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Birkestrand et al.

[11] **3,820,180**

[45] **June 28, 1974**

[54] **AUTOMATIC LEVER CONTROLLED DIE HEAD**

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[73] Assignee: **Collins Machinery Corporation,** Monterey Park, Calif.

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[21] Appl. No.: **349,324**

[52] **U.S. Cl.** ..... **10/94,** 10/96 R, 408/149, 408/177

[51] **Int. Cl.** **B23g 1/52,** B23g 5/12

[58] **Field of Search** ..... 10/96 R, 97, 94, 95, 120, 10/121; 408/148, 149, 174–178

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Primary Examiner—Charles W. Lanham
Assistant Examiner—E. M. Combs
Attorney, Agent, or Firm—William W. Haefliger

[57] **ABSTRACT**

A work threading tool includes a lever movable between an operating position in which thread chasers are advanced to work threading position and release position in which the chasers are in retracted position; and trip mechanism operatively connected with the lever to respond to predetermined relative endwise travel of the threaded work to effect automatic displacement of the lever from operating to release position and consequent retraction of the chasers.

3 Claims, 8 Drawing Figures

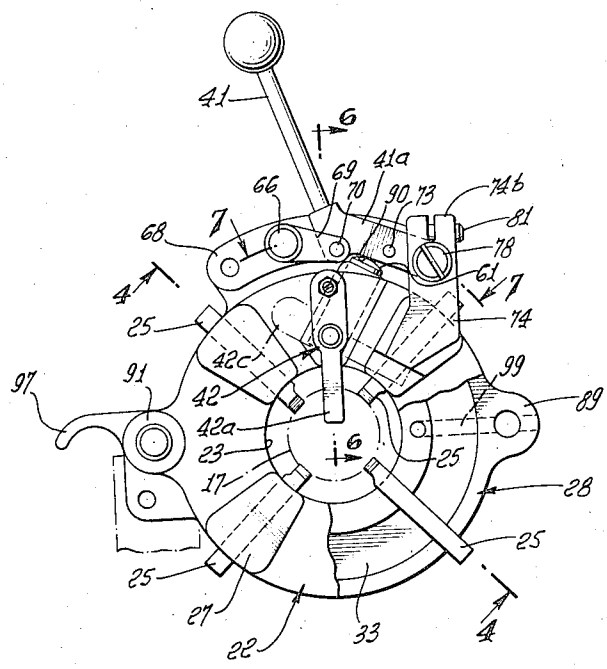

FIG. 1.

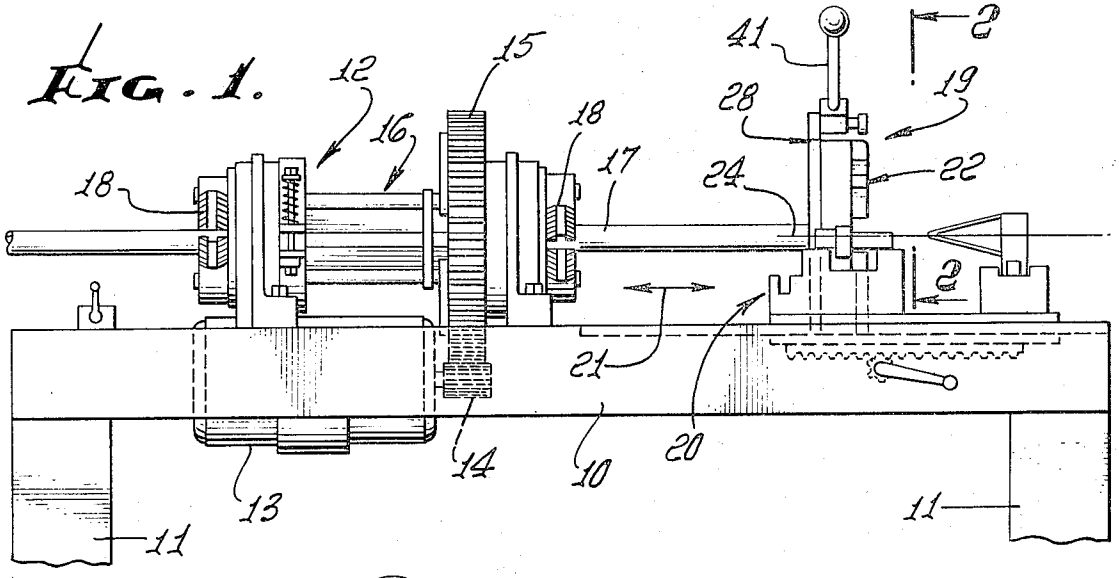
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FIG. 2.

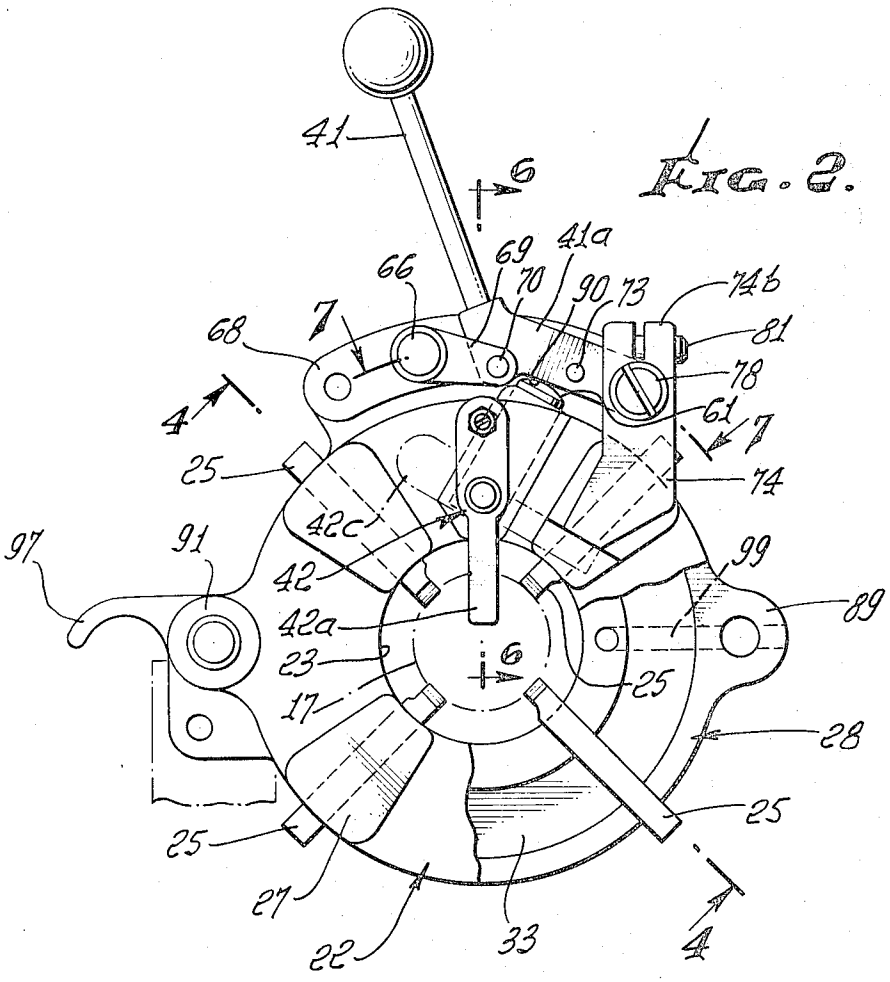
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FIG. 3.

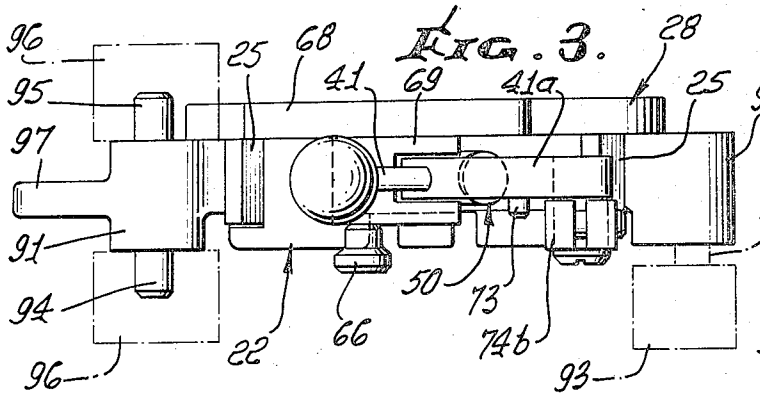

FIG. 4.

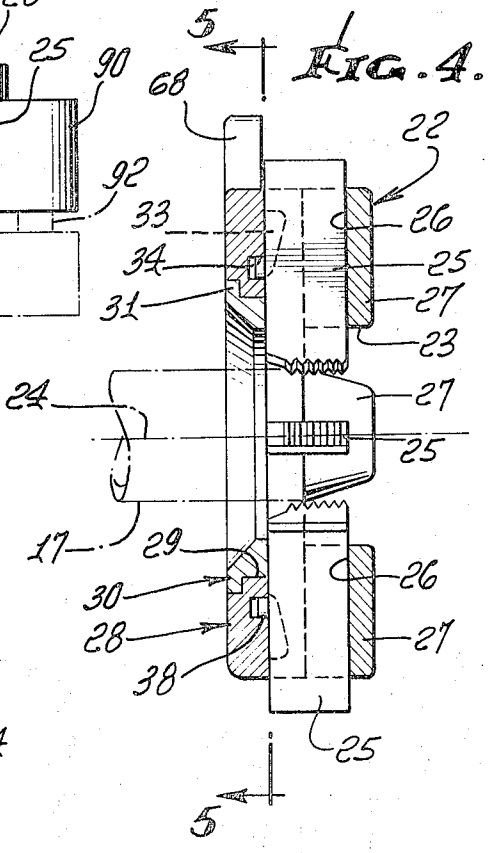

FIG. 5.

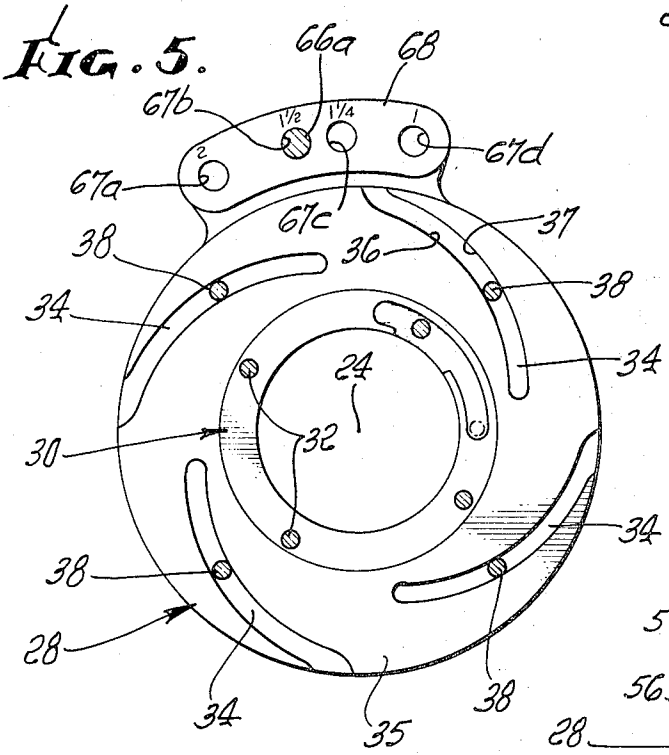

FIG. 6.

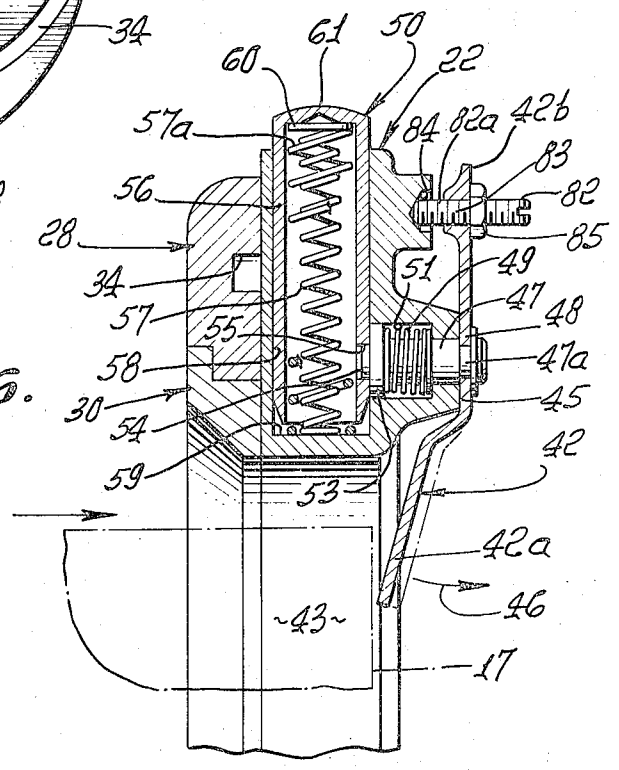

FIG. 8.

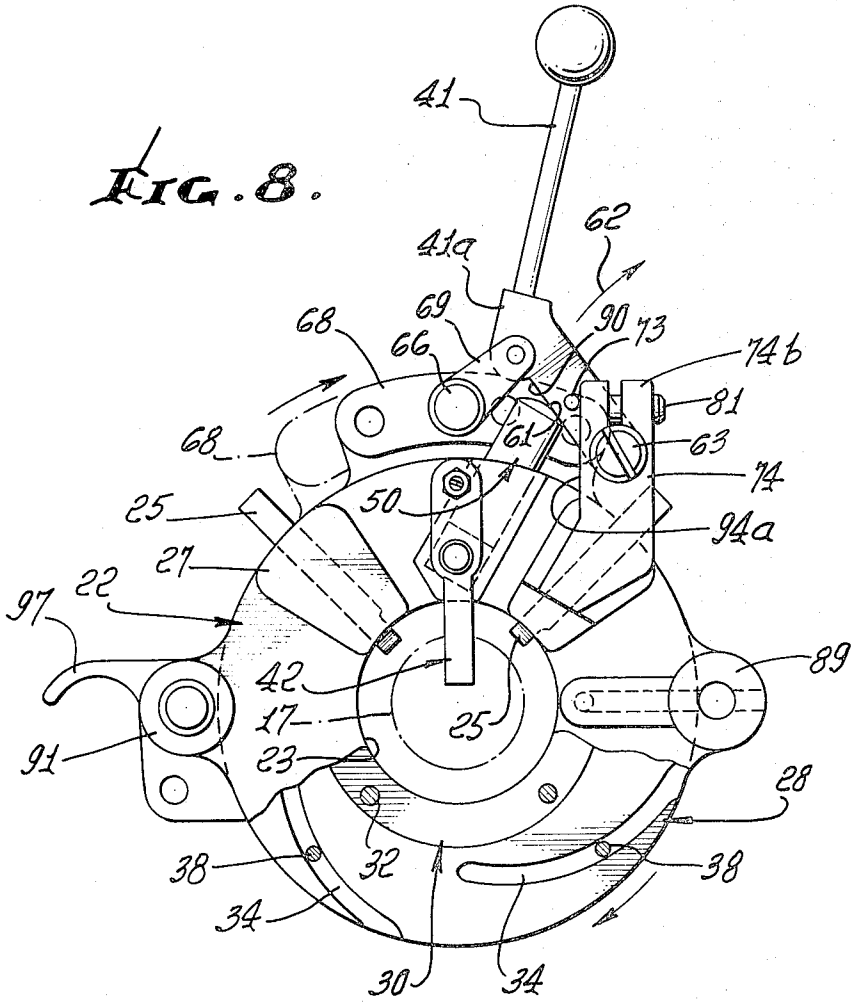
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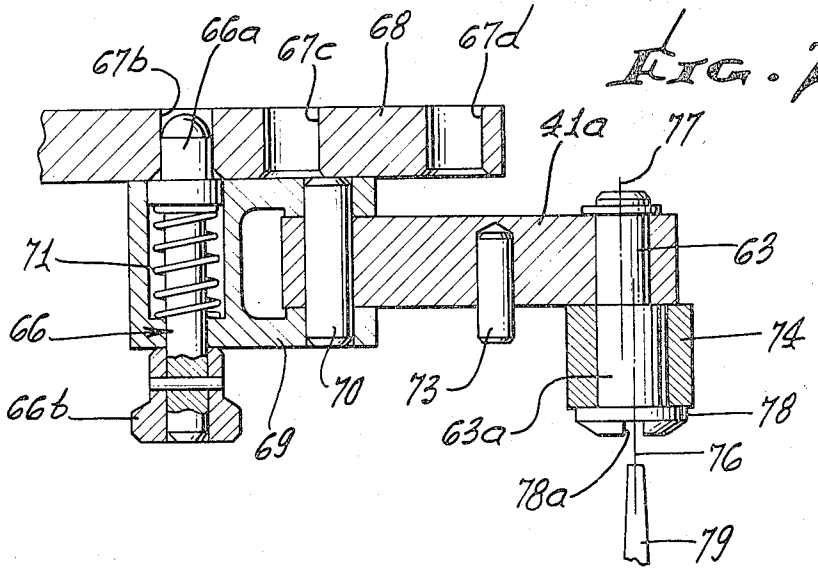
FIG. 7.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AUTOMATIC LEVER CONTROLLED DIE HEAD

BACKGROUND OF THE INVENTION

This invention relates generally to apparatus for cutting threads of different sizes on work such as pipe. More particularly it concerns inprovements in the indexing or adjusting of thread chasers to cut different sized threads on rotating pipe, and the automatic release of such chasers when threading is completed.

Threading of pipe ends or the like is typically carried out while the pipe is clamped and rotated. U.S. Pat. No. 3,274,627 to Behnke describes apparatus for accomplishing such threading; however there is need for improvement in indexing of the thread cutting chasers and for automatic retraction of the chasers when a desired thread length has been cut. There is also need for the unusual improvements in structure, mode of operation and results as are now afforded by the present invention.

SUMMARY OF THE INVENTION

It is a major object of the invention to provide means to meet the above needs, and also to overcome additional problems encountered in the field of the invention. Basically, a work threading tool embodying the invention comprises first and second generally annular and axially relatively rotatable members, one of which carries thread chaser means to be advanced toward and retracted from work received generally axially of the members; operating means interconnecting the members and including a manually operable lever movable between an operating position in which the members are relatively moved to advance the chasers to work threading position, and release position in which the members are relatively moved to retract the chasers; and trip mechanism operatively connected with the lever to be responsive to travel of the threaded work to predetermined position relative to the body and housing members to effect automatic displacement of the lever from operating to release position. As a result, the chasers are automatically retracted from the work. As will be seen, the trip mechanism may include a trigger projecting into work engaging alignment with a work receiving opening defined by the members, and a trigger controlled lever actuator movable to displace the lever to release position in response to predetermined displacement of the trigger by the work.

Additional objects include the provision of a spring urged plunger to be released when the trigger is engaged and displaced by the work, the plunger urging the manually operable lever to release position; the adjustable connection of the manually operable lever with the body member so as to define different thread chaser positions corresponding to different thread diameter to be cut when the lever is in operating position; the provision for fine adjustment of lever connection to the housing member to in turn provide for fine control of chaser positioning; the provision for adjustment of trigger positioning in the direction of work relative travel; and provision for movement of the trigger out of the path of the work to allow continuous threading.

These and other objects and advantages of the invention, as well as the details of an illustrative embodiment, will be more fully understood from the following description and drawings.

DRAWING DESCRIPTION

FIG. 1 is a side elevation showing apparatus for mounting and rotating a pipe, together with the apparatus for precision threading the pipe in accordance with the invention;

FIG. 2 is an enlarged elevation, partly broken away, taken on lines 2—2 of FIG. 1;

FIG.3 is a top plan view of the FIG. 2 apparatus;

FIG. 4 is a section on lines 4—4 of FIG. 2;

FIG. 5 is a section on lines 5—5 of FIG. 4;

FIG. 6 is an enlarged fragmentary section on lines 6—6 of FIG. 2;

FIG. 7 is an enlarged fragmentary section on lines 7—7 of FIG. 2; and

FIG. 8 is a view like FIG. 2 but showing the thread chasers in retracted position.

DETAILED DESCRIPTION

Referring first to FIG. 1, the apparatus for mounting and rotating the pipe includes a table 10 supported on suitable legs 11, and carrying a drive generally indicated at 12. The latter includes an electric motor 13 driving a pinion gear 14, which in turn drives a large ring gear 15 which is supported for rotation by the structure 16. A pipe to be threaded is shown at 17 extending generally horizontally through the drive 12 to be gripped by suitable jaws 18 at opposite ends of the drive, and in response to rotation of the ring gear 15, there being suitable camming mechanism, not shown, to cause the jaws 18 to pivot inwardly to grip the pipe when the drive is operated.

Coming now to the subject matter with which the invention is particularly concerned, the assembly shown generally at 19 may be characterized as pipe threading apparatus mounted on a suitable carrier 20 which may be movable endwise along the table 10 as indicated by the arrows 21. As better seen in the remaining figures, the assembly 19 includes an annular housing member 22 forming a through opening 23 to receive the pipe 17 extending generally horizontally for rotation about the first axis 24. Thread chaser means such as thread chaser units seen at 25 is carried by the housing member and disposed about the axis 24 for cutting presentment to the pipe, as illustrated in FIGS. 2 and 8. The chaser units are shown as received within radial slots 26 cut in the bosses 27 which appear in FIG. 2. These slots 26 open toward the front side of the housing facing an annular body member 28 which likewise forms a pipe-receiving through opening 29 in registration with the housing opening 23.

The body member 28 is rotatable about the axis 24 while it is retained in the position shown in FIG. 4 by the housing member 22 and the retaining ring 30, a flange 31 of the latter overlapping the body member 28 at the forward side thereof. The ring 30 is in turn fastened to the housing 22 as by suitable fasteners 32 extending parallel to the axis 24. Frictional resistance to rotation of the body member 28 is reduced by relieving the face of the housing member at the annular location 33.

The body member 28 carries a series of cams spiraling about the axis 24 and located to effect simultaneous inward advancement, or outward retraction, of the chaser units 25 upon relative rotation of the body and housing members. For example, as seen in FIG. 5, the cams are formed by the spiral grooves 34 cut in the face

35 of the body at equal intervals about axis 24, the inner and outer shoulders 36 and 37 being adapted to have camming engagement with pins 38 which are integral with the chaser units 25. As viewed in FIG. 5, the pins 38 are in intermediate position, corresponding to the positions of the units 25 in FIG. 2 for threading pipe 17. When the pins 38 are outwardly retracted by the cams, the chaser units 25 are likewise retracted as, for example, is illustrated in FIG. 8.

In accordance with the invention, operating means operatively interconnects the housing and body members, and includes a manually operable lever 41 movable between an operating position, as for example is seen in FIG. 2 in which the members 22 and 28 have been relatively moved to advance the chasers 25 to work threading position, and release position, as for example is seen in FIG. 8 in which the members 22 and 28 have been relatively moved to retract the chasers from work threading position. Further, trip mechanism is operatively connected with the lever to be responsive to endwise travel of the threaded work 17 to predetermined position relative to the members to effect automatic displacement of the lever from operating to release position.

In the example seen in the drawings, the trip mechanism may with unusual advantage include a trigger 42 projecting at 42*a* into work engaging alignment with a work receiving opening 43 defined by the members 22 and 28; in addition a trigger controlled lever actuator is movable to displace the lever 41 in response to predetermined displacement of the trigger by the work. The trigger 42 may comprise another lever having pivotal connection with the member 22 to be swingable in the general direction of the axis 24 (i.e. in the direction of arrow 46) in response to endwise travel of the work following initial engagement of the work with the trigger. Such pivotal connection may advantageously include a shaft 47 having a reduced portion 47*a* to which the trigger fulchrum portion 48 has loose connection, and a spring 49 on the shaft acting to yieldably urge the fulchrum portion 48 toward face 45 of member 22. Further, the fulchrum portion 48 of the trigger is bodily movable away from the face 45 in response to trigger swinging, thereby to release a trigger controlled lever actuator 50 which is then movable to displace the manual lever 41 to released position, as described.

Spring 49 is shown as received on a portion of shaft 47 projecting within a bore 51 in housing member 22. When the shaft 47 is urged to the right in FIG. 6, in response to trigger displacement away from face 45, the spring is compressed by a washer 53 on the shaft. Such shaft movement displaces a catch 54 on the left end of the shaft from a notch 55 in the actuator plunger sleeve 56, allowing springs 57 and 57*a* within the plunger to displace it endwise outwardly, relative to guide bore 58 formed in member 22, the opposite ends of the springs bearing against bore internal shoulder 59 and a washer 60 within the sleeve. Such plunger movement causes the outer nose end 61 of the plunger (in the shape of a convex bearing) to displace the manual lever inner extension 41*a* outwardly, as indicated by arrow 62 in FIG. 8. Note that the manual lever extension is pivotally connected at 63 to a boss 74 integral with member 22, and has a bearing surface 90 slidably engaged by the nose 61. Note also that the shaft 47 and housing 22 block access of work chips to actuator 50.

The operating means interconnecting the housing and body members 22 and 28 also includes structure connected with the lever, and selectively connectible with the body member 28 to control the extent of the thread chaser advancement when the lever is moved to operating position, as seen in FIG. 2. Such structure may, with unusual advantage, include a selector pin, as for example is seen at 66 in FIG. 7, a series of holes at 67*a*–67*d* in flange 68 on body 28 to selectively receive the pin nose 66*a*, the holes being spaced about axis 24, and a link 69 carrying the pin and pivotally connected (as by pin 70) with the lever extension 41*a*. The pin 66 includes a knob 66*b* which may be retracted to withdraw the nose 66*a* from any of the holes 67*a*–67*a* against yieldable resistance imposed by spring 71, to allow sufficient relative rotation of the body member 28 for insertion of that pin into another of the holes which is selected in accordance with the desired diameter of the thread to be cut by the chasers. Merely as illustrative, the holes 67*a*–67*a* in FIG. 5 are designated to correspond to thread diameters 2 inch, 1½ inch, 1¼ inch and 1 inch, respectively. Note that when the lever is moved from retracted to advanced position, the member 28 is rotated about axis 24 relative to member 22, to advance the chasers radially inwardly to selected extent for thread cutting. Upon trigger operation to release the lever, as described, the lever retracts to the position as seen in FIG. 8, wherein a stop pin 73 engages a side 94*a* of boss 74 projecting from housing member 22 to limit upward retraction of the lever 41.

Fine control of relative rotation of the members 22 and 28, and consequently of thread chaser advanced positioning, may also be provided, in accordance with a further aspect of the invention. For this purpose, extension 63*a* of pin 63 extends eccentrically relative to that pin, i.e. the axis 76 of extension 63*a* being offset from the axis 77 of pin 63. Further, extension 63*a* is rotatable in the boss 74, as by turning the adjustment head 78 (notched at 78*a* to receive a tool 79), whereas pin 63 is turnable in the lever extension. As a result, rotary adjustment of head 78 achieves fine control adjustment of members 22 and 28, in operating position of the lever 41, and once the correct adjustment is obtained, it is fixed as by tightening screw 81 which clamps the bifurcated arms 74*b* of the boss about the extension 63*a*.

With further regard to the trigger mechanism, adjustable means is provided to preliminarily locate the trigger to be initially engaged by the work. As seen in FIG. 6, such adjustable means may include a fastener 82 having threaded connection at 83 with an extension 42*b* of the trigger, the end 82*a* of the fastener bearing in a socket 84 in the housing 22. Rotation of the fastener displaces the opposite projecting end 42*a* of the trigger lever in an axial direction, to locate it axially for engagement by the work. A nut 85 is tightenable to lock the fastener 82 against rotation relative to the lever, at a selected trigger adjusted position. It will also be noted that the trigger is rotatable about the axis of shaft 47, following sufficient retraction of fastener 82, to carry the trigger extent 42*a* out of alignment with the work 17 and opening 43, for example to the stored position seen in broken lines 42*c* in FIG. 2. This allows continuous threading of the work, without interruption by the trigger.

Finally, means is provided for releasably mounting the assembly **19** so that the lever **41** projects upwardly in all positions thereof as well as all adjusted positions of members **22** and **28.** Thus, the housing member **22** is provided with lugs **89** and **91** projecting at opposite sides thereof to transmit the weight of the assembly. Lug **89** carries a pin **92** releasably received into a bore opening in upright **93** of structure **20.** Lug **91** carries two oppositely projecting pins **94** and **95** adapted to seat downwardly against the uprights **96** of structure **20,** after first inserting pin **92** into the opening in upright **93.** For this purpose, a hand grip is provided at **97** to be integral with the lug **91** for lifting the heavy assembly about the pivot pin **92.** Accordingly, the assembly may be quickly removed from mounted condition in order to slip onto or off a long pipe projecting through the central openings found in the assembly. A lubricant duct appears at **99** in FIG. **2** in housing **22** to deliver a stream of lubricant to the work at the point of threading.

We claim:

1. In a work threading tool, the combination comprising

a. first and second generally annular and coaxially relatively rotatable members, and thread chaser means carried by one of the members to be advanced toward and retracted away from work received generally axially of said members in response to member relative movement in opposite rotary directions,

b. operating means operatively interconnecting said members and including a manually operable lever movable between an operating position in which the members are relatively moved to advance the chaser means to work threading position, and release position in which the members are relatively moved to retract the chaser means from work threading position, and

c. trip mechanism operatively connected with said lever to be responsive to relative travel of the threaded work to predetermined position relative to said members to effect automatic displacement of the lever from operating to release position and consequent retraction of the chaser means, said trip mechanism including a trigger projecting into work engaging alignment with a work receiving opening defined by said members, and a trigger controlled lever actuator movable to so displace the lever in response to predetermined displacement of the trigger by the work, the trigger being movable in the general direction of said axis in response to endwise travel of the work following initial engagement of the work therewith,

d. said trip mechanism including a shaft movable in said one member to effect said actuator movement in response to said trigger displacement by the work, said shaft and said one member at all times blocking access of work chips to said actuator, the shaft having an axis, the trigger also carried by the shaft for pivotal movement generally about the shaft axis and completely out of work engaging alignment with said opening to enable work threading without chaser retraction, there being a spring confined in a bore defined by said one member for urging a fulchrum portion of the shaft toward said one member to rock relative thereto, the trigger having a remote portion which projects relatively away from the work receiving opening and beyond the shaft axis, and adjustable means carried by said remote portion of the trigger to rock the trigger as aforesaid so as to adjust the location of the trigger axially relative to the work opening, said adjustable means located above said shaft axis and remotely from and above the level of said work opening.

2. The combination of claim **1** wherein the lever actuator comprises a spring urged plunger having a retracted position in which the trip mechanism blocks plunger advancement with the lever remaining in operating position, the plunger being releasable by the trip mechanism after said predetermined trigger displacement to release spring energy acting to transmit force via the plunger to the lever to displace the lever to release position.

3. The combination of claim **1** wherein the operating means includes structure connected with the lever and selectively connectible with the other of the annular members to control the extent of thread chaser advancement when the lever is moved to operating position, said structure including a pin, there being a series of holes in the other member to selectively receive the pin, the holes spaced about said axis, a link carrying the pin and pivotally connected with the lever, and an adjustable eccentric connection between the lever and said one member to provide a fine control of member relative rotation when the lever is in said operating position.

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