bits and the overrun of said honing bits.

2. A honing tool according to claim 1 wherein said body and said cathode means are electrically interconnected to form a live conductor which may be connected in its entirety to the negative terminal of a source of current.

3. A honing tool according to claim 2 wherein said honing bit carriers are in electrical contact with said

tool body and said honing bits are electrically insulated from said honing bit carriers.

4. A honing tool according to claim 1, said adjusting means having at least one conical surface thereon coaxial with said tool body and both said honing bit carriers and said cathode means engaging said conical surface whereby said carriers and said cathode means are simultaneously adjusted radially by equal increments upon axial adjustment of said adjusting means.

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