Fig. 1.

Fig. 9.

Inventor:
Howard N. Behnke

by White & Kafliger

Attorneys.
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H. N. BEHNKE

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UNIVERSAL SUPPORTING AND DRIVING APPARATUS
FOR PIPE SUBJECTED TO THREADING

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Inventor.
HOWARD N. BEHNKE
By WHITE & HAEFLIGER

ATTORNEYS.
UNIVERSAL SUPPORTING AND DRIVING APPARATUS FOR PIPE SUBMITTED TO THREADING

Howard N. Behnke, Monterey Park, Calif., assignor to Collins Machinework Corporation, Monterey Park, Calif., a corporation of California
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ABSTRACT OF THE DISCLOSURE

The disclosure concerns portable apparatus for centering and rotating workpieces, such as pipe to be threaded, and in which work gripping jaws have work release positions in which each jaw is elongated in a direction normal to an axial radial plane, the jaw being rotatable by a lever extending radially in that jaw position, the lever being spaced from the jaw.

This invention relates generally to apparatus for centering and rotating workpieces such as pipe to be threaded, cut or otherwise subjected to a forming operation. More specifically, it concerns improvements over the subject matter disclosed in my co-pending application Ser. No. 335,587 entitled, "Universal Supporting and Driving Apparatus for Pipe subjected to Threadin, filed Jan. 3, 1964 now Patent No. 3,270,592.

Basically, the improvements which are the subject of the present invention have to do with increasing the utility of work centering and rotating apparatus, and with the provision of portable apparatus of this character. Regarding utility, the invention makes possible the rotation of workpieces such as pipe in opposite directions without removing the pipe from between the work gripping jaws, while at the same time retaining the advantages of driving the jaws and workpiece as by means of links and levers in the manner to be described, overcoming the disadvantages of prior drives that include undesirable and expensive complexity.

As will be seen, the environment of the invention includes a carrier having a horizontal central axis of rotation, pivot members supported on the carrier to have pivot axes spaced about the central axis and parallel thereto, bearing structure supporting the carrier for rotation, levers operatively connected with the pivot members to simultaneously pivot such members, a drive including a drive rotor rotatable clockwise and counter-clockwise about the central axis, and links operatively connected with the rotor and levers to transmit rotary drive from the rotor to the levers and thereby pivot the pivot members. The improvement in this area comprises work gripping jaws integral with the pivot members and having work release positions in which each jaw is elongated in a direction substantially normal to a plane passing through the central axis and the axis of the pivot member integral with that jaw, the lever operatively connected with that pivot member then extending substantially radially with respect to the central axis, and the jaws having work gripping faces generally convex toward the central axis. Typically, each jaw has wings extending symmetrically on opposite sides of the pivot member integral with that jaw; each jaw has terminals spaced apart in the jaw elongation direction, the jaws being rotatable by the pivot members so that the jaw terminals define cylindrical loci overlapping pivot member axes, adjacent cylindrical loci overlapping, and each jaw face defines two parallel rows of serrations.

As regards portability, the invention affords the mounting of the drive apparatus as well as threading and reaming equipment upon a tripod base, in the unusually effective manner to be described. 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 detailed description of the drawings, in which:

FIG. 1 is a perspective view showing the complete portable apparatus;

FIG. 2 is a vertical section taken on line 2—2 of FIG. 1;

FIG. 3 is a perspective view of the hollow spindle or carrier;

FIG. 4 is a vertical section taken on line 4—4 of FIG. 2 and showing the jaws locked clockwise to grip work;

FIG. 5 is a view like FIG. 4, but showing the jaws locked counterclockwise to grip work;

FIG. 6 is an exploded perspective view of a jaw and its pivot member;

FIG. 7 is a view taken on line 7—7 of FIG. 2;

FIG. 8 is a view like FIG. 4, but showing the jaws in neutral or unlocked position; and

FIG. 9 is a section taken on line 9—9 of FIG. 3.

Referring to FIGS. 1 and 2, a housing 20 is shown as having a base 10 mounted on the table 11 of a tripod support 12 having legs 12 interconnected at 13 so as to be portable. The housing in turn supports internal annular bearings 14 and 15 respectively receiving left and right flanges 16 and 17 of a spindle or carrier 18. Retainer rings 19 and 20 carried by the housing engage the flanges to retain the carrier against endwise displacement within the housing.

The carrier has a horizontal central axis of rotation 21 and has a hollow bore 22 through which work such as the pipe 23 is insertible to be gripped, centered and rotated clockwise or counterclockwise, as will appear. Likewise, the end shrouds 24 of the housing have openings 25 to pass the work.

The carrier 16 supports parallel pivot members such as rods 26 having pivot axes 27 equally spaced at 90 degree intervals about the central axis 21, as better seen in FIG. 8. Like jaws 37 are attached to the extreme left and right ends of the pivot members, as by keys 28, thereby to define left and right jaw sets, the jaws at opposite ends of any pivot member remaining in axial alignment. Levers or cranks 30 are attached as by keys to the pivot rods or members 26 at a location intermediate the flanges 16 and 17 as seen in FIGS. 2 and 8, for simultaneously rotating the pivot members in response to operation of a drive assembly. The latter includes a drive rotor in the form of a ring gear 31 supported by and rotatable relative to the carrier 18 and about central axis 21. Links 32 are pivotally connected at 33 and 34 to the drive rotor and levers 30 to transmit rotary drive from the rotor to the levers thereby to pivot the pivot members 26. The drive may also be considered to include a reversible electric motor 35 driving a pinion 36 meshing with the ring gear as seen in FIG. 7.

In accordance with the invention, the jaws 37 have work release positions as seen in FIG. 8 in which each jaw is elongated in a direction substantially normal to an axial radial plane 38 passing through the central axis 21 and the axis 27 of the pivot member 26 integral with that jaw. Further, the lever 30 connected with pivot member 26 then extends substantially radially with respect to the central axis, in the sense that pivot connection 34 is also intercepted by the plane 38. As will be seen, this construction affords substantially equalized clockwise and counterclockwise force transmission to the jaws, and provides for sufficient rocking of the jaws in clockwise and counterclockwise sense as to enable gripping and centering of extremely small diameter workpieces. Note in this
regard, the additional advantage that the pipe 23 need not be axially withdrawn from the housing to enable over-center jaw adjustment to facilitate shifting from clockwise to counterclockwise driving or vice versa. The pipe may be left in place, and all that is required is a reversal of the direction of rotary driving gear 31, since the jaws for example shift from Fig. 4 to Fig. 5 configuration or vice versa, passing through the neutral or work release configuration as seen in Fig. 8. This need for reversal may arise for example after the user has inserted the pipe and he determines that a left-hand thread is to be cut rather than a right-hand thread. He need not, in other words, pre-adjust the jaws in accordance with the thread to be cut, before inserting the pipe.

More specifically, each jaw has two wings 37a extending symmetrically at opposite sides of the axis 27, and terminals 37b. The latter define cylindrical loci about the pivot member axis, adjacent loci 40 having overlapping relation as seen in Fig. 4. In this regard, the radii of the cylindrical loci 40 are substantially equal to the spacing of the pivot axes 27 from the central axis 21. The jaw faces 42 are generally convex toward the central axis 21 throughout their pivoting, and they each define two parallel rows 43 of serrations as seen in Figs. 2 and 6, a groove 44 separating those rows. The spindle or carrier 18 has a series of flats 46, one for each lever, to limit extreme pivoting of the levers at such time as the terminals 37b approach the central axis 21.

Pivoting of the jaws in response to rotation of the gear wheel is further facilitated by means frictionally resisting rotation of the carrier. Such a means may take the form of the brake shoe 50 urged against the drum surface 51 of the spindle by the band 53. The latter is in turn urged by a spring 52, as seen in Fig. 7. Jaw pivoting centers the work so that the jaws then grip the centered work, following which the pivot member drives the spindle in engagement with the brake and the gripping work is thereby rotated.

FIGS. 1 and 7 also illustrate the provision of beam structure such as parallel rods 54 carried by the housing bosses 55 to project in the general direction of the central axis 21, the rods being shiftable endwise in the bosses if desired. Portability is facilitated by complete removal of the rods from the bosses. The beam structure carries pipe threading means generally indicated at 56, and which may have the form and construction as described in my co-pending application for U.S. Letters Patent, Serial No. 335,022, new patent No. 3,274,627. Such means is supported on a carriage 57 having arms 58 integral with sockets 59 through which the rods 54 project. As the thread chasers of unit 56 cut the rotating pipe, the carriage slides along rods 54. A tapered pipe end reamer 60 is also carried on the carriage, as by support structure 61. The reamer is advanced toward the pipe end by pressing against a pusher 62 movable axially in socket 61, the pusher being integral with the reamer.

I claim:

1. In portable apparatus of the character described including a carrier having a horizontal central axis of rotation, pivot members supported on the carrier to have pivot axes spaced about said central axis and parallel thereto, bearing structure supporting the carrier for rotation, levers operatively connected with the pivot members to simultaneously pivot said members, a drive including a drive rotor rotatable clockwise and counterclockwise about said central axis, and links operatively connected with the rotor and levers to transmit rotary drive from the rotor to said levers and thereby pivot the pivot members, the improvement comprising work gripping jaws integral with the pivot members and having work release positions in which each jaw is elongated in a direction substantially normal to an axial radial plane passing through the central axis and the axis of the pivot member integral with that jaw, the lever operatively connected with that pivot member then extending substantially radially with respect to the central axis, the jaws having work gripping faces generally convex toward said central axis, and stop shoulders on the carrier to limit pivoting of the levers acting to pivot the jaws, said levers and stop shoulders being axially spaced from said jaws.

2. The combination of claim 1, in which each jaw has wings extending symmetrically at opposite sides of the axis of the pivot member integral with that jaw, there being two axially spaced sets of said jaws, each set including four jaws.

3. The combination of claim 1, in which each jaw has terminals spaced apart in said elongation direction, the jaws being rotatable about said pivot members so that said terminals define cylindrical loci about the pivot member axes, adjacent cylindrical loci having overlapping relation.

4. The combination of claim 1, in which each jaw face defines two parallel rows of serrations.

5. The combination of claim 1, including a support for the bearing structure and including a housing, beam structure carried by the support to pivot in the general direction of said central axis, and pipe threading means carried by said beam structure in axially spaced relation to said housing.

6. The combination of claim 5, in which said support includes a tripod mounting said housing, said beam structure being carried by the housing.

7. The combination of claim 4 including a reamer carried by said beam structure and tapering toward said housing in axially spaced relation thereto.

8. The combination of claim 1, including means within the housing to resist rotation of the carrier.

9. The combination of claim 3, in which said cylindrical loci have radii substantially equal to the spacing of the pivot axes from the central axis.

10. For use in gripping and rotating an elongated workpiece about a central axis, at least four work gripping jaws having pivot axes spaced about said central axis and parallel thereto, the jaws having work release position in which each jaw is elongated in a direction substantially normal to an axial radial plane passing through the central axis and the pivot axis of that jaw, each jaw having terminals spaced apart in said elongation direction and at opposite sides of the jaw pivot axis and each jaw having a work gripping face generally convex toward said central axis, and means to support and simultaneously pivot said jaws about said pivot axes so that said terminals define cylindrical loci about the pivot axes, adjacent cylindrical loci having overlapping relation, said means including levers, and stop shoulders to limit pivoting of said levers, said stop shoulders and levers being axially spaced from said jaws.

11. The combination of claim 10 in which each jaw has wings extending symmetrically at opposite sides of the jaw pivot axis, the wings defined said jaw faces to have parallel rows of serrations.

12. The combination of claim 10 in which said cylindrical loci have radii substantially equal to the spacing of the pivot axes from the central axis.

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LEONIDAS VLACHOS, Primary Examiner.