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TAP FOR ROLLING INTERNAL THREADS

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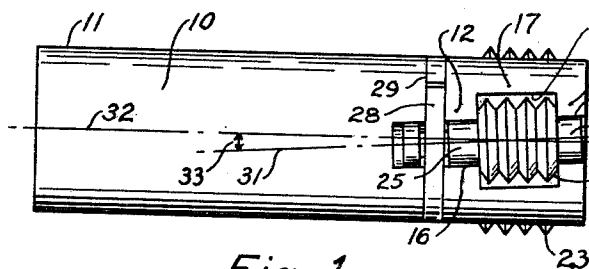


Fig. 1

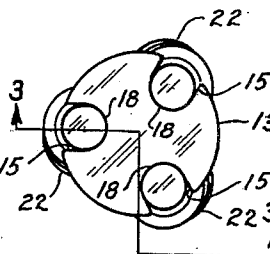


Fig. 2

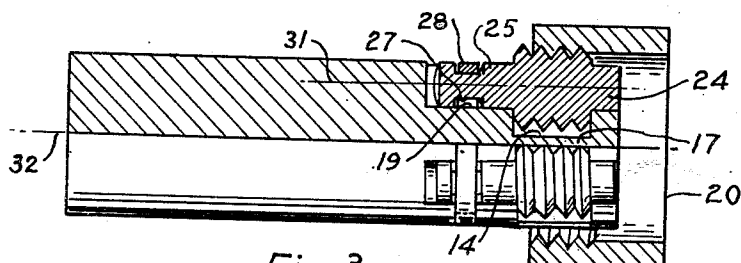


Fig. 3

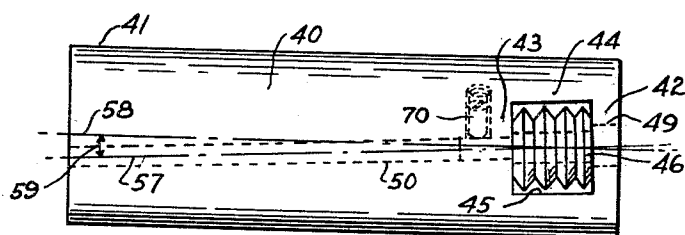


Fig. 4

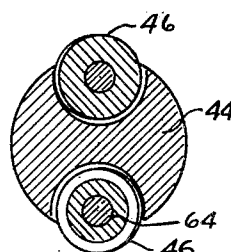


Fig. 7

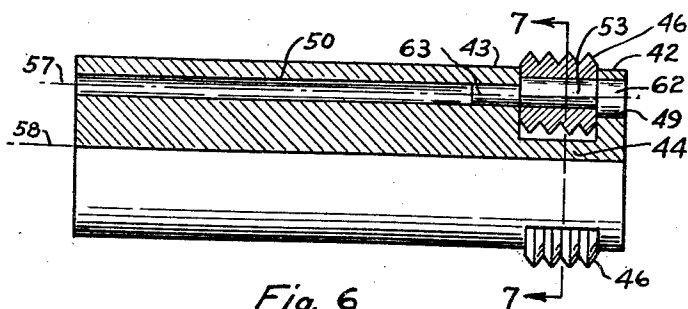


Fig. 6

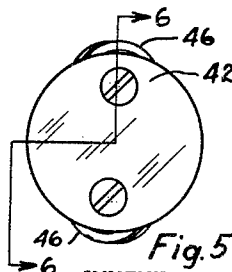


Fig. 5

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TAP FOR ROLLING INTERNAL THREADS

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1 Claim. (Cl. 80-6)

This invention relates to taps for rolling internal threads.

Although there have been prior attempts to provide taps for rolling internal threads, such taps are not in widespread use despite the fact that rolled threads are stronger and smoother than cut threads.

One of the principal reasons why such prior taps have not achieved general commercial acceptance is that the designs have been such as to be unable to provide sufficient rigidity for the thread forming rolls to withstand the side loads imposed thereon without deflecting, resulting in inaccurate and non-uniform sizing of the thread.

Accordingly, it is an object of the present invention to provide a tap for rolling internal threads in which the holder for the thread forming rolls is so constructed as to rigidly support the thread forming rolls against deflection under side loads thereon.

It is another object to provide a tap of the type described in which a one piece holder supports the thread forming rolls at both ends thereof for maximum rigidity against deflection of such rolls.

It is another object to provide an internal thread rolling tap with a plurality of thread forming rolls and with a simple means for adjusting the relative radial position of one thread forming roll with respect to another for accurately controlling the size of the thread to be formed in a workpiece.

It is another object to provide a tap for rolling internal threads in which the holder for the thread forming rolls is one-piece for maximum rigidity and has recesses for containing the thread forming rolls which are easy to machine.

It is another object to provide a tap of the type described in which the thread forming rolls have shafts integral therewith and the holder has roll supporting portions having radially outward openings through which the shafts may be inserted, thus permitting the shafts to be integral with the rolls and the roll supporting portions be integral with the holder for maximum rigidity.

Other objects will become apparent from the drawings and from the following description in which:

FIG. 1 is a side view of the tap.

FIG. 2 is an end view.

FIG. 3 is a one quarter section view along the lines 3-3 of FIG. 2 and showing a work piece with the tap.

FIG. 4 is a side view of a modified form of the tap.

FIG. 5 is an end view of the modified form.

FIG. 6 is a one quarter section view along the lines 6-6 of FIG. 5.

FIG. 7 is a section along the lines 7-7 of FIG. 6.

The form of the tap shown in FIGS. 1-3 includes a holder 10 which has a shank 11 at one end adapted to be received and clamped in a suitable chuck, not shown. The other end of the holder includes axially spaced thread forming roll supporting portions 12 and 13 which are integral with the holder and which have a plurality of recesses 14 therebetween, the recesses being radially spaced from the longitudinal axis of the holder and being angularly spaced from each other. The roll supporting portions 12 and 13 are integral with an axially extending portion 17 which contains the recesses 14. This axial extending portion 17 traverses the axis of the holder and extends radially between the recesses.

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The roll supporting portions 12 and 13 each have a plurality of radially outward front and rear openings 15 and 16 on each side of the recesses 14. The bottoms of the openings 15 and 16 provide bearing surfaces 18 and 19 which are radially spaced from the axis of the holder and angularly spaced from each other. The bearing surfaces 18 and 19 are in axial alignment with the respective recesses 14.

Mounted in each of the recesses 14 is a thread forming roll 22 having a series of annular thread forming ribs 23 thereupon. Each roll has shaft extensions 24 and 25 extending from opposite sides thereof and constituting mounting means which is engageable with the bearing surfaces 18 and 19 for rotatably supporting the roll. The shaft extension 25 has a groove 27 formed therein and there is a split ring 28 which fits within an annular groove 29 in the holder and within the groove 27 of each roll for retaining the rolls in the recesses 14. The split ring 28 preferably does not extend radially beyond the periphery of the holder 11.

The thread forming ribs 23 project radially from the recesses 14 but the shaft extensions 24 and 25 are preferably within the radial confines of the holder 11.

The recesses 14 and the openings 15 and 16 are so formed in the holder that their common longitudinal axis 31 is parallel to the axis 32 of the holder when viewed as in FIG. 3 and is at an angle 33 to the axis 32 when viewed as in FIG. 1. The angle 33 corresponds to the helix angle of the thread to be rolled in a workpiece. The end surfaces of each recess 14 are normal to the respective axis 31.

When rolling the thread, the tap 10 is rotated relative to the workpiece, the latter being shown at 20 in FIG. 2. As the tap enters the workpiece and rolls the thread therein, extremely high pressure is exerted in a radially inward direction upon the rolls. In order that the threads in the workpiece be accurately formed with a uniform pitch diameter, it is necessary that the rolls 22 be rigidly supported against radially inward deflection due to such inward pressure. Maximum support for such rolls is obtained by making the roll supporting portions 12 and 13 integral with each other and with the holder 10, and by having such portions of continuous transverse cross section.

The axially extending portion 17 between the roll supporting portions 12 and 13 is provided with a maximum of cross section by making the rolls 22 of a relatively small diameter with the recesses 14 fitting closely thereabout so that a substantial thickness of metal is provided at the central portion of the axially extending portion 17 as well as between the recesses 14.

To facilitate the making of a one-piece holder for the thread forming rolls, the openings 15 and 16 are open to the periphery of the roll supporting portions 12 and 13. This permits accurate milling of the recesses 14 and openings 15 and 16 by conventional means. Having the openings 15 and 16 open to the radial periphery of the holder also permits the rollers 22 to be integral with their shafts 24-25 since the rollers can be assembled to the holder by lateral insertion into the recesses 14 and the openings 15 and 16.

An optional form of the holder is shown in FIGS. 4 through 7. In this form, the holder 40 has a shank 41 at one end and at the other end has roll supporting portions 42 and 43 which are spaced from each other but which are integrally connected with the holder 40 by means of an axially extending portion 44. The latter has a pair of recesses 45 formed therein for receiving thread forming rolls 46. In this instance only two rolls 46 are illustrated but it is understood that in both forms of the invention the number of rolls employed is optional.

In the modified form, the roll supporting portions 42 and 43 have bores 49 and 50 formed on opposite sides of each recess 45 and axially aligned therewith. The bores 49 and 50 form bearing surfaces for pins 53 therein upon which the rolls 46 are mounted. In addition, the bores 50 extend to the opposite end of the holder.

Each set of bores 49-50 and recesses 45 have a common longitudinal axis 57 which is parallel to the longitudinal axis 58 of the holder in one plane, as viewed in FIG. 6, and which is at an angle 59 to the axis 58 when viewed in another plane which is at right angles to the first mentioned plane, as shown in FIG. 2.

The end surfaces of the recesses 45 are normal to the respective axis 57. Bore 49 is of larger diameter but concentric with bore 50. Mounted in each set of bores 49 and 50 are pins 53. Each pin 53 has concentric cylindrical end portions 62 and 63 and an intermediate cylindrical portion 64 whose axis is parallel to but offset from the axis of the end portions so that the cylindrical portion 64 is eccentric to the cylindrical portions 62 and 63.

The thread forming rolls are mounted on the intermediate portions 64 of the pins and have a close rotating fit thereon. Since the intermediate portions 64 of the pins are eccentric with the end portions 62 and 63, rotation of the pin within the pin supporting bores 49 and 50 will cause the roll 46 which is mounted on the pin being rotated to assume various adjusted lateral positions with respect to the other roll 46. By this means, the pitch diameter of the thread being rolled into the workpiece may be adjustably varied. When the pins 53 have been rotated to their proper setting, they are clamped in such rotated position by set screws 70 threaded into the holder 40. The set screws also prevent end wise displacement of the pins 53. As is evident from the drawings, set screws 70 do not project beyond the periphery of holder 40 and thus are within a circle circumscribed by the rolls 46 when holder 40 is rotated on its longitudinal axis. Shaft 53 is accessible from the front end of the holder for rotating the same for adjusting the lateral positions of the rolls with respect to each other, a screw driver slot being provided in the outer end of the shaft for this purpose.

This form of the invention likewise provides a very rigid support against radially inward deflection of the rolls due to pressure of the same against the workpiece. Such very rigid support is brought about by the fact that the roll supporting portions 42 and 43 are integral with the holder and are connected by an axially extending portion 44 which is of maximum cross sectional and which is integral with the portions 42 and 43.

Although two embodiments of the invention have been

shown and described, it is apparent that various other changes or modifications may be made without departing from the scope of the invention as defined in the following claims.

I claim:

A tap for roll forming internal threads in a workpiece, said tap including a holder and at least a pair of thread forming rolls spaced transversely on said holder and each having an annular thread forming rib thereon, said holder having front and rear sections having openings forming front and rear bearing portions for each roll for rotatably supporting the same with the axis of rotation being generally longitudinal of said holder, said front section being integral with said holder and being imperforate except for said openings therein for rigidly supporting the front ends of said rolls against radial inward deflection, said rear section also being integral with said holder and imperforate except for the openings therein for rigidly supporting the rear ends of said rolls against radial inward deflection, said sections being on opposite ends of said rolls and being joined by an axially extending portion integral therewith and which traverses the axis of said holder and which surrounds a substantial portion of each of said rolls, said rolls having shafts extending from each end thereof journaled in said bearing portions, said front bearing portions being located at the extreme front end of said holder, and all of said openings extending radially to the periphery of said sections whereby said shafts may be inserted radially into said openings.

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