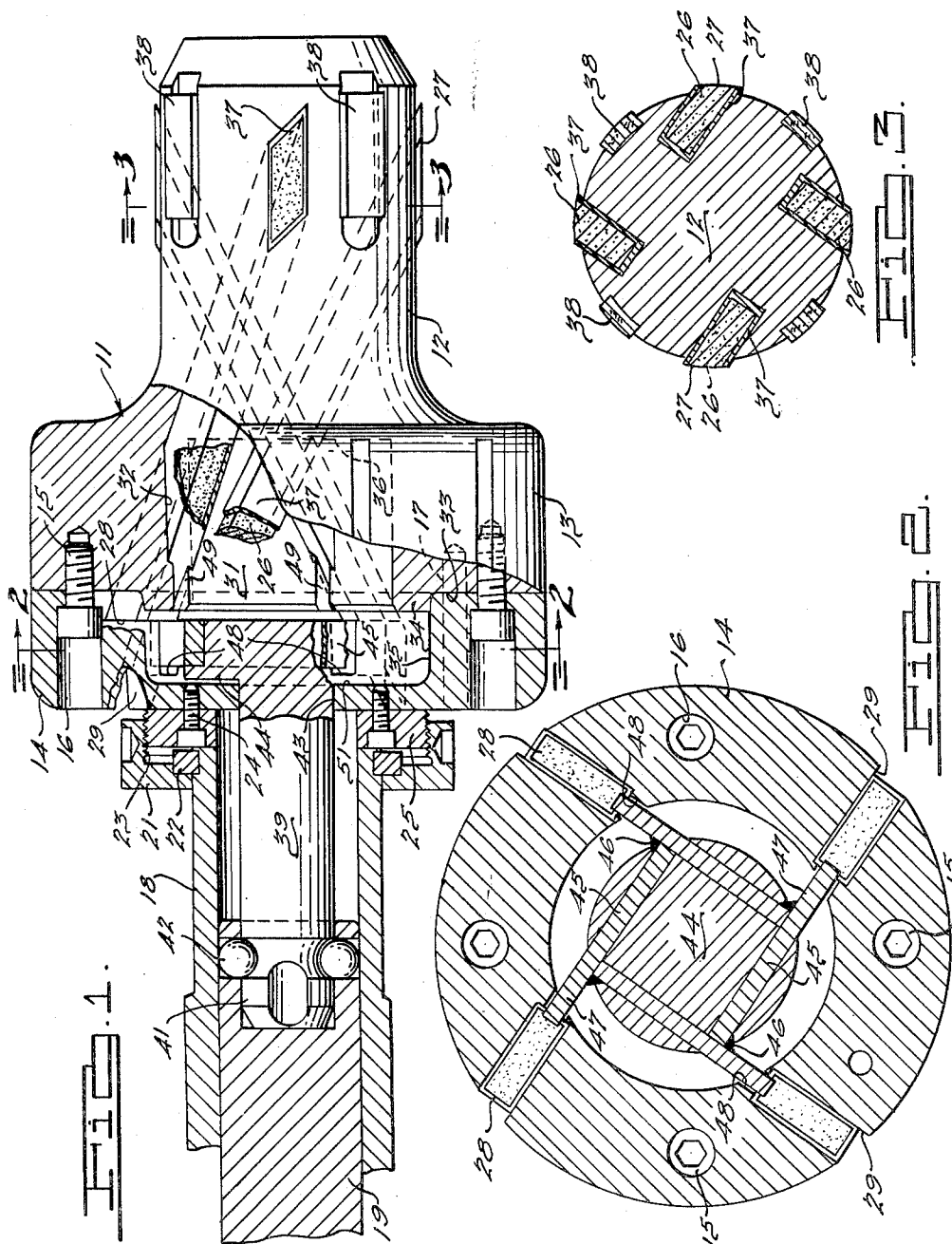


Nov. 23, 1954

D. T. PEDEN
HONING TOOL WITH STONES DISPOSED
AT AN ANGLE TO THE TOOL AXIS
Filed April 22, 1952

2,694,885



INVENTOR.

Douglas T. Peden.

BY

Harnes, Dickey & Pierce
ATTORNEYS.

1

2,694,885

HONING TOOL WITH STONES DISPOSED AT AN ANGLE TO THE TOOL AXIS

Douglas T. Peden, Ann Arbor, Mich., assignor to Micro-matic Hone Corporation, Detroit, Mich., a corporation of Michigan

Application April 22, 1952, Serial No. 283,604

8 Claims. (Cl. 51—184.1)

This invention relates to honing tools and more particularly to tools adapted for honing the internal or bore diameters of articles by a combined reciprocating and rotating movement.

One disadvantage with the heretofore known honing tools of this type has been the limited life of the abrasive stones which necessitates their frequent replacement. This is due to the fact that during the honing operation the bore diameter increases, necessitating the constant outward radial movement of the abrasive stones. Moreover, the working faces of these stones are constantly being broken down during the normal operation which necessitates still further radial movement to compensate for this wear. Since the size of the abrasive stones is inherently limited by the previously known types of honing tools this has made necessary the frequent stopping of the machine in order to replace the worn stones with new stones of sufficient length to permit outward radial movement.

It is an object of the present invention to overcome this disadvantage of the previously known honing tools, and to provide an improved tool for honing bore diameters which makes possible a greatly increased life of the abrasive stones, thus reducing the frequency of machine stoppage in order to replace the stones.

It is another object to provide an improved honing tool of the above character in which a plurality of abrasive stones are disposed in a novel manner within the tool body so that the stones may be of relatively great length and have working surfaces which are movable radially outwardly during the honing operation.

It is also an object to provide a honing tool as described above, in which the abrasive stones are disposed in angular relation with the hone body axis, and are also so disposed that the stones are in non-interfering relation so that they may be simultaneously moved during the honing operation.

It is a further object to provide an improved honing tool of the above nature in which an actuating means for adjusting the abrasive stones is provided, this actuating means having a relatively great travel so that major portions of the abrasive stones may be used before replacement becomes necessary.

Other objects, features, and advantages of the present invention will become apparent from the subsequent description, taken in conjunction with the accompanying drawings.

In the drawings:

Figure 1 is a side elevational view partly in cross-section, and with parts broken away from clarity, of the improved honing tool of this invention;

Figure 2 is a cross-sectional view taken along the line 2—2 of Figure 1 and showing the cooperation of the actuating bars and the abrasive stones; and

Figure 3 is a cross-sectional view taken along the line 3—3 of Figure 1 and showing the disposition of the working portions of the stones within the hone body.

The invention comprises a hone body generally indicated at 11 which holds the abrasive stones and has a narrowed working portion 12 of cylindrical shape which is adapted to be inserted within the bore of the work (not shown). The upper end 13 of hone body 11 is also of cylindrical shape but of greater diameter than the working portion 12, and a cap member 14 is secured thereto by a plurality of screws 15 which are disposed in counterbores 16 within the cap. The cap and hone body may also be interconnected by a dowel connection 17. Means are

2

provided for securing the hone body to a conventional honing machine of the type which provides simultaneous reciprocation and rotation of the hone body. Such a machine is shown for example in my Patent No. 2,350,527, issued June 6, 1944, and need not be described in detail in this application since it forms no part of the present invention. The machine is provided with a tubular member 18 which is actuated in a reciprocating and rotating manner, and an adjusting rod 19 which is movable axially within the tubular member 18 and serves as an actuating member for radially adjusting the working faces of the abrasive stones. In the illustrated embodiment the tubular member 18 is provided with a rotatable attaching ring 21 held thereon by a collar 22 and provided with threads 23. Secured to cap 14 by screws 24 is an externally threaded attaching member 25 which is threadably engageable by ring 21 to secure the hone body firmly against the end of tubular member 18.

The hone body supports a plurality of abrasive stones 26 which have working faces 27 the shape of a section of a cylinder struck from the center of the working portion 12 of the hone body. In the illustrated embodiment four such stones are shown although it will be understood that the principles of the invention contemplate the use of more or less stones according to requirements. The stones are each disposed in inclined chordal relation within the hone body, and are circumferentially spaced so that they extend in noninterfering relation. The upper end 28 of each stone is disposed, when the stone is of full length, within an inclined passageway 29 within the cap 14. Each stone extends downwardly and angularly through the hone body, and for this purpose the body is provided with an axial recess 31 and inclined passageways 32 which are aligned with passageways 29. It will be seen that each passageway 32 extends from the end surface 33 of the hone body which mates with cap 14, and intersects the side wall of recess 31. The end surface 33 may be provided with a lip portion 34 to interfit with a recessed portion 35 in the cap. Passageways 32 continue past the floor 36 of recess 31 into the working portion 12 of the hone body and terminate at the outer surface of working portion 12. The arrangement is therefore such that the working faces 27 of the stones protrude from the hone body near the end of the working portion 12 at peripherally spaced intervals, as illustrated in Fig. 1. Due to the inclined chordal arrangement of the stones the working faces will, when shaped to conform to the internal diameter of the work, assume a trapezoidal or parallelogram shape as seen best in Figure 1. The stones may be further provided with a plastic or similar sheath 37 for protective purposes, this sheath having wearing properties approximately equal to the stone. The hone body may be further provided with conventional wiper guides 38 interposed between the stone faces, these wiper guides serving to guide the hone body during the honing operation to prevent unwanted engagement of the stones and work.

Means are provided for interconnecting the adjusting rod 19 and the stones 26 to incur movement of these stones in the direction of their axes. It will be seen that such movement will cause the working faces 27 to move radially outwardly with respect to the hone body axis, so that the tool diameter may be enlarged during operation. This means preferably comprises an adjusting member or head 39 having an attaching end 41 connected to the adjusting rod 19 by ball lock means 42 such as is shown in the aforementioned patent. The adjusting member is of cylindrical shape within tubular member 18 and extends through a bearing aperture 43 in cap 14. The end of the adjusting member is provided with a head end 44 disposed within the recess 35 of cap 14. Rigidly secured to this head are a plurality of actuating bars 45 which are adapted to simultaneously engage the upper ends 28 of the abrasive stones. As is seen best in Figure 2, these bars fit into appropriate grooves in head 44 and are secured thereto by such means as welds 46. The bars are in symmetrical chordal relation and each bar has an end 47 which extends outwardly from head 44 and is adapted to engage the upper end 28 of a corresponding stone 26. For this purpose the cap 14 is provided with a plurality of clearance recesses 48 connecting the interior recess 35 and the inclined passageways 29, and bar extensions 47 are

3

adapted to extend through the apertures 48 to overlie the ends 28 of the stones. It will therefore be seen that axial movement of adjusting rod 19 to the right as seen in Figure 1 will cause bars 45 to engage the inner ends of the stones 26 and move the stones simultaneously through their inclined passageways. Since the bars 45 moves as a unit it will be seen that all the stones 26 will move an equal amount during this operation. It will also be observed that during this movement the end faces 28 of the stones will have a lateral sliding motion along the abutting surfaces of the bars, and since the coacting faces are relatively smooth this will not impair the operation.

The extent of movement permitted the adjusting head will of course determine the active life of the stones, and for this reason means are provided for permitting a relatively long stroke of the adjusting head. This means preferably comprises a plurality of clearance slots 49 which extend axially within hone body 11 and interconnect the interior recess 31 and the inclined stone passageways 32. These clearance slots 49 are aligned with the extensions 47 of actuating bars 45, so that if the adjusting head is moved to the right in Figure 1 the head end 44, which is preferably of less diameter than the recess 31, will enter this recess, and the bar extensions 47 will pass through slots 49 permitting their continued engagement with the stones. It will therefore be seen that the limits of movement of the adjusting head are the end surface 51 of cap recess 35 and the floor 36 of hone body recess 31. This will allow major portions of the stones to be utilized in the honing operation before it becomes necessary to replace the stones.

It will be observed that during the operation of the device the stones 26 will be at all times fully supported within their passageways, and this support will continue even after the stones are disposed only in the working portion 12 of the hone body. When it becomes necessary to replace the worn stones this may be accomplished by detaching hone body 11 from the cap 14 and removing the worn stones.

While it will be apparent that the preferred embodiment of the invention herein disclosed is well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims. In particular, it should be kept in mind that while the illustrated embodiment shows only the necessary apertures, passageways, and recesses for the proper operation of the tool, the actual construction of the device may vary due to the machining operations required to obtain the necessary structure.

What is claimed is:

1. In a tool for honing a surface of revolution, a rotatable hone body having a working portion movable into adjacent relation with the surface to be honed, said body having an aperture disposed in a chordal plane, and extending therein at an angle to the axis of the body and through the peripheral surface of said working portion, an elongated abrasive stone slidably disposed in said aperture, said stone having a working surface protruding from said aperture at the working portion of the hone body when said stone is in operating position, and adjusting means within said body engageable with the inner end of

4

said stone for moving the stone along said aperture whereby said working surface is moved outwardly from the hone body axis.

2. A tool as defined in claim 1 having a plurality of said apertures therein in circumferentially spaced relation and a stone in each of said apertures, said adjusting means being arranged to move said stones simultaneously.

3. A tool as defined in claim 1 having a plurality of said apertures therein in circumferentially spaced relation and a stone in each of said apertures, said adjusting means being arranged to move said stones simultaneously, the working surfaces of said stones being parallel to said axis.

4. A tool as defined in claim 1 having a plurality of said apertures therein in circumferentially spaced relation and a stone in each of said apertures, said adjusting means being arranged to move said stones simultaneously and comprising a head engaging the inner ends of each of said stones and being adjustably movable in the direction of the hone body axis.

5. A tool as defined in claim 4 wherein said head is provided with different portions, each portion being engageable with the inner end of one of said stones.

6. A tool as defined in claim 1 having a plurality of said apertures therein in circumferentially spaced relation and a stone in each of said apertures, clearance openings extending radially inward from each of said apertures, said adjusting means comprising a head movable axially of said body and having portions extending through said clearance openings into engagement with the inner ends of said stones.

7. A tool as defined in claim 1 having a plurality of said apertures therein in circumferentially spaced relation and a stone in each of said apertures, attaching means on said hone body for securing said body to a honing machine for rotation and reciprocation thereby, said adjusting means being arranged to simultaneously engage and move said stones and having a portion thereof attachable to an actuating member on said honing machine.

8. A tool as defined in claim 1 wherein said aperture and said stone are of complementary rectangular cross section, a sheath of wearable material covering and secured to the four side walls of said stone, the working surface of said stone being disposed at an acute angle to one of said side walls and at an obtuse angle to an adjacent side wall thereof.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
431,713	Whaley	July 8, 1890
1,114,039	Richards	Oct. 20, 1914
1,385,370	Fox	July 26, 1921
1,409,379	Hunziker	Mar. 14, 1922
1,509,438	Miller	Sept. 23, 1924
1,978,445	Zimmerman	Oct. 30, 1934
2,038,295	Kaminsky	Apr. 21, 1936

FOREIGN PATENTS

Number	Country	Date
578,652	Great Britain	July 5, 1946