July 13, 1965 W. H. PFISTER 3,193,859

THREAD TAPPING DEVICE ROTATABLE BY RECIPROCATING PRESS

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FIG. 1

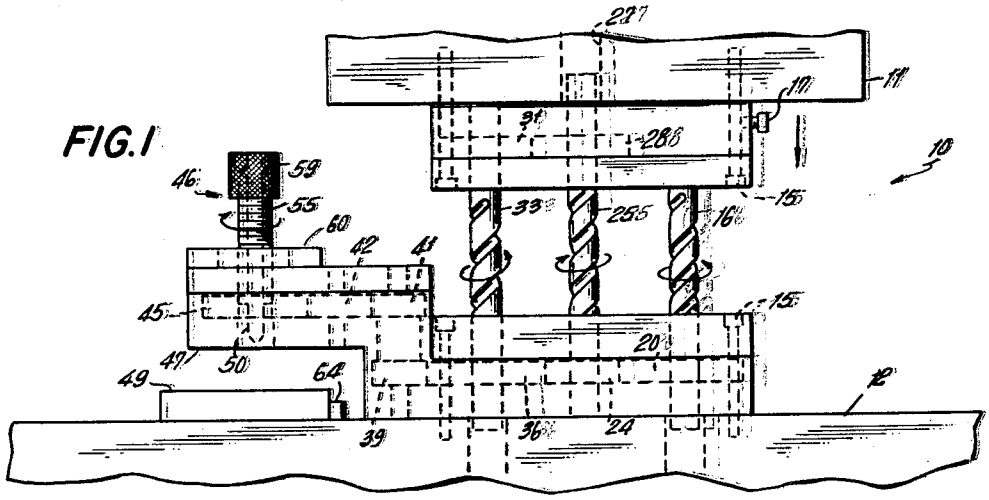
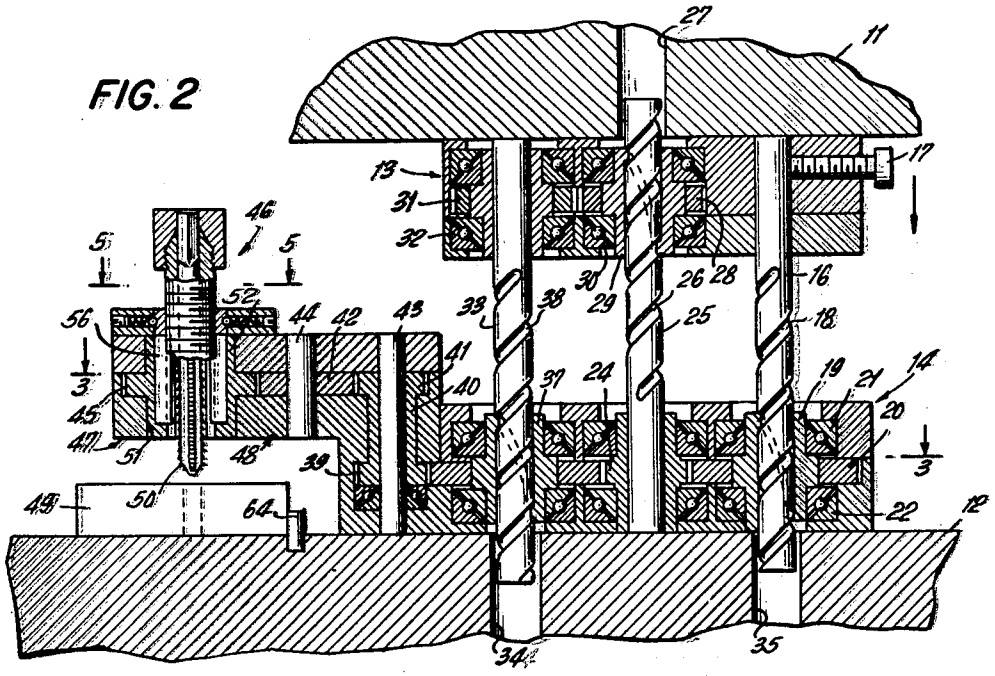


FIG. 2



INVENTOR.
WILLIAM H. PFISTER

BY Albert F. Ronman

ATTORNEY

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FIG.3

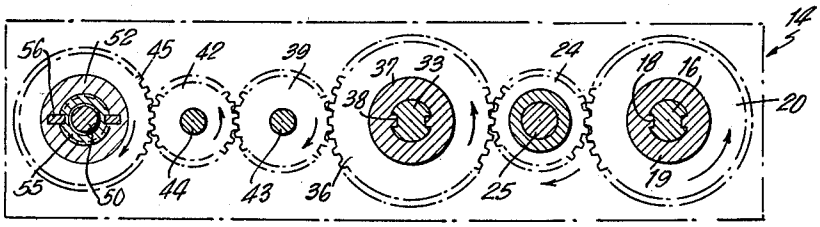


FIG.4

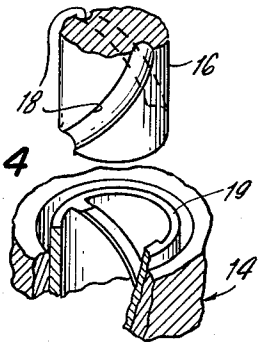


FIG.5

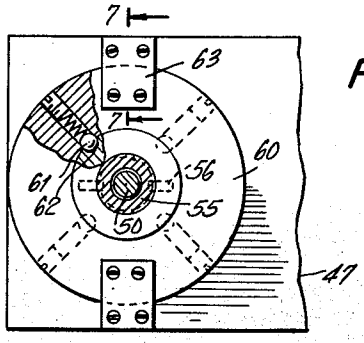


FIG.6

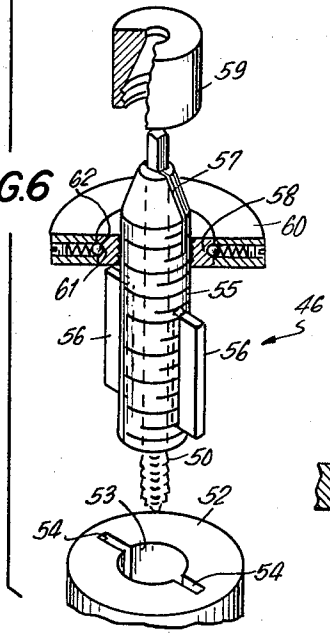


FIG.7

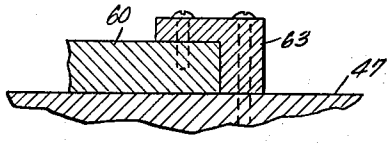
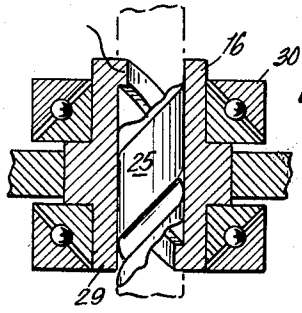


FIG.8



INVENTOR.
WILLIAM H. PFISTER
BY Albert T. Kronman
ATTORNEY

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THREAD TAPPING DEVICE ROTATABLE BY RECIPROCATING PRESS

William Henry Pfister, 179 McClellan Ave., Livingston, N.J.

Filed July 13, 1962, Ser. No. 209,730
5 Claims. (Cl. 10—138)

This invention relates to a thread tapping device and particularly to an attachment for a punch press which will permit a work part to be tapped while in the press.

Where work parts are being fabricated by punch presses or machines having a substantially reciprocal movement it is often desired to perform tapping operations. Since tapping requires essentially a circular movement of the tap a different machine is required.

Certain prior art devices have secured motor driven taps to the press. However, these mechanisms have been cumbersome and fail to meet the need for a drive which is press driven.

Accordingly, it is an object of the present invention to provide a tapping attachment which will convert the reciprocating motion of a punch press or the like into rotary tapping motion.

Another object of the present invention is to provide a tapping attachment which will withstand the high speeds and impact of a punch press.

Still another object of the present invention is to provide a tapping attachment which can be operated without removing the work part from the press.

An object of the present invention is to provide a thread tapping attachment which is capable of accepting a wide variety of taps.

A feature of the present invention is its use of series of lead screws and gears to convert reciprocating motion into rotary motion.

Another feature of the present invention is its tap receiving chuck for rapid and easy insertion and removal of taps.

A further feature of the present invention is its even distribution of forces over the entire structure to improve its useful life.

The invention consists of the construction, combination and arrangement of parts, as herein illustrated, described and claimed.

In the accompanying drawings, forming a part hereof there is illustrated one form of embodiment of the invention, in which drawings similar reference characters desigate corresponding parts and in which:

FIGURE 1 is a view in side elevation of a thread tapping attachment according to the present invention with certain internal parts shown in dashed lines.

FIGURE 2 is a view in vertical section of the attachment shown in FIGURE 1, somewhat enlarged.

FIGURE 3 is a section taken on line 3—3 in FIGURE 2, looking in the direction of the arrows.

FIGURE 4 is a fragmetary isometric view of a portion of a lead screw and gear according to the present invention.

FIGURE 5 is a section taken on line 5—5 in FIGURE 2, looking in the direction of the arrows.

FIGURE 6 is a somewhat exploded view partially broken away of the tap receiving chuck according to the present invention.

FIGURE 7 is a fragmentary view taken on line 7—7 in FIGURE 5, looking in the direction of the arrows.

FIGURE 8 is a fragmentary view partially in vertical section of a lead screw and gear in the assembled position.

Referring to the drawings, and particularly to FIGURES 1 and 2, 10 indicates a thread tapping attachment

having an opposed top plate 11 and a bottom plate 12. A top gear block 13 is secured to the top plate 11 and a bottom gear block 14 is secured to the bottom plate 12. The gear blocks are attached to the plates by screws 15.

A first lead screw 16 is secured to the top gear block 13 by some suitable means such as the set screw 17 shown in FIGURE 2. The lower portion of the lead screw 16 is provided with a helical groove 18 which engages a helically splined bushing 19, carried within the bottom gear block 14.

The bushing 19 is fitted into a first gear 20 which is freely carried within the bottom gear block 14 upon ball bearings 21, 22. It will be apparent that vertical motion of the first lead screw 16 will rotate the bushing 19 and first gear 20 within the gear block 14.

The first gear 20 is in mesh with a second gear 24 freely carried within the bottom gear block 14. The second gear 24 has, axially secured therein a second lead screw 25. The second lead screw 25 is helically grooved as indicated at 26 and extends upwardly from the bottom gear block 14 in the direction and through the top gear block 13. The top plate 11 is bored as indicated at 27 to permit the second lead screw 25 to pass therethrough when the gear blocks are brought together.

A third gear 28 having an internally splined bushing 29 therein is drivably coupled to the second lead screw 25 and freely carried within the top gear block 13 by ball bearings 30.

Motion imparted to the third gear 28 is transferred to a fourth gear 31 with which the third gear is in mesh. The fourth gear 31 is freely carried within the top gear block 13 by ball bearings 32. The fourth gear 31 also has axially secured thereto a third lead screw 33 which extends downwardly in the direction of the bottom gear block 14. As shown in FIGURE 2 and in dashed lines in FIGURE 1, the bottom plate 12 is bored as indicated at 34 and 35 to permit the first and third lead screws to pass therethrough. The third lead screw 33 serves to drive a fifth gear 36 by way of a splined bushing 37 therein and the helical groove 38 in the third lead screw 33.

The fifth gear 36 is in mesh with a small pinion gear 39 which is formed on the end of an arbor 40. A second pinion gear 41 is formed on the opposite end of the arbor 40 and is in mesh with an idler gear 42. The arbor 40 and idler gear 42 are journaled on shafts 43, 44, respectively, which are carried within the bottom gear block 14.

The idler gear 42 is in mesh with a gear 45 to which the tap receiving chuck is secured.

The chuck receiving extension 47 is bored as indicated 6 and 7, is carried within an extension 47 of the bottom gear block 14. The extension 47 is cut away as indicated at 48, so that a work part 49 may be slid below the tap 50.

The chuck receiving extension 47 is bored as indicated at 51 to receive a cylindrical member 52 and the gear 45 secured thereto. The cylindrical member 52 is axially bored as shown at 53 in FIGURE 6 and provided with opposed longitudinal splines 54 which communicate with the bore 53.

The tap 50 is held within a tap holder 55, which is provided with laterally extending key members 56. The key members 56 are slidably received within the opposed splines 54 in the cylindrical member 52. The top of the tap holder 55 is slit as shown at 57, and the end of the tap 50 extends through the tap holder 55 at the slit portion. The top of the tap holder is threaded to receive an internally threaded adjusting ring 58 and a locking nut 59.

The adjusting ring 58 permits the tap 50 to be located within the device at the proper distance above the bottom plate 12 to prevent tap damage. The locking nut 59 secures the tap within the tap holder 55 when it is tightened down upon the top of the holder. Tapers on the outside

of the holder 55 and inside of the nut 59 compress the tap holder 50 about the slits 57.

The adjusting ring 58 is held within a collar 60 by means of spring loaded ball-bearings 61. The ball-bearings 61 are urged into a peripheral socket 62 in the adjusting ring 58 to accomplish a coupling arrangement which is secure enough to permit the tapping operation and yet will enable the operator to pull the tap out of the chuck quickly so that other sizes of taps may be inserted therein. The collar 60 is secured to the top of the bottom gear block extension 47 by means of brackets 63 as shown in FIGURES 5 and 7.

When it is desired to operate the thread tapping device described herein, the attachment is secured within a punch press or suitable device in the position shown in FIGURES 1 and 2. Thereafter, the tap 50 of a desired size is slipped into the tap holder 55 and with the adjusting ring 58 properly spaced from the bottom thereof, the tap holder and adjusting ring are snapped into place within the collar 60. The work part 49 is slipped beneath the tap 50 and preferably against some positioning stop such as the one shown at 64 in FIGURE 2.

When the press is set in motion, the top plate 11 will be driven toward the bottom plate 12 and the lead screws 16, 25, 33, will convert the reciprocal motion of the press into rotary motion of the tap by way of the gear train to which they are coupled. The lead screw 16 will drive the first gear 20 as it is forced down by the top plate 11. The gear 20 which is in mesh with the second gear 24 will drive the second gear which in turn will impart its rotary motion to the second lead screw 25. As the second lead screw turns it will drive the third gear 28 carried in the top gear block 13 which in turn will rotate the fourth gear 31 with which it is in mesh. The fourth gear 31 will turn the third lead screw 33 which will drive the fifth gear 36 rotatably carried within the bottom gear block 14. The manner in which the lead screws are coupled to the gears by means of the splines is best illustrated in FIGURES 4 and 8. The gear train and the respective motion imparted thereto within the bottom gear block 14 is best shown in FIGURE 3.

The fifth gear drives the pinion gears 39, 41, which in turn impart their motion to the idler gear 42 and to the chuck gear 45. As the chuck gear turns it carries with it the cylindrical member 52 which rotates the tap holder 55. The threads on the outside of the tap holder 55 have the same pitch as the tap 50. As the tap holder 55 is rotated, therefore, the tap 50 will be fed down into the work part 49 by the internal threads on the adjusting ring which thus acts as a feed nut to provide the proper tapping motion. By reason of the gear train the very rapid motion of the press is translated into a substantially slower rotary motion of the tap which will permit the threads to be cut without tap damage.

From the foregoing it will be seen that there has been provided a thread tapping attachment for punch presses and other similarly reciprocated machines which will translate the reciprocal motion into rotary motion and permit the tapping of threads within such machines with great accuracy, speed, and long tap life. In addition, the spaced disposition of the lead screws provide a rigid support for the opposed gear blocks 13, 14, and insure the alignment of the various elements of the attachment within the press. A wide variety of taps can be substituted in the attachment with a minimum amount of difficulty and with a very small requirement of time.

In the event the tap strikes an obstruction or bottoms within the hole to be tapped, the adjusting ring 58 will be forced upwardly past the ball bearings 61 to prevent tap damage.

Having thus fully described the invention, what is claimed as new and desired to be secured by Letters Patent of the United States, is:

1. A tapping attachment for a punch press or the like comprising a top plate, a bottom plate opposite the top plate, means to reciprocate the top plate with respect to the bottom plate, a top gear block secured to the top plate, a bottom gear block secured to the bottom plate, a gear train carried within each of the gear blocks, a helically grooved first lead screw secured at one end to the top gear box and extending therefrom, a first helically splined bushing carried within the bottom gear box in driving engagement with the first lead screw, a first gear within the bottom gear train around the first bushing and secured thereto, a second gear within the bottom gear train in mesh with said first gear, a second helically grooved lead screw secured at one end to the second gear and extending outwardly thereof toward the top gear block, a second helically splined bushing within the top gear block in driving engagement with the second lead screw, a third gear within the top gear train around the second bushing and secured thereto, a fourth gear within the top gear train in mesh with the third gear, a third helically grooved lead screw, secured at one end to the fourth gear and extending outwardly thereof toward the bottom gear block, a third helically splined bushing within the bottom gear block in driving engagement with the third lead screw, a fifth gear around the third bushing and secured thereto, an extension on the bottom gear block, a pinion gear member within the extension in mesh with the fifth gear, a tap receiving chuck assembly carried by the extension, a chuck gear in the chuck assembly, a feed nut in said chuck assembly for advancing the chuck toward a work part, a speed reducing gear train interconnecting the pinion gear member and chuck gear, whereby rapid reciprocation of the top and bottom plates toward and away from each other will be translated in rotation of the chuck assembly at a suitable tapping speed.

2. An attachment according to claim 1 which the tap receiving chuck comprises a cylindrical member, an externally threaded tap holder slidably received within the cylindrical member, an internally threaded adjusting ring, threaded upon the external threads of the tap holder and means to secure the adjusting ring to the bottom gear box.

3. An attachment according to claim 1 in which the tap receiving chuck comprises a longitudinally splined cylindrical member, an externally threaded tap holder at least one laterally extending key in the tap holder slidaby received within the cylindrical member spline, an internally threaded adjusting ring, threaded upon the external threads of the tap holder and means to secure the adjusting ring to the bottom gear box.

4. An attachment according to claim 1 in which the tap receiving chuck comprises a cylindrical member, an externally threaded tap holder slidably received within the cylindrical member, an internally threaded adjusting ring, threaded upon the external threads of the tap holder and means including a collar, spring loaded ball bearings communicating, with the inside diameter of the collar and a peripheral groove in the adjusting ring to partially receive the ball bearings to secure the adjusting ring to the bottom gear box.

5. A tapping attachment for a punch press or the like comprising a top plate, a bottom plate opposite the top plate, means to reciprocate the top plate with respect to the bottom plate, a top gear block secured to the top plate, a bottom gear block secured to the bottom plate, a gear train carried within each of the gear blocks, a helically grooved first lead screw secured at one end to the top gear box and extending therefrom, a first helically splined bushing carried within the bottom gear box in driving engagement with the first lead screw, a first gear within the bottom gear train around the first bushing and secured thereto, a second gear within the bottom gear train in mesh with said first gear, a second helically grooved lead screw secured at one end to the second gear gear and extending outwardly thereof toward the top gear block, a second helically splined bushing within the top gear block in driving engagement with the second lead

screw, a third gear within the top gear train around the second bushing and secured thereto, a fourth gear within the top gear train in mesh with the third gear, a third helically grooved lead screw, secured at one end to the fourth gear and extending outwardly thereof toward the bottom gear block, a third helically splined bushing within the bottom gear block in driving engagement with the third lead screw, a fifth gear around the third bushing and secured thereto, an extension on the bottom gear block, a pinion gear member within the extension in mesh with the fifth gear, a tap receiving chuck assembly comprising a cylindrical member within the chuck gear, a tap holder slidably and non-rotatably received within the cylindrical member and an internally threaded adjusting ring threadably received upon the tap holder carried by the

extension, a chuck gear in the chuck assembly, a feed nut in said chuck assembly for advancing the chuck toward a work part, a speed reducing gear train interconnecting the pinion gear member and chuck gear, whereby rapid reciprocation of the top and bottom plates toward and away from each other will be translated in rotation of the chuck assembly at a suitable tapping speed.

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ANDREW R. JUHASZ, *Primary Examiner.*