July 23, 1940. F. JUDGE 2,209,228

TAP CHAMFERING MACHINE

Filed Aug. 18, 1938 4 Sheets-Sheet 1

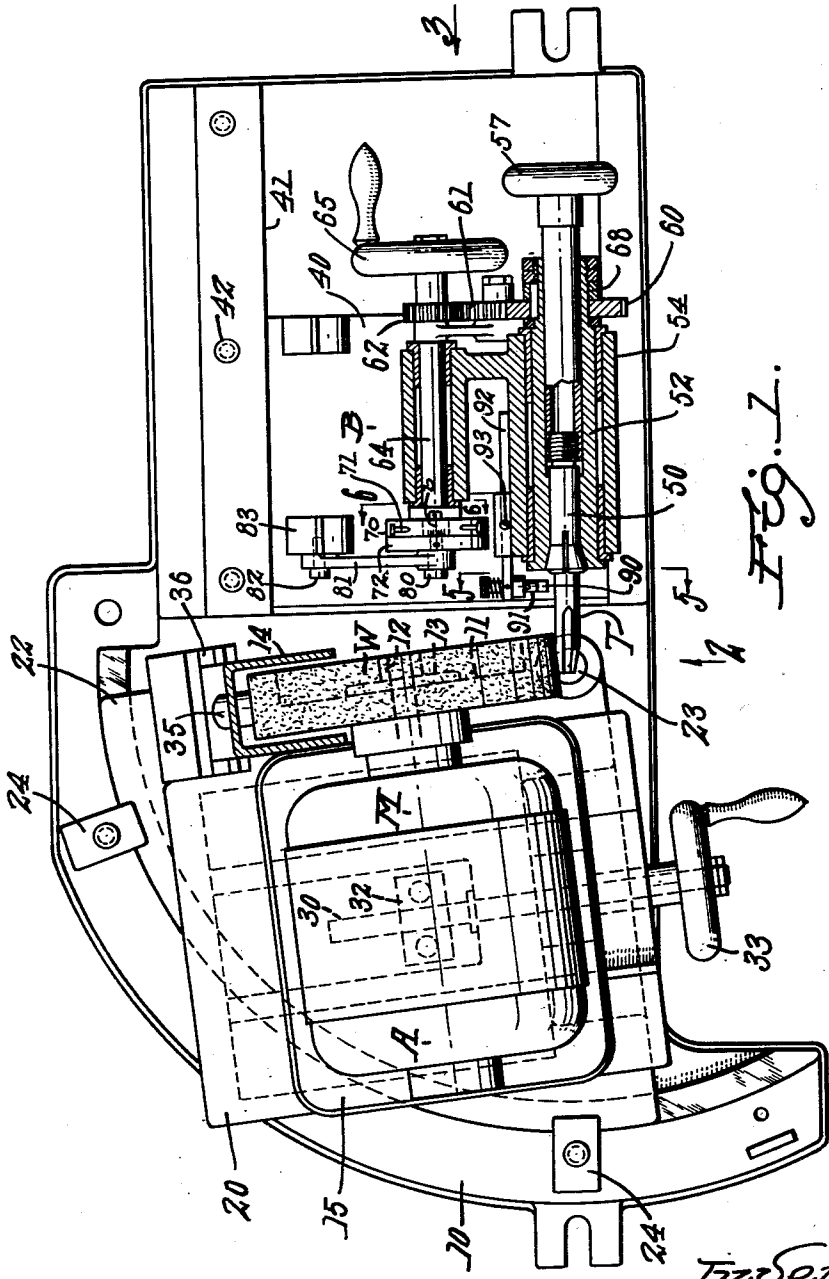


Fig. 1.

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Filed Aug. 18, 1938 4 Sheets-Sheet 2

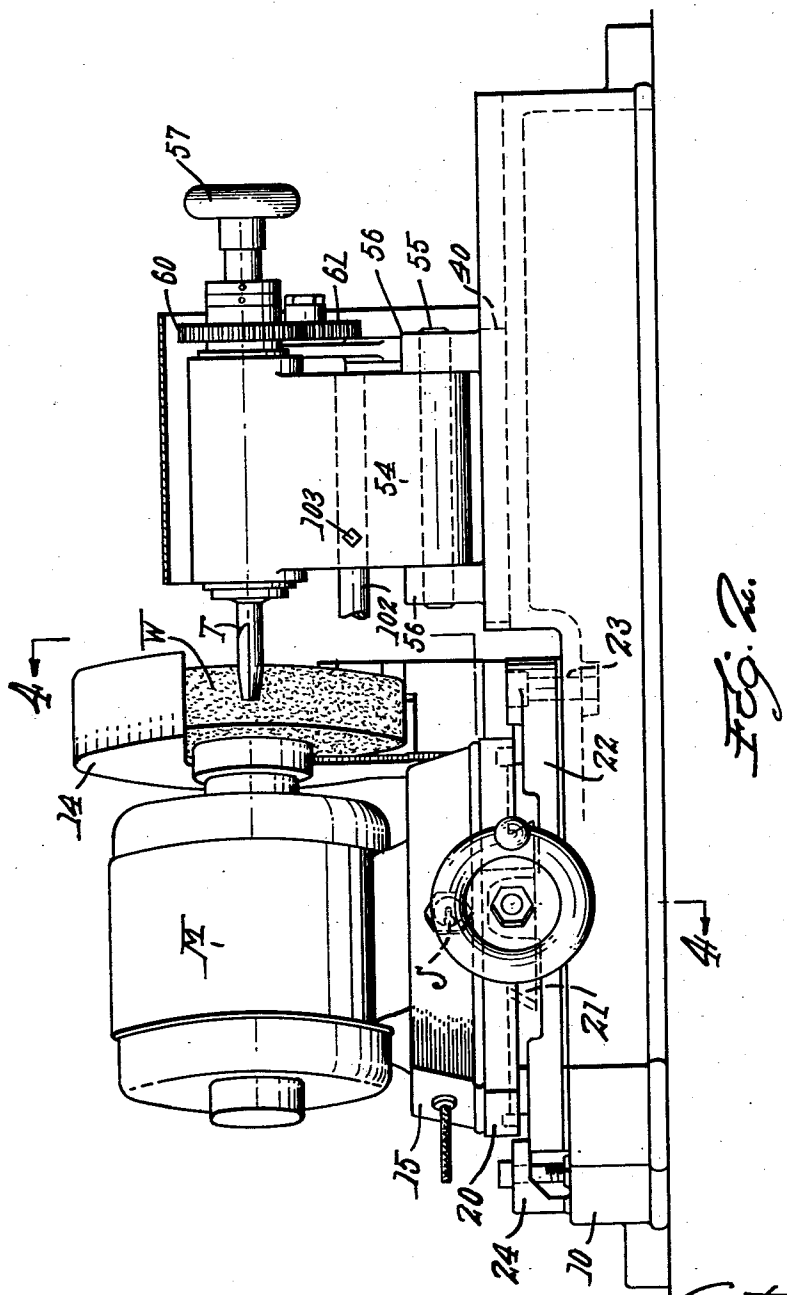


Fig. 2.

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Filed Aug. 18, 1938 4 Sheets-Sheet 3

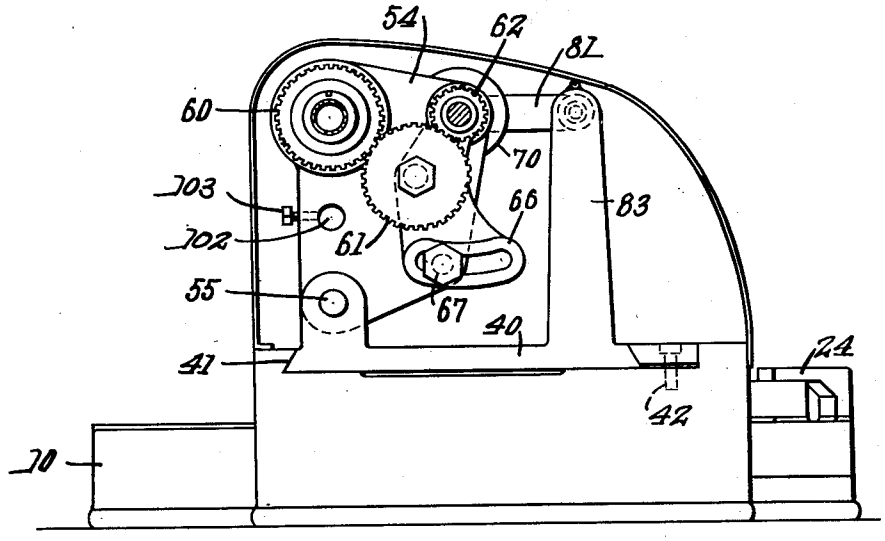


Fig. 3.

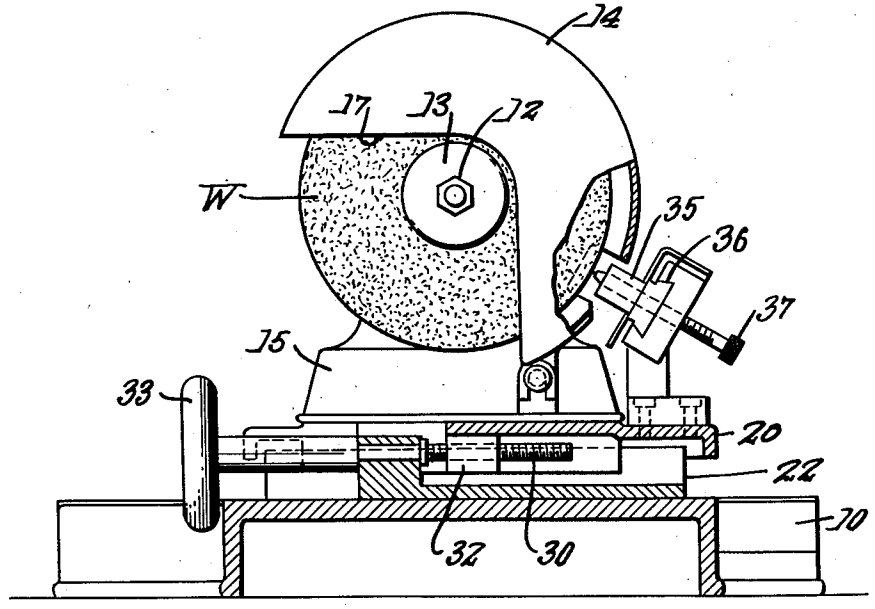


Fig. 4.

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TAP CHAMFERING MACHINE

Filed Aug. 18, 1938 4 Sheets-Sheet 4

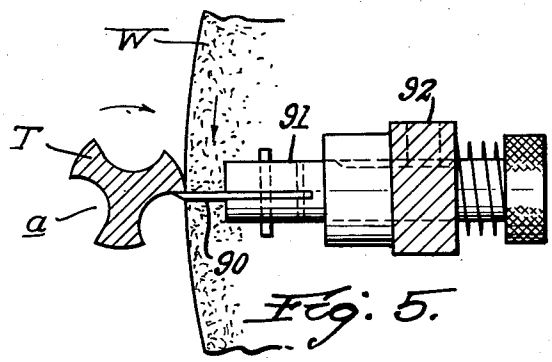


Fig. 5.

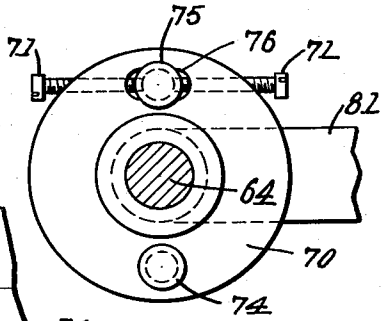


Fig. 6.

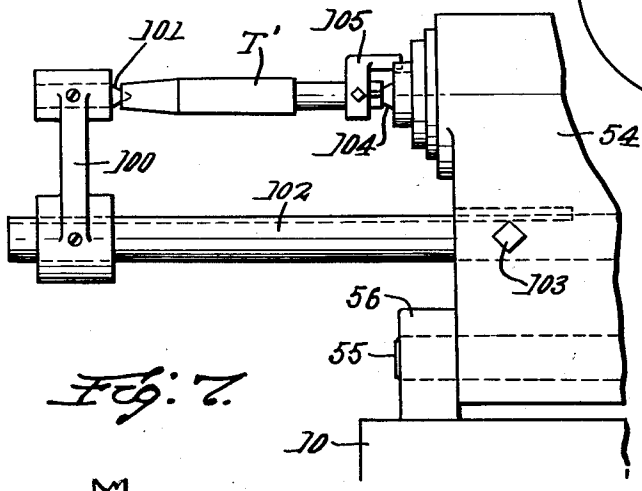


Fig. 7.

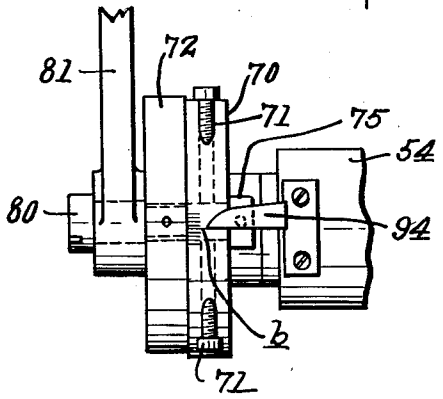


Fig. 8.

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UNITED STATES PATENT OFFICE

2,209,228

TAP CHAMFERING MACHINE

Franklin Judge, Greenfield, Mass.

Application August 18, 1938, Serial No. 225,601

2 Claims. (Cl. 51—97)

This invention relates to a machine particularly designed for grinding the entrance taper or chamfer angle at the ends of the lands of a thread-cutting tap.

This chamfered entering end portion of a tap is subject to more rapid wear than any other portion of the tap and requires more frequent regrinding. It is also desirable that all of the lands of a tap be ground to identical contours, so that any tendency of the tap to cut off-center may be avoided. Machines heretofore developed for this particular purpose have been of complicated construction and have not been readily adapted for use with differing kinds of taps.

It is the general object of my invention to provide an improved machine for chamfering taps and for performing other similar operations, by which such operations may be quickly, easily and accurately performed.

A further object is to provide a machine which is relatively simple in construction, economical in manufacture, and easily adapted for use with taps having different numbers of flutes, different angles of chamfer, or different relief angles.

My invention further relates to arrangements and combinations of parts which will be hereinafter described and more particularly pointed out in the appended claims.

A preferred form of the invention is shown in the drawings, in which

Fig. 1 is a plan view, partly in section, of my improved tap chamfering machine;

Fig. 2 is a front elevation thereof, looking in the direction of the arrow 2 in Fig. 1;

Fig. 3 is an end view of certain parts, looking in the direction of the arrow 3 in Fig. 1;

Fig. 4 is a sectional end elevation, taken along the irregular line 4—4 in Fig. 2;

Figs. 5 and 6 are detail sectional views, taken along the lines 5—5 and 6—6 in Fig. 1;

Fig. 7 is a front elevation of a modified tap support; and

Fig. 8 is a detail view to be described.

Referring to the drawings, my improved tap chamfering machine comprises a grinding portion A and a tap supporting and rotating portion B, both assembled on a main base 10.

The portion A preferably comprises a motor M having a grinding wheel W mounted on the armature shaft thereof. The wheel W may desirably be recessed, as indicated at 11 in Fig. 2, to receive a clamping bolt 12 and a washer 13. A casing or guard 14 surrounds the wheel W and is supported on the base portion 15 of the motor M. The guard 14 is recessed at 17 (Fig. 4) to clear certain of the tap supporting parts.

The motor base 15 is mounted on a wheel slide 20, having a dove-tail portion 21 (Fig. 2) slidable in guideways in a wheel table 22. The table 22 is pivoted at 23 to the base 10 and is angularly adjustable about said pivot. The axis of the pivot 23 is substantially in transverse alignment with the axis of the tap to be ground. Clamps 24 (Fig. 1) are provided for holding the table 22 in angularly adjusted position.

A cross feed screw 30 (Fig. 4) is rotatably mounted in a bearing in the table 22 but is restrained from axial movement therein. The screw 30 is threaded in a nut 32 secured to the under side of the wheel slide 20. A handle 33 (Fig. 1) is provided for turning the cross feed screw 30 and thus adjusting the motor M and wheel W toward or away from the tap.

A truing device 35 (Fig. 4) is slidably mounted in a guideway 36 fixed at the rear of the wheel slide 20 and may be moved axially of the wheel by means of a handle 37 to dress the cylindrical outer surface thereof.

The usual electrical connections are provided for the motor M, and said motor may be controlled by a switch S (Fig. 2) mounted on the front of the motor base 15.

By the constructions described, the grinding wheel may be adjusted with its peripheral surface at any desired angle to the axis of the tap, so as to provide any desired chamfer angle, and may be adjusted forward or rearward to grind taps of different diameters.

I will now describe the tap supporting and rotating portion B of my improved machine. This portion comprises a work head 40 (Fig. 3) slidable in guideways 41 in a raised end portion of the base 10. The head 40 may be clamped in adjusted position by gib screws 42 (Fig. 1).

The tap T (Fig. 5) to be chamfered may be held in a draw-back chuck 50 (Fig. 1) mounted in a chuck spindle 52, which in turn is rotatably mounted in bearings in the upper portion of a work support 54. The support 54 is mounted to rock or swing on a cross shaft 55 (Fig. 2) supported in bearings 56 on the work head 40. The draw-back chuck 50 may be of any usual or commercial construction and may be tightened or loosened by use of a hand wheel 57 (Fig. 1).

In chamfering taps, it is necessary not only to grind the ends of the lands at the desired angle, but also to separately back off or relieve each land of the tap as the chamfer is ground, for the purpose of clearance.

I accomplish this relieving action by swinging or oscillating the work support 54 on the cross shaft 55 during the grinding operation, and I have provided specially designed mechanism for rotating the tap and for oscillating the work support in predetermined timed relation to such rotation.

For this purpose, I connect the chuck spindle 52 through gears 60, 61 and 62 (Fig. 1) to an operating shaft 64 rotatably mounted in the work support 54 and having means, such as a hand

wheel 65 or any suitable power means, by which it may be rotated.

The gears 60, 61 and 62 are change gears, and the gear 61 is mounted on a swinging support 66 (Fig. 3) which may be swung toward or away from the spindle 52 to cause gears 60 and 61 of different sizes to be operatively engaged. The support 66 may be retained in adjusted position by a clamping screw 67 (Fig. 3).

A spacing collar 68 is provided on the chuck spindle 52, and the gear 60 and collar 68 may be interchanged when compound gearing is necessary to secure a desired ratio.

A two-to-one ratio between the revolutions of the operating shaft 64 and of the chuck spindle 52 is required for two-flute taps and may be easily attained by simple gearing, but compound gearing is usually desirable for the three-to-one or four-to-one reductions required when grinding three-flute or four-flute taps.

I obtain the desired oscillating movement of the work support 54 by providing the left-hand end of the operating shaft 64 (as viewed in Fig. 1) with a disc 70 fixed thereon and carrying a pair of adjusting screws 71 (Fig. 6). A second disc 72 (Fig. 1) is secured to the disc 70 by a pivot screw 74 (Fig. 6) and also by a clamping screw 75 extending through a slot 76 in the disc 70. Angular adjustment of the disc 72 relative to the disc 70 is effected by engagement of the screws 71 with the shank of the screw 75.

The outer and adjustable disc 72 has a pivot stud 80 mounted therein and connected by a link 81 (Fig. 1) to a fixed pivot stud 82 in a post or stand 83 (Fig. 3) mounted on the work ahead 40. By adjustment of the disc 72, the pivot stud 80 may be thrown off center with respect to the axis of the disc 70 and the operating shaft 64.

When the shaft 64 is subsequently rotated, the pivot stud 80 will have an eccentric motion and will react against the link 81, which is mounted on a fixed pivot. This will thus produce a limited oscillating or swinging movement of the work support 54. The amount of this movement is determined by the adjustment of the disc 72 by the screws 71, and the eccentricity is shown by graduations on the disc 70 (Fig. 1) relative to an index mark on the disc 72. Each space on the scale will commonly indicate 0.003'' relief.

Through the described mechanism, the chuck spindle 52 is moved toward and from the grinding wheel in timed relation to its rotation. The change gearing is so selected as to swing the chuck 50 and tap T toward the wheel for backing-off action each time a land is being ground, and to swing the tap away from the wheel as each space *a* (Fig. 5) between two lands passes the grinding point.

In order that the backing off or relieving shall be accurately correlated to the lands, I provide the tap setting device shown in Figs. 1 and 5. This device comprises a gauge or stop 90 mounted in the end of a plunger 91 axially movable but non-rotatable in a supporting bar 92 slidably mounted on the work support 54 and held in desired position by a clamping screw 93 (Fig. 1).

When a tap T (Fig. 5) is inserted in the chuck 50, the plunger 91 is pushed inward so that the cutting edge of a land may be pressed against said stop or gauge. At the same time the shaft 64 is turned to bring an index line *b* (Fig. 8) in line with an index plate 94 on the work support 54, the tap T being then at its point of farthest removal from the wheel W.

After the tap is clamped in its adjusted position, the plunger 91 is released and the gauge 90 moves back where it will not be engaged by the tap during subsequent rotation thereof. The grinding wheel W is then moved forward by the cross feed screw 30 to produce the desired amount of chamfer and the chamfering and relieving operation is then performed as described.

It is at times desirable to support a tap on centers during the chamfering operation, instead of holding the tap in a chuck, and for this purpose I provide the attachment shown in Fig. 7. This comprises an arm 100 supporting a tail center 101 and fixed on a rod 102 which is slidable in the work support 54 and may be secured in adjustment position therein by a binding screw 103.

The rod 102 is preferably keyed in the support 54 so that the center 101 will be held in axial alignment with a second center 104 held in the draw back chuck. The tap T' may be caused to rotate with the chuck and chuck spindle by a dog 105 engaging a suitable notch or projection in the end of the chuck or chuck spindle.

It occasionally happens that the lands of a tap are irregularly spaced angularly, and in such a case the tap may be accurately ground by resetting the tap by means of the stop or gauge 90 before each land is ground.

It will be evident from the foregoing description that my improved machine, while of very simple construction, is well adapted for its intended purposes and that it is also very easily set and adjusted for chambering taps having widely differing characteristics. The machine may also be used for other and somewhat general purposes.

Having thus described my invention and the advantages thereof, I do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claims, but what I claim is:

1. A grinding machine comprising a grinding wheel, means to rotate said wheel in a defined position, a support for the work mounted to swing about an axis parallel to the axis of rotation of the work, a shaft mounted in said work support and connected to rotate the work, a link connecting an eccentric element on said shaft to a fixed pivot to give the work a predetermined number of swinging movements about said axis parallel to the axis of rotation of the work and toward and from the grinding surface of the wheel during each revolution of the work, and means to vary the amount of eccentricity of said eccentric element relative to the axis of said shaft.

2. A tap chamfering machine comprising a grinding wheel supported in a definite position, means to rotate said wheel, a work support in which the tap is rotatably mounted, means to mount said support for swinging movements about an axis parallel to the axis of rotation of the tap, means to rotate the tap, and means to give the work support a number of oscillations about said axis parallel to the axis of rotation of said tap and toward and from the grinding surface of the wheel during each revolution of said tap, said oscillations being equal in number to the lands of the tap, and said latter means including a stud having an eccentric motion about an axis in said work support parallel to the axis of rotation of the tap and rotated in fixed speed relation to the rotation of the tap, and a link connecting said stud to a fixed pivot.

FRANKLIN JUDGE.