Jan. 29, 1963 A. F. WEIR 3,075,323

HONING TOOL

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FIG.1

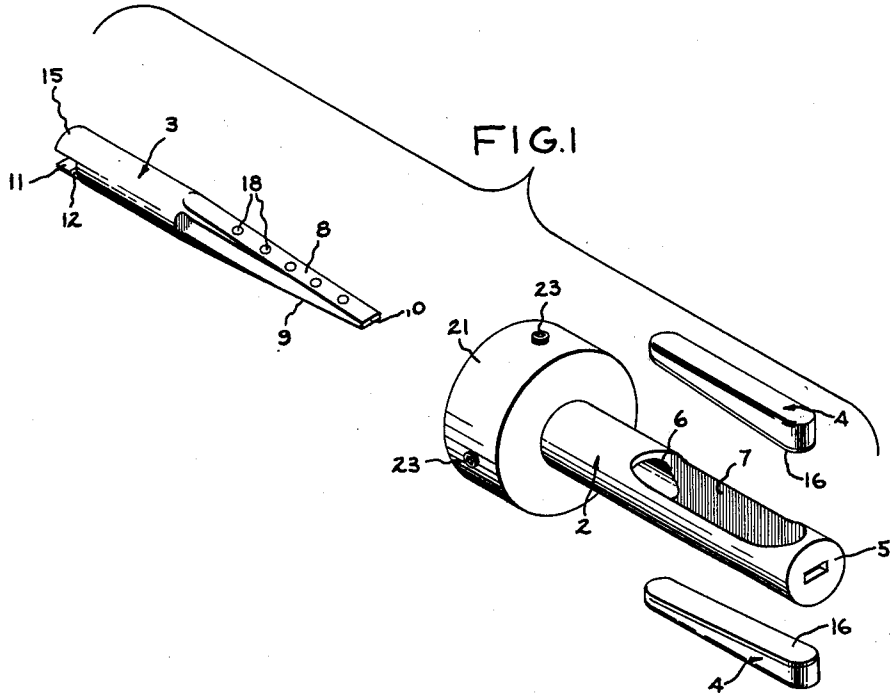
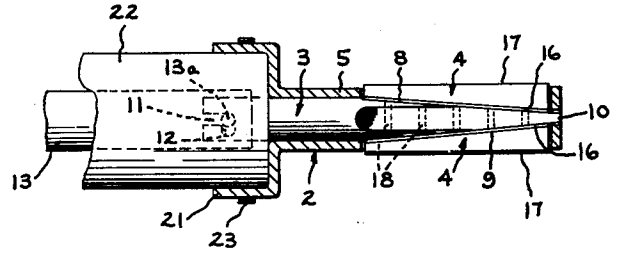


FIG.2



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HONING TOOL

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The present invention relates to a honing tool and more particularly to an improved arrangement for mounting and retaining a detachable abrasive element in place on a rotatable honing bar.

In presently known types of honing or lapping tools, the abrasive members are retained in place on the rotating bar by a holding device or a clamping means that necessarily places a strain on the abrasive members and distorts the cutting edge of the member thereby affecting the cutting action of the abrasive members and greatly reducing the useful life of the abrasive members. This makes it difficult to "round up" irregular bores without removing stock on portions of the bore that are already up to size.

Accordingly, it is an object of the present invention to provide a honing tool having an improved arrangement for retaining the detachable abrasive members in place on the rotatable honing bar.

It is a further object of the present invention to provide an improved honing tool in which the abrasive cutting members are not held onto the rotating bar by a holding device likely to cause strain or distortion of the abrasive member.

A more specific object of the present invention is to provide an adjustable honing tool having magnetically retained abrasive inserts freely held on a rotatable driving member for obtaining a quick-change size adjustment.

Further objects and advantages of the invention will become apparent as the following description proceeds, and the features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

In accordance with the present invention, there is provided a honing tool having a rotatable honing bar which is adapted for connection to some rotating means such as a lathe or a boring tool shaft. The bar is provided with an axial cavity. At least one longitudinal slot extends from the surface of the bar and communicates with the axial cavity. Inserted within the axial cavity of the rotatable bar and rotatable therewith is a retaining member having a flat surface disposed in juxtaposed relation with respect to the slot in the bar. A detachable honing member is disposed within the slot in the bar and provided with a magnetically attractable flat base mating with the flat surface of the adjustable member. Magnetic means in the retaining member, having pole faces on the flat surface thereof, provides a magnetic force attracting the base of the honing member and thereby retains the honing member within the slot in the bar against centrifugal force exerted on the honing member by the rotation of the bar.

For a better understanding of the invention reference may be had to the accompanying drawing in which:

FIG. 1 is an exploded view of the honing tool showing the various components of the tool layed out in relationship to their relative points of assembly; and

FIG. 2 is an elevation view partly in cross section showing the honing tool with all of the components assembled in position for a lapping or honing operation.

Referring now to the drawing, there is shown in FIG. 1 an exploded view of the honing tool of the present invention. In its preferred form, the honing tool comprises generally a rotatable honing bar 2, a retaining member or rod 3 and a pair of abrasive members 4. Referring to both FIGS. 1 and 2, it can be seen that the rotatable bar

comprises a longitudinal section 5 having an axial cavity 6 therein.

The longitudinal section 5 connects with, or is provided with, a flanged end 21 by means of which the bar 2 is attached to a rotatable spindle or shaft 22 of a boring machine or lathe. A plurality of locking screws 23 are utilized to attach the flanged end 21 to the spindle 22. In most instances the shaft or spindle 22 is adapted to move axially for inserting the rod 2 into the bore of an object to be lapped or honed. Extending from the outer surface of the longitudinal section of the bar 2 are a pair of oppositely disposed longitudinal slots 7 which communicate with the cavity 6 in the interior of the bar.

The retaining member 3 is provided with a pair of flat surfaces 8 and 9 which taper or slant in opposite directions toward the end 10 of the member. As may be seen in FIG. 2, the retaining member 3 is inserted into the axial cavity of the honing rod 2 with the end 10 forwardly and the member 3 fitting snugly within the unslotted portion of the axial cavity 6 so that the tapered or angularly disposed flat surfaces 8 and 9 are very precisely located with respect to the axis of the honing bar 2. The flat surfaces 8 and 9 are in juxtaposed relation with respect to the slots 7 of the honing rod 2 when the retaining member 3 is inserted into the rod. At the rear end 15 of the retaining member 3 there is a slot 11 and a locking slot 12 which cooperate with a means for axially adjusting the position of the retaining member 3 with respect to the rod 2. In the illustrated embodiment, these means comprise the adjusting sleeve 13, which encompasses the rear portion of the retaining bar 3, and a pin 13*a* which locks into the slot 12 of the retaining member 3. Axial movement of the sleeve 13 adjusts the position of the retaining member 3 with respect to the honing rod 2 and positions the flat surfaces 8 and 9 with respect to the slots 7 in the honing rod.

In the preferred embodiment of the invention, the lapping or honing stones comprise a pair of abrasive members 4 that are detachably inserted into the slots 7 of the rotatable rod 2. The abrasive members 4 may be made of any of the well known abrasive or lapping materials which are bonded to a base or portions 16 of magnetically attractable material such as iron, steel or some other ferrous material. The abrasive members 4 are formed so that the base 16 slants in the opposite direction to the taper of the flat surfaces 8 and 9 on the retaining member 3 so that the abrasive members 4 seat onto the flat surfaces 8 and 9 of the retaining member 3 with the outer surfaces or honing surfaces 17 of the abrasive members parallel to the axis of the rotatable rod 2.

In order to retain the abrasive members 4 in place within the slots 7 of the rotatable rod 2, the retaining member is provided with a magnetic means having pole faces in the flat surfaces 8 and 9 for attracting the magnetically attractable base 16 of the abrasive members. In the illustrated and preferred embodiment of the invention, there are shown a plurality of small slender magnets 18 disposed normal to the axis of the retaining member 3 and provided with pole faces in the opposite surfaces 8 and 9 of the retaining member. The slender magnets are preferably small "Alnico" magnets of high strength and permanence. When using independent magnets of this type, it is necessary to make the retaining member 3 out of a non-magnetic material, such as non-magnetic stainless steel or some other highly durable non-magnetic material. It is possible to magnetize the retaining member 3 so that the opposite surfaces 8 and 9 provide pole faces designed to attract the honing members 4. When these small "Alnico" magnets are spaced along the retaining member 3, they are machined during the forming of the retaining rod so that they actually form a portion of the flat surfaces 8 and 9. The "Alnico" magnets 18 provide a force attracting the base 16 of ferrous surface material of the

abrasive members 4 and force these members to seat strongly against the surfaces 8 and 9 of the retaining rod 3. Thus, during rotation of the rotatable rod 2 and the retaining member 3 which rotates with the rod, the abrasive members 4 are retained within the slots against the centrifugal force tending to throw them out of the slots.

It should be mentioned that, by merely moving the retaining member 3 axially with respect to the rotatable bar 2, the abrasive members are forced inwardly or outwardly radially with respect to the axis of the rod 2 for adjusting the abrasive members 4 according to the circumference to be honed thereby obtaining a quick-change size adjustment.

In the preferred embodiment of the invention the slots 7 in the rotatable rod 2 are made of sufficient width so that the inserted abrasive members 4 have a combined circumferential distance greater than ½ of the total circumference of the honing tool. In other words, the combined angle subtended by the slot openings 7 is more than 180°. This, therefore, makes the tool hone or round up bores without overcutting those edges which have already been brought up to size. By making the combined circumferential distance of the rounded honing surface greater than ½ the total circumference of the honing bar, the honing surface rides over and up to size areas and removes stock only from those surfaces not up to size.

By the present invention there has been provided a honing tool having honing stones or abrasive members that are detachably held in place by a magnetic force which causes the honing stones to be retained tightly in place within the honing tool without exerting any clamping strain on the abrasive portions of the honing member. This greatly increases the usable life of the honing members by eliminating the clamping strains and wear on the members at the clamping point due to vibrations created during honing operations.

While in accordance with the patent statutes there has been described what at present is considered to be the preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention and it is, therefore, the aim of the appended claims to cover all such changes and modifications as wall within the true spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A honing tool comprising a rotatable honing bar that is adapted to turn about its longitudinal axis, said bar having an axial cavity therein and at least one slot extending from the surface thereof and communicating with said axial cavity, an adjustable retaining member in said axial cavity of said bar and adapted to rotate therewith, said retaining member having a longitudinally tapered surface disposed in juxtaposed relation with said slot in said honing bar, an abrasive member adapted to fit into said slot in said honing bar and having a base of magnetically attractable material adapted to seat on said tapered surface of said retaining member, and magnetic means in said retaining member having pole faces on the tapered surface thereof for attracting said magnetically attractable base of said abrasive member so that said abrasive member is retained in said slot against centrifugal forces exerted on said abrasive member during rotation of said bar, the honing diameter of the tool being changed automatically by merely moving the retaining member either backward or forward within the honing bar.

2. A honing tool comprising a rotatable honing bar that is adapted to turn about its longitudinal axis, said honing bar having an axial cavity therein and a plurality of slots extending from the surface thereof and communicating with said axial cavity, an adjustable retaining member disposed in said axial cavity of said bar and rotatable with said bar, said retaining member having a plurality of flat surfaces each disposed at an angle with respect to the axis of said bar and disposed in juxtaposed relation with said slots of said bar, abrasive members adapted to fit into said slots in said honing bar, each of said abrasive members having a base of magnetically attractable material adapted to seat on an angularly disposed flat surface of said retaining member, magnetic means in said retaining member having pole faces on the flat surfaces thereof for exerting a magnetic force on said bases of said respective abrasive members so that said abrasive members are retained in said slots against centrifugal forces exerted on said abrasive members during rotation of said honing bar, and means for adjusting said retaining member lengthwise with respect to said honing bar so that said flat angularly disposed surfaces of said retaining member displace said abrasive members radially with respect to the longitudinal axis of said honing bar thereby to provide either larger or smaller honing diameters for said tool.

3. A honing tool comprising a rotatable honing bar that is adapted to turn about its longitudinal axis, said honing bar having an axial cavity therein and a pair of longitudinal slots on opposite sides thereof extending from the surface of said bar and communicating with said axial cavity, an adjustable retaining member of non-magnetic material having flat oppositely disposed surfaces converging toward the end of said member, said retaining member extending into said axial cavity of said rotatable bar and being rotatable therewith, said flat surfaces on said retaining member being arranged in juxtaposed relation with said slots in said honing bar, longitudinal abrasive members adapted to fit into said longitudinal slots in said bar and having flat base portions of magnetically attractable material mating with said converging surfaces of said retaining member, said abrasive members having outer edge surfaces in a plane generally parallel to the axis of rotation of said rotatable bar, and a plurality of magnets disposed in said retaining member with pole faces on the opposite converging surfaces of said retaining member for attracting said magnetically attractable base portions of said abrasive members so that said abrasive members are retained in said slots against centrifugal forces exerted on said abrasive members during rotation of said bar, the honing diameter of the tool being changed automatically by merely moving the retaining member backward or forward within the honing bar.

4. A honing tool comprising a rotatable honing bar that is adapted to turn about its longitudinal axis, said bar having an axial cavity therein, a pair of longitudinal slots on opposite sides of said bar extending from the surface of said bar and communicating with said axial cavity, said slots having a combined opening of more than ½ of the circumference of said bar, an adjustable retaining member made of a non-magnetic material and having at least two flat surfaces converging toward one end of said member, said retaining member disposed in said axial cavity of said rotatable bar and rotatable therewith, said retaining member having said flat surfaces thereof in juxtaposed relation with said slots in said bar, longitudinal abrasive members adapted to fit into said longitudinal slots in said bar and having flat bases of magnetically attractable material mating with said flat surfaces of said retaining member, said abrasive members having rounded outer honing surface coextensive with the outer surface of said honing bar to provide a rounded honing surface having a combined circumferential distance greater than ½ the total circumference of the honing bar, and a plurality of permanent magnets disposed in said retaining member having pole faces on opposite converging surfaces of said retaining member for attracting said magnetically attractable bases of said abrasive members so that said abrasive members are retained in said slots against centrifugal force exerted on said abrasive members during rotation of said bar, the honing

diameter of the tool being changed automatically by merely moving the retaining member either backward or forward within the honing bar.

References Cited in the file of this patent

UNITED STATES PATENTS

1,828,074 Roebbel et al. ---------- Oct. 20, 1931
2,317,079 Peden ---------- Apr. 20, 1943
2,333,256 Kline ---------- Nov. 2, 1943
2,481,967 Archer ---------- Sept. 13, 1949
2,503,619 Hopps et al. ---------- Apr. 11, 1950
2,662,353 Bergman ---------- Dec. 15, 1953