May 21, 1940. M. N. PRANGE 2,201,593

HONING TOOL

Filed Feb. 28, 1938 2 Sheets-Sheet 1

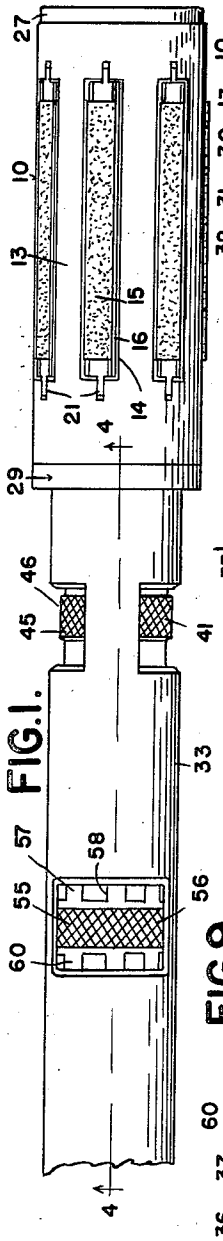


FIG. 1.

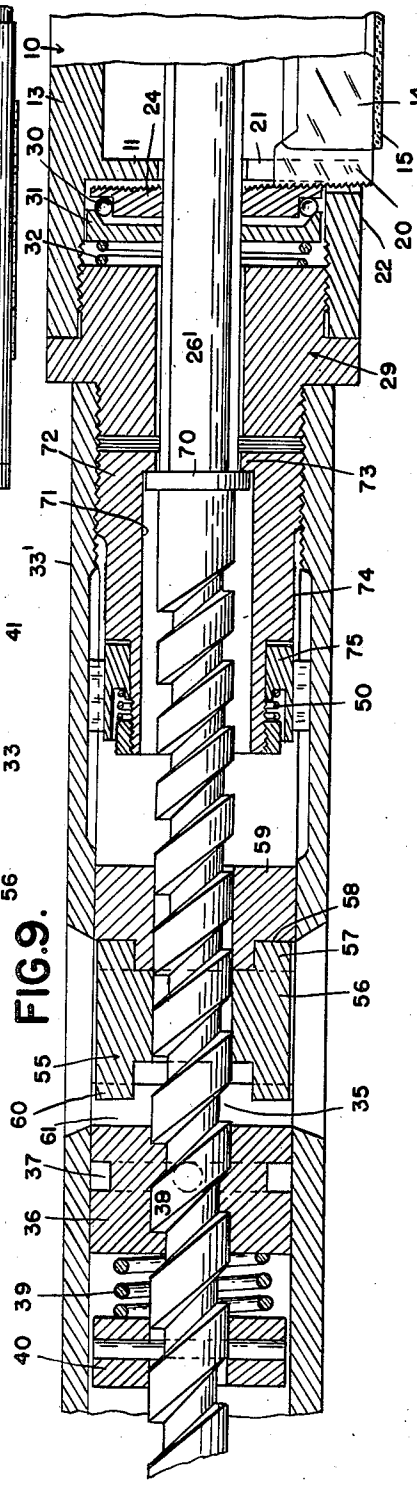


FIG. 9.

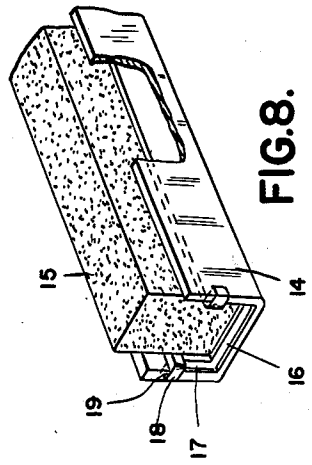


FIG. 8.

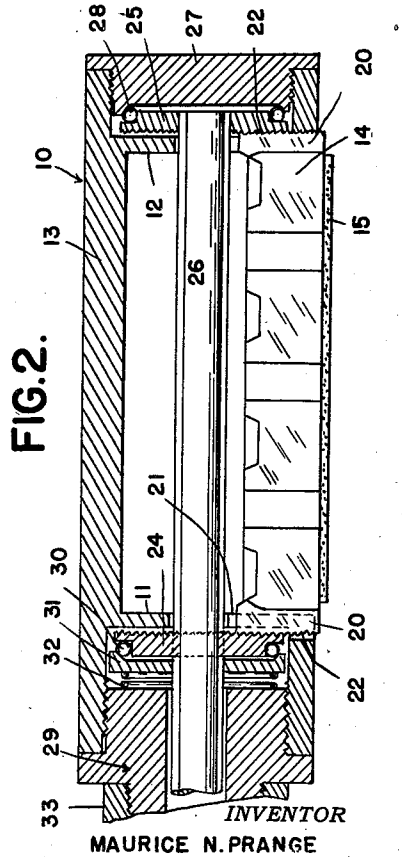


FIG. 2.

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Filed Feb. 28, 1938 2 Sheets-Sheet 2

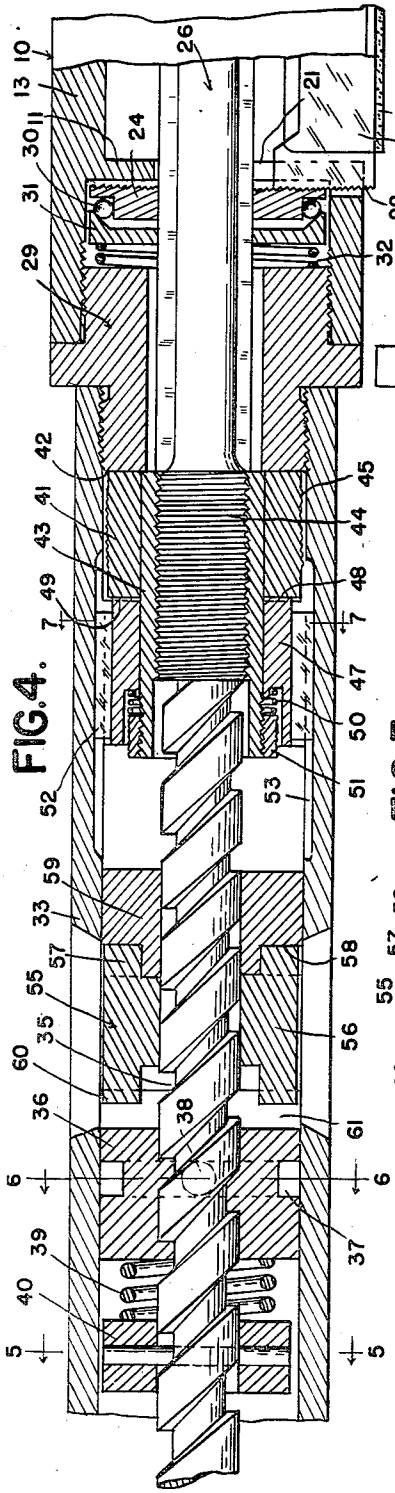


FIG. 4.

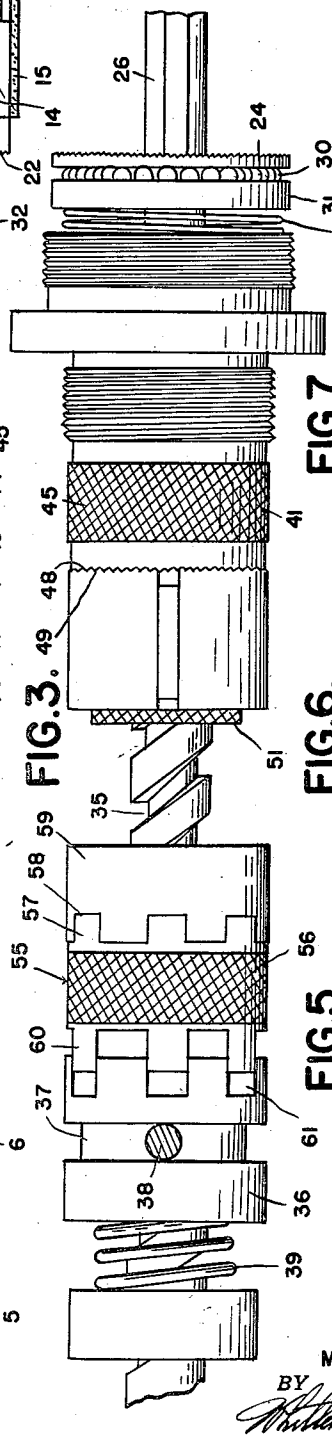


FIG. 3.

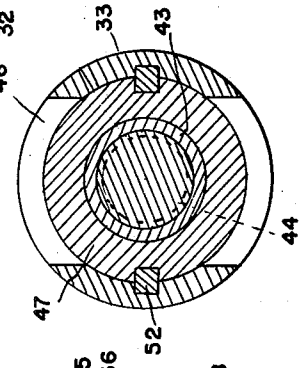


FIG. 7.

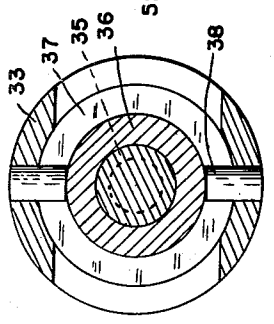


FIG. 6.

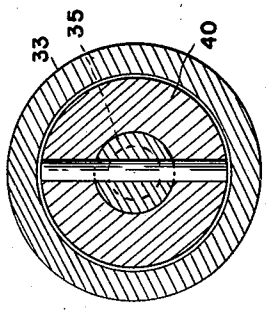


FIG. 5.

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Patented May 21, 1940 2,201,593

UNITED STATES PATENT OFFICE

2,201,593

HONING TOOL

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Application February 28, 1938, Serial No. 193,183

5 Claims. (Cl. 51—184.4)

This invention relates generally to honing or lapping tools and refers more particularly to honing tools of the type having provision for adjusting the stones or abrasive elements radially to provide for honing bores of different diameter.

One of the principal objects of this invention resides in the provision of a relatively simple inexpensive lapping tool having means rendering it possible to not only secure a wide range of radial adjustment of the abrasive elements either inwardly or outwardly with respect to the axis of rotation of the tool but, in addition, permits accurately adjusting the elements to any diameter within said range.

Another object of this invention consists in the provision of a lapping tool wherein the abrasive elements are moved radially inwardly and outwardly relative to the axis of rotation of the tool by scrolls having a threaded engagement with opposite ends of the abrasive elements and revoluble in opposite directions about the axis of the tool by a rod reciprocable along the axis of the tool.

Still another advantageous feature of this invention resides in the provision of a tool of the character set forth in the preceding paragraph wherein the rod is provided with a spiraled cam surface engageable in a spiraled groove formed in a nut held against reciprocation with the rod in a manner that movement of the rod in opposite directions along the axis of the tool relative to the nut causes the rod and scrolls to rotate in opposite directions.

A further object of this invention resides in the provision of means for accurately adjusting the effective stroke of the rod to in turn vary the extent of rotative movement of the scrolls and correspondingly vary the degree of radial movement of the abrasive elements relative to the axis of the tool.

A still further object of the invention consists in adjusting the position of the abrasive elements radially of the cage by rotating the nut previously set forth as effective to impart a rotative movement to the rod upon axial sliding movement thereof.

The foregoing, as well as other objects, will be made more apparent as this description proceeds, especially when considered in connection with the accompanying drawings, wherein:

Figure 1 is an elevational view of a lapping tool constructed in accordance with the present invention;

Figure 2 is a longitudinal sectional view through a portion of the tool shown in Figure 1;

Figure 3 is an enlarged elevational view of a portion of the lapping tool shown in Figure 1;

Figure 4 is a sectional view taken substantially on the plane indicated by the line 4—4 of Figure 1;

Figures 5, 6, and 7 are cross sectional views taken respectively on the lines 5—5, 6—6, and 7—7 of Figure 4;

Figure 8 is a fragmentary perspective view illustrating the manner in which the abrasive members or stones are secured in the stone holders; and

Figure 9 is a fragmentary longitudinal sectional view through another embodiment of this invention.

In Figure 1 of the drawings, I have shown a lapping tool having a cage 10 provided with upper and lower heads 11 and 12, respectively, integrally connected together by ribs 13. The ribs are spaced from each other circumferentially of the cage and adjacent ribs cooperate to slidably receive a stone holder 14. The stone holders 14 are channel-shaped in cross section, and each stone holder is adapted to receive an abrasive element or stone 15.

In the present instance, the radially inner side of each stone 15 is integrally united in any suitable manner to a sheet metal channel retainer 16 adapted to be inserted with the stone in one of the stone holders 14. Upon reference to Figure 8, it will be noted that the opposite ends of the flanges 17 on the sheet metal channel 16 are provided with ears 18 extending laterally outwardly from the flanges 17 into suitable recesses 19 formed in the adjacent flanges of the channel-shaped stone holder 14. In accordance with the present invention, the ears 18 are bent laterally to assume positions in the recesses 19 after the retaining channels and associated stones are assembled in their respective stone holders. The recesses 19 in the flanges of the stone holders are such that when the ears 18 are bent laterally to assume positions in these recesses, the stones are prevented from displacement relative to the holders.

The opposite ends of each stone holder 14 are provided with a flange 20 respectively slidably engaged in radially extending slots 21 formed in the heads 11 and 12 on the cage. The end surfaces of the flanges 20 are fashioned with teeth 22, and the arrangement of these teeth is such that they mesh with spiraled teeth formed on the inner surfaces of the scrolls 24 and 25. Both scrolls are splined on a shaft 26 extending axial-

ly through the cage 10 and mounted for both reciprocation and rotative movement in opposite directions relative to the cage. Inasmuch as the scrolls are splined on the shaft 26, it follows that the scrolls revolve as a unit with the shaft and in view of the threaded connection between the scrolls and stone holders 14, it also follows that rotation of the scrolls in opposite directions by the shaft 26 relative to the cage effects an adjustment of the stone holders 14 either radially inwardly or outwardly depending upon the direction of rotation of the scrolls by the shaft.

The lower scroll 25 is held in place by a suitable nut 27 threaded in the lower end of the cage. A suitable ball bearing 28 is positioned between the scroll and nut to reduce the friction to the minimum. The upper scroll 24 is held in assembled relation with the cage by means of a coupling 29 having a portion threaded in the upper end of the cage above the scroll 24. The scroll 24 is also rotably supported in a ball bearing 30 held in place by a retaining disc 31 slidably mounted on the shaft 26 and normally urged in a direction toward this scroll by means of a spring 32 surrounding the shaft 26 with one end engaging the lower end of the coupling 29 and with the opposite end abutting the top surface of the disc 31.

The cage and associated parts, including the shaft 26, are rotated as a unit by means of a sleeve 33 having the lower end threaded on the upper end of the coupling 29. The upper end of the sleeve is connected in any suitable manner to a motivating device (not shown and forming no part of the present invention).

Reference has been made above to the fact that the stone holders 14 are adjusted radially of the cage by rotating the shaft 26 and scrolls splined to the latter shaft. In accordance with the present invention, the shaft 26 is rotated in opposite directions by reciprocating the same axially of the sleeve 33. As shown particularly in Figure 4, the upper end portion of the shaft 26 is fashioned with a spiraled cammed groove 35 adapted to be threaded in a correspondingly spiraled nut 36 having an annular groove 37 in the outer cylindrical surface thereof for receiving the diametrically opposed pins 38 fixed to the sleeve 33. The construction is such as to prevent movement of the nut 36 axially of the sleeve 33 with the result that reciprocation of the shaft 26 relative to the nut imparts a rotative movement to the shaft in opposite directions. The shaft 26 is adapted to be moved in a downward direction by any suitable means (not shown) and, in the present instance, is returned by a spring 39 surrounding the shaft 26 with one end abutting the upper end of the nut 36 and with the opposite end abutting a collar 40 pinned to the shaft 26 for movement as a unit therewith.

In the present instance, downward movement of the shaft 26 relative to the nut 36 effects a rotation of the scrolls in a direction to move the stone holders 14 radially outwardly of the cage, and the extent of radial outward movement is limited by engagement of a nut 41 with a fixed stop 42 formed by the upper end of the coupling 29. The nut 41 is provided with an axially extending sleeve 43 internally threaded for engagement with cooperating threads 44 formed on the shaft 26 between the splined and spiraled portions of the latter. The exterior surface of the nut is knurled, as at 45, and is accessible through slots 46 formed in the sleeve 33. Thus, it will be seen that rotation of the nut 41 varies its position axially with respect to the stop 42 and, as a consequence, controls the extent of radial outward movement of the stone holders upon axial movement of the shaft 26 in a downward direction.

Provision is made herein for preventing accidental rotation of the nut 41 and for indicating predetermined increments of adjustment of the nut or stone holders. The above is accomplished, in the present instance, by providing a collar 47 rotatably mounted on the upper end of the sleeve 43 and having a serrated bottom face 48 arranged with the serrations thereof in intermeshing relation with corresponding serrations 49 on the upper face of the nut 41. The serrations are normally maintained into engagement with each other by means of a spring 50 surrounding the upper end of the sleeve 43 with the lower end abutting the adjacent end of the collar 47 and with the upper end abutting a nut 51 threaded upon the sleeve 43. The collar 47 is held from rotation with the nut 41 by means of diametrically opposed keys 52 secured to the collar 47 and slidably engaging keyways 53 formed in the inner surface of the sleeve 33.

The inclination of the diverging walls of the serrations is such that when the nut 41 is rotated, the serrations 49 on the upper face of the nut apply a cam action on the corresponding serrations 48 on the sleeve to move the latter axially upwardly relative to the sleeve 33 against the action of the spring 50. As soon as the nut 41 is rotated throughout the angular distance of one serration, the collar 47 is immediately returned by means of the spring 50 indicating that one increment of adjustment has been effected.

The present invention also contemplates supplementing the above adjustment by an additional adjustment indicated generally in Figures 3 and 4 by the reference character 55. In detail, the adjustment 55 comprises a collar 56 freely slidably and rotatably mounted on the shaft 26 at the underside of the nut 36. The lower end of the collar 56 is provided with a series of circumferentially spaced depending projections 57 adapted to extend into correspondingly spaced recesses 58 formed in the upper end of a collar 59 which, in turn, is fixed to the sleeve 33 for rotation therewith as a unit. The upper end of the collar 56 is provided with circumferentially spaced upwardly projecting portions 60 adapted to engage in correspondingly spaced recesses 61 formed in the lower end of the nut 36. The projections 60 and corresponding recesses 61 are of a greater length than the projections 57 and cooperating recesses 58 by such an amount that when the collar 56 is moved upwardly the extent required to engage the upper ends of the projections 60 with the bottoms of the recesses 61, the projections 57 move out of the recesses 58. As a result, the collar 56 may be rotated in either direction to impart a corresponding rotation to the nut 36. Rotation of the nut 36 in opposite directions tends to reciprocate the shaft 26 axially of the sleeve 33 and to vary the position of the nut 41 relative to the stop 42. This adjustment is resorted to when it is desired to effect a relatively great adjustment of the stone holders and, after the approximate diameter of the lapping tool is effected by rotating the nut 36, the nut 41 is manipulated to secure an accurate adjustment. In other words, the extent of adjustment of the nut 36 must be equal to at least the angular distance between adjacent projections on the collar 56, since after the adjustment is completed by the nut 36, the collar 56

is moved downwardly to re-engage the projections 57 in the recesses 58 on the upper edge of the fixed collar 59. In this connection, attention is called to the fact that the projections 60 are maintained in the recesses 61 at all times so that the nut 36 is prevented from rotation by engagement of the projections 57 in the recesses 58 on the fixed collar 59.

The embodiment of the invention illustrated in Figure 9 differs from the one previously described in the particular construction of the adjusting means provided to secure an accurate adjustment of the stone holders. In this construction, the shaft 26' is provided with an enlargement 70 arranged in a counterbored recess 71 formed in the nut 72 and adapted to abut the upper wall 73 of the recess to stop or limit the extent of downward movement of the shaft 26'. The nut 72 has a threaded engagement with the inner surface of the sleeve 33' with the result that rotation of the nut 72 relative to the sleeve varies the axial distance between the enlargement 70 on the shaft 26' and the stop 73 on the nut. In other words, the extent of reciprocation of the shaft 26' and, accordingly, the diameter of the lapping tool may be accurately varied by manipulating the nut 72. As in the first described form of the invention, the nut 72 is provided with a knurled portion 74 at the upper end thereof accessible for manipulation exteriorly of the sleeve 33' and cooperating with a unit 75 in the same manner as described in connection with the first form of the invention to prevent accidental rotation of the nut 72 and to indicate predetermined increments of adjustment.

What I claim as my invention is:

1. In a lapping tool, a revoluble cage, abrasive elements supported on the cage for movement radially of the axis of the cage, a member supported for sliding movement relative to the cage, means responsive to sliding movement of the member in one direction to impart a rotative movement to said member, and a scroll revoluble with said member and having spiraled teeth on one side thereof engageable with corresponding teeth on adjacent portions of the abrasive elements to move the latter radially relative to the cage.

2. In a lapping tool, a revoluble cage, abrasive elements supported on the cage for movement radially of the axis of the cage, a rod supported for reciprocation relative to the cage and having a spiraled cam portion, a nut fixed against sliding movement with the rod and having a spiraled groove receiving the spiraled cam portion in a manner to effect rotation of the rod in opposite directions upon reciprocation thereof, and a scroll splined on the rod for rotation as a unit therewith and having spiraled teeth on one side surface thereof engaging corresponding teeth on the abrasive elements to move the latter radially of the cage in directions depending upon the direction of rotation of the rod.

3. In a lapping tool, a revoluble cage, abrasive elements supported on the cage for movement radially of the axis of the cage, a rod supported for reciprocation relative to the cage and having a spiraled cam portion, a nut fixed against sliding movement with the rod and having a spiraled groove receiving the spiraled cam portion in a manner to effect rotation of the rod in opposite directions upon reciprocation thereof, means rotatable with the rod and engageable with the abrasive elements to move the latter radially relative to the cage, and means for rotating said nut to radially adjust the abrasive elements relative to the cage.

4. In a lapping tool, a revoluble cage, abrasive elements supported on the cage for movement radially of the axis of the cage, a rod supported for reciprocation relative to the cage and having a spiraled cam portion, a nut fixed against sliding movement with the rod and having a spiraled groove receiving the spiraled cam portion in a manner to effect rotation of the rod in opposite directions upon reciprocation thereof, means rotatable with the rod and engageable with the abrasive elements to move the latter radially relative to the cage, means for rotating said nut to radially adjust the abrasive elements relative to the cage, and means for independently adjusting the extent of radial outward movement of the abrasive elements upon sliding movement of the rod in one direction.

5. In a lapping tool, a revoluble cage, abrasive elements supported on the cage for movement radially of the axis of the cage, a rod supported for reciprocation relative to the cage and having a spiraled cam portion, a nut fixed against sliding movement with the rod and having a spiraled groove receiving the spiraled cam portion in a manner to effect rotation of the rod in opposite directions upon reciprocation thereof, means rotatable with the rod and engageable with the abrasive elements to move the latter radially inwardly and outwardly relative to the cage, and an adjustable stop limiting the extent of sliding movement of the rod in a direction to move the abrasive elements radially outwardly relative to the cage.

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