Nov. 2, 1943. H. BOLD 2,333,233

TOOL

Filed April 4, 1942

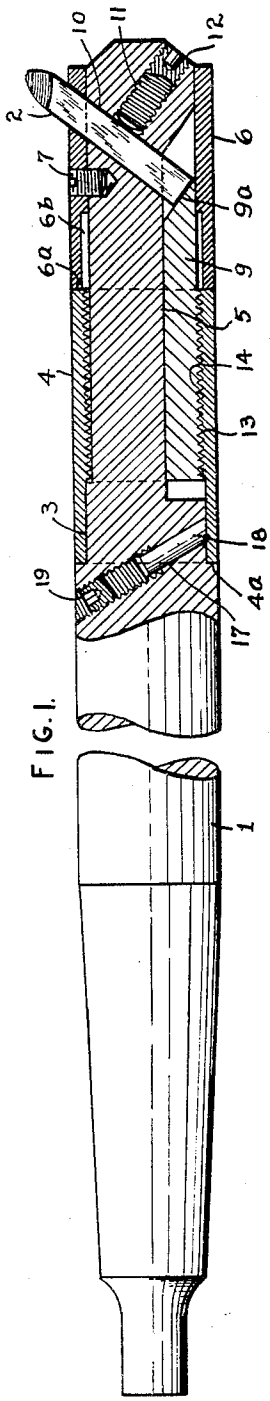


FIG. 1.

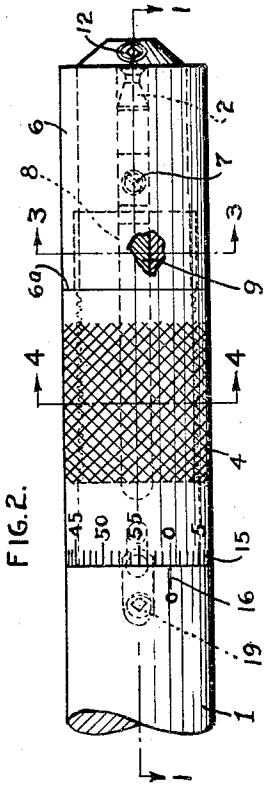


FIG. 2.

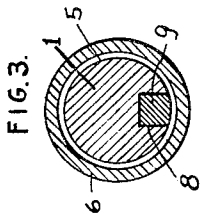


FIG. 3.

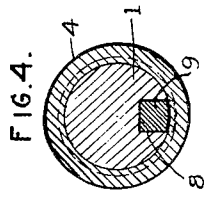


FIG. 4.

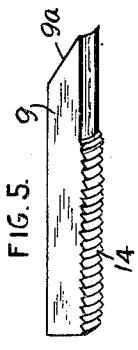


FIG. 5.

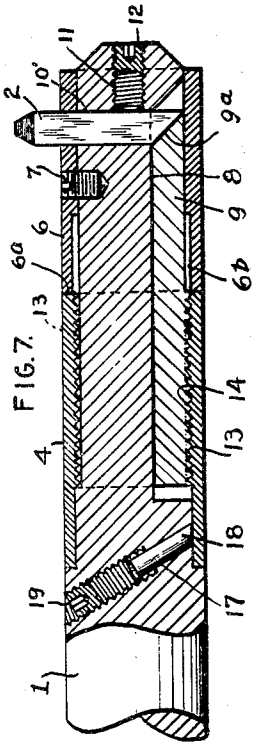


FIG. 7.

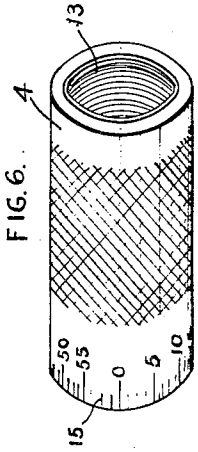


FIG. 6.

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2,333,233

TOOL

Herbert Bold, Cleveland, Ohio

Application April 4, 1942, Serial No. 437,657

7 Claims. (Cl. 77—58)

This invention relates to a tool particularly adapted for cutting away or boring metal forming the inner wall of a hole, cavity, cylinder and the like, whereby the diameter of a hole may be enlarged or annually recessed, the inner wall of a cavity or cylinder may be grooved or enlarged from end to end or intermediate its ends or the end wall of a hole, cavity or cylinder cambered or beveled.

In tools for carrying out operations of this character, of which I have knowledge, the cutting element was adjusted by a cut-and-try method; that is, the cutter element was manually engaged and moved endwise and then secured in its adjusted position, and then the operative would test the tool with a work piece or attempt to measure its position. This sort of construction would often require several adjustment operations, and when finally adjusted the operative was compelled to carry out the intended operation, at least partially, to determine the accuracy of the adjustment. In tools of this form of construction and method of adjustment, very often one or more work-pieces were ruined and hence wasted. In making adjustments of this character, the setting of the cutting element becomes largely a matter of guess-work, so that where the work pieces must be finished in accordance with exact specified dimensions, great danger of inaccuracy occurring is present; also, when two or more tools are being employed on work pieces of like character danger of non-uniformity of the finished pieces is also present.

One object of the invention is to provide an improved tool of this type having micrometer adjustment means, whereby the cutting element may be adjusted predetermined distances according to specified dimensions at the will of the operative, whereby work pieces may be properly finished and danger of non-uniformity eliminated.

Another object of the invention is to provide an improved tool of this character comprising few parts, which may be readily assembled and easily operated to effect each desired adjustment of the cutting element.

Another object of the invention is to provide an improved tool of this character, having micrometer adjustment means for the cutting element wherein the cutter element is removable and both the cutting element and its adjustment means may readily be locked in operative position.

Other objects of the invention will be apparent to those skilled in the art to which my invention relates from the following description taken in connection with the accompanying drawing, wherein

Fig. 1 is a view, partly in section, of a tool embodying my invention.

Fig. 2 is a fragmentary bottom plan view.

Figs. 3 and 4 are sections on the lines 3—3 and 4—4, respectively of Fig. 2.

Figs. 5 and 6 are perspective views of details.

Fig. 7 is a fragmentary view, partly in section, showing a modified form of construction.

In the drawing, 1 indicates as an entirety a shank, provided at its outer end with a cutting element 2 mounted as hereinafter set forth. The inner end of the shank 1 is shaped to be rigidly, but removably mounted in a clamping device (not shown) provided on a driven spindle or shaft in relation to a support or bed for the work-piece to be operated upon. The clamping device, spindle or shaft and support or bed are not shown as they form no part of the present invention and may be of standard or special construction. The shank 1, inwardly of its outer end, is circumferentially reduced, as shown at 3 to form a bearing for the inner end portion of a rotatable sleeve 4 and a shoulder 4a against which the inner end of the sleeve bears. The shank 1, outwardly of the bearing 3, is reduced circumferentially as shown at 5, relative to the bearing 3 for a purpose later set forth. 6 indicates a collar surrounding the reduced portion 5 of the shank and fixed thereto preferably by a countersunk set screw 7. The inner end of the collar forms a shoulder 6a against which the outer end of the sleeve 4 bears, the shoulders 4a, 6a, serving to prevent movement of the sleeve axially of the shank during its rotation. The inner wall of the collar 6 adjacent its inner end is recessed, as shown at 6b, for a purpose later set forth. At one side, the reduced portion 5 of the shank 1 is formed with a longitudinally extending slot 8, of non-circular shape in cross section, the walls of which form guides for a thrust member 9, arranged to be moved endwise therein. The guide slot 8 preferably terminates inwardly of the outer end of the shank 1 for a purpose later set forth. The outer end of the thrust member 9 is inclined or beveled from its inner side outwardly, as shown at 9a, for engagement with the inner end of the cutting element 2, whereby outward movement of the thrust member 9 is effective to move the cutting element 2 endwise outwardly. The thrust member 9 is extended inwardly into overlapping relation to the sleeve 4 and is operatively connected to the latter, as later set forth, whereby

rotation of the sleeve serves to effect endwise movement of the thrust member 9. The cutting element 2 is slidably and removably mounted in an elongated through opening 10 formed in the end portion of the shank 1, the inner end of the opening 10 merging into the guide slot 8 so as to provide for the engagement of the cutting element by the outer beveled end of the thrust member 9 and extending diametrically to the opposite side of the shank 1. In the form of construction shown in Figs. 1, 2 and 5, the opening 10 extends in an outwardly inclined direction, at an angle of substantially 53 degrees relative to the axis of the shank 1, so as to position the outer end of the cutting element 2 opposite the outer end of the shank 1. In this arrangement, the inner end of the cutting element 2 is preferably disposed at right angles to its axis and the beveled end 9a of the thrust member 9 is preferably inclined at the same or complementary angle relative to the axis of the shank 1 as the opening 10. Where the opening for the cutting element 2 is disposed diametrically at right angles to the axis of the shank 1, as shown at 10' in Fig. 7, the inner end of the cutting element 2 is beveled preferably at an angle of 45° to its axis, and the end 9a of the thrust member 9 is correspondingly beveled.

By preference the collar 6 extends to a point adjacent the outer end of the shank 1 to close the guide slot 8 at its outer end and to maintain the outer end portion of the thrust member 9 in the guide slot 8 to insure the positive engagement of its end 9a with the cutting element 2 and a predetermined adjustment movement in relation to a predetermined travel of the thrust member 9. As shown, the collar 6 is formed with an opening 6c in registry with the outer end of the opening 10 to accommodate the cutting element. The collar 6 also forms a stop for the cutting element 2 when the latter is positioned in the opening 10.

The outer end of the shank 1 outwardly of the opening 10 or 10' is formed with a threaded opening 11 disposed at right angles to the opening 10 or 10' and extending at its inner end thereinto and arranged to receive a countersunk set screw 12 which may be tightened against the cutting element 2 to rigidly secure it in its adjusted position. By terminating the guide slot 8 inwardly of the outer end of the shank 1, such end is closed to exclude grease, oil, circulating fluid and metal chips from the slot 8 and sufficient metal is provided for forming the openings 10 or 10' and 11 and inserting a relatively large set screw in the latter.

The inner wall of the sleeve 4, from its outer end inwardly throughout a portion of its length is provided with screw threads 13 and the outer side of the thrust member 9 is correspondingly threaded, as shown at 14 for engagement with the screw threads 13, so that by rotating the sleeve 4, which is held against endwise movement by the shoulders 4a, 6a, endwise movement is imparted to the thrust member 9.

It will be observed that the screw threads 13, 14, have a predetermined pitch relative to the inclination of the co-acting engaging ends between the thrust member 9 and cutting element 2, whereby rotation of the sleeve 4 a predetermined distance will effect a predetermined endwise movement of the thrust member 9 and the latter in turn will adjust the cutting element 2 a predetermined distance outwardly. By reason of the co-ordinated relationships between these parts, designated graduations 15, preferably in thousandths of an inch, on the sleeve 4 and movable relative to a fixed mark 16 on the shank 1, serve to indicate to the operative the amount of adjustment of the cutting element 2, which will result from each rotation or partial rotation of the sleeve 4; he is thus enabled to readily determine the necessary angular movement of the sleeve for any desired adjustment of the cutting element and to effect such adjustment accurately.

The recess 6b accommodates the screw threads 14 when the thrust member 9 is moved outwardly, whereas the reduced portion 5 of the shank 1 accommodates the screw threads 13, being engaged thereby to form a bearing for the outer end portion of the sleeve.

17 indicates a through opening formed in the shank 1 and extending diametrically thereof and at an inclined angle from a point inwardly of the sleeve 4 to a point outwardly of the inner end of the latter, so as to merge with the reduced or bearing portion 3. The inner end portion of the opening 17 slidably supports a plunger 18 arranged to engage the inner wall of the sleeve 4. The walls of the outer end portion of the opening 17 are provided with screw threads to take a set screw 19, arranged to engage the outer end of the plunger 18 and when tightened against the latter it clamps the plunger 18 against the sleeve 4 to prevent its rotation.

By preference, the guide slot 8 extends inwardly beyond the reduced portion 5 to insure clearance.

To position the parts for operation, the sleeve 4 is rotated in that direction to move the thrust member 9 inwardly approximately to the limit of its movement, then the cutting element 2 is inserted in its seat or supporting opening 10 with its inner end against the collar 6, and then the sleeve 4 is rotated in the opposite direction until the "0" graduation 15 on the sleeve 4 coincides with the mark 16 on the shank 1, which coincidence indicates that the thrust member 9 is set in position, that is, in engagement with the inner end of the cutting element 2, ready to adjust the latter outwardly in accordance with movement of the sleeve 4 relative to the mark 16.

From the foregoing description it will be noted that the cutting element 2 is capable of adjustment to effect precision cuts or boring operations and is also removable so that cutting elements of varying lengths may be employed dependent upon the size of the opening in which the tool is to operate and other conditions.

To those skilled in the art to which my invention relates, many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the spirit and scope thereof. My disclosures and the description herein are purely illustrative and are not intended to be in any sense limiting.

What I claim is:

1. A tool of the class described comprising a shank the outer side of which is formed with a longitudinally extending slot, a thrust member slidably mounted in said slot and provided on its outer side with screw threads, a diametrically extending seat formed in the outer end portion of said shank and communicating at its inner end with said slot, a cutting element slidably mounted in said seat with its inner end in the path of movement of said thrust member, said thrust member and the inner end of said cutting element having co-acting surfaces, whereby end-

wise outward movement of said thrust member serves to adjust said cutting element relative to the axis of said shank, inner and outer sleeves surrounding said shank in end-to-end relation and arranged to form the outer wall for said slot, and means for securing said outer sleeve to said shank, said inner sleeve being rotatable on said shank and provided on its inner wall with screw threads arranged to engage the screw threads on said thrust member to move the latter endwise.

2. A tool as claimed in claim 1, wherein means are provided on said shank outwardly of said seat for fixedly securing said cutting element to said shank in its adjusted position.

3. A tool as claimed in claim 1, wherein means are provided on said shank inwardly of said slot for positively locking said inner sleeve against movement.

4. A tool as claimed in claim 1, wherein means are provided on said shank outwardly of said seat for fixedly securing said cutting element to said shank in its adjusted position and separate means are provided inwardly of said cutting element for securing said outer sleeve to said shank.

5. A tool of the class described comprising a shank formed in its side wall with a longitudinally extending slot, a thrust member slidably supported in said slot and provided on its outer side with screw threads, a cutting element slidably mounted in the outer end portion of said shank and arranged to be engaged at its inner end by the outer end of said thrust member and moved endwise upon movement of said thrust member in one direction, a sleeve the inner end portion of which extends inwardly beyond said slot and rotatably fits said shank, and means on the outer end portion of said shank for preventing endwise movement of said sleeve during rotation thereof, the outer portion of said sleeve being provided internally with screw threads arranged to engage the threads on said thrust member and operable when rotated to move the latter endwise.

6. A tool of the class described comprising a shank the outer side of which is formed intermediate its ends with a longitudinally extending slot, a thrust member slidably mounted in said slot and provided on its outer side with screw threads, said thrust member having a cross section equal to that of said slot, a cutting element adjustably mounted in the outer end portion of said shank, and arranged to be engaged by the outer end of said thrust member and adjusted relative to the axis of said shank, a sleeve surrounding said shank, the inner end portion of said sleeve rotatably fitting said shank and the outer portion thereof being provided internally with screw threads in engagement with the threads on said thrust member, and means for holding said sleeve against endwise movement, whereby rotation thereof moves said thrust member endwise.

7. A tool of the class described, comprising a shank having a reduced outer end portion forming an annular shoulder inwardly of its outer end, the side wall of said reduced portion intermediate its ends being formed with a longitudinally extending recess and adjacent its outer end said portion being formed with a diametrically extending opening leading into said recess intermediate the ends thereof and forming a seat for slidably supporting a cutting element, inner and outer sleeves disposed in end-to-end relation and fitting the reduced portion of said shank, the inner end of said inner sleeve abutting said shoulder and the outer end of said outer sleeve engaging said shank outwardly of said opening, whereby said sleeves form the outer wall of and close said recess, means inwardly of said opening for securing said outer sleeve to said shank, separate means outwardly of said opening adapted to secure the cutting element in said opening, and a thrust member slidably fitting said recess and arranged to engage the inner end of the cutting element, the outer side of said thrust member and the inner wall of said inner sleeve being provided with screw threads in threaded engagement, whereby rotation of said inner sleeve on said shank moves said thrust member endwise to adjust the cutting element.

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