

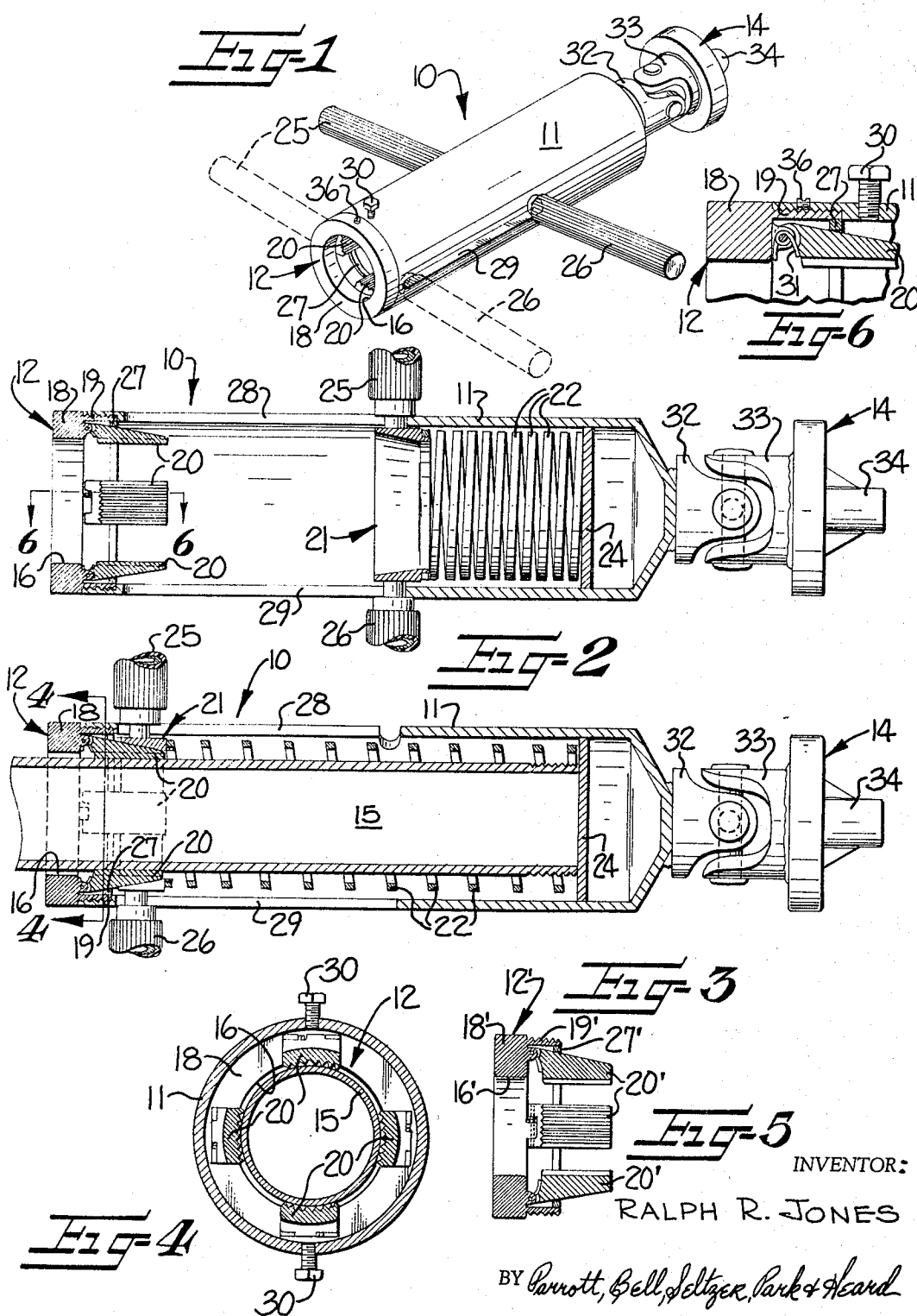
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POWER WRENCH

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POWER WRENCH
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ABSTRACT OF THE DISCLOSURE

A readily portable power wrench for facilitating the assembly of threaded workpieces, such as pipe, and particularly the field installation of long runs of such pipe, by being adapted for quick connection to and disconnection from lengths of pipe and to transmit rotational force to the pipe from a variety of power sources.

Heretofore, the practice in installing threaded workpieces, such as lengths of pipe, and particularly in assembling such pipe into a long run flow system, such as a natural gas transmission line, has been to manually screw the threaded workpieces together with hand tools at the installation site. Threading such pipe together with hand tools requires substantial time for each joint assembled, and long practice has resulted in the expectance and usual existence of from three to five leaking joints in each mile of pipe so assembled.

Power driven machinery for screwing together threaded workpieces has been used heretofore, particularly in securing fittings such as end caps to lengths of pipe. Such machinery is not, however, a substitute for hand tools in installing lengths of pipe as described above. Due to the large size and heavy weight of such machinery, which frequently is constructed as a permanent shop fixture, the machinery is not readily portable. Thus, such previously known machinery cannot be used in the field as hand tools are used.

With these difficulties clearly in mind, I have determined that field assembly of threaded workpieces, such as lengths of pipe, into long runs would be facilitated through the use of a readily portable power wrench for transmitting rotational movement from a suitable power source to a workpiece, to cause rotation of a workpiece about its longitudinal axis. Such a power wrench desirably would be adapted for connection to a variety of power source means, to accommodate use of the wrench under field conditions, and further would be constructed for quick connection to and quick disconnection from the workpieces being assembled.

In view of the above, it is an object of this invention to provide a power wrench having the desirable characteristics and features enumerated above, which wrench will more quickly assemble threaded workpieces together with materially less leaking joints and thereby obviate the aforementioned difficulties and deficiencies in field assembly of threaded workpieces into long runs.

A more specific object of this invention is to provide a power wrench adapted for direct interconnection of a workpiece with a power source means, to transmit rotational movement from the power source means to the workpiece substantially along the longitudinal axis of the workpiece, while permitting ready connection to or disconnection from the workpiece.

In accomplishing the objects of this invention, the power wrench which is described more fully hereinafter has been found to result in a saving of at least six minutes for each joint of pipe assembled in a long run, and to reduce the leaking joints in each mile of pipe from three to five, as experienced when hand tools are used, to substantially none.

Some of the objects and advantages of the invention having been stated, others will appear as the description

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proceeds, when taken in connection with the accompanying drawings, in which:

FIGURE 1 is a perspective view of the power wrench of my invention;

FIGURE 2 is an enlarged scale view, in partial section, of the wrench of FIGURE 1 out of engagement with a workpiece;

FIGURE 3 is a view, similar to FIGURE 2, of the wrench of FIGURE 1 in engagement with a workpiece;

FIGURE 4 is an elevation view, in section, taken substantially along the line 4—4 in FIGURE 3;

FIGURE 5 is a section view of an alternate removable workpiece gripping means for the wrench of FIGURES 1—4; and

FIGURE 6 is an enlarged scale view, in section, of a portion of the gripping means of the wrench of FIGURES 1—4, taken substantially along the line 6—6 in FIGURE 2.

Referring now more particularly to the drawing, the power wrench of my invention is there shown and generally indicated at 10 (FIGURE 1). Broadly, the power wrench 10 of my invention comprises an elongate hollow casing 11, workpiece gripping means generally indicated at 12 and mounted in one end of the casing 11 for gripping an elongate workpiece, grip controlling means for controlling the workpiece gripping means 12, and power connector means generally indicated at 14 and secured to the other end of the casing 11 and aligned with the longitudinal axis thereof. The casing 11 is open at one end thereof for receiving a terminal extremity of a pipe (as in FIGURE 3) and is closed at the other end, to which the power connector means 14 is secured. In order to facilitate the ready use of the power wrench 10 in field assembly of pipe, the casing 11 is of a size and weight so as to be easily handled by a single man. As used herein, the term "readily portable" as applied to the power wrench 10 of my invention is intended to reflect this size and weight characteristic of the wrench.

In order to permit controllable gripping of an elongated substantially rigid workpiece, such as a piece of pipe 15 (FIGURE 3), my invention includes the workpiece gripping means 12. The gripping means 12 is removably mounted in one end of the casing 11 and has an opening 16 therein substantially concentric with the longitudinal axis of the casing 11. The opening 16 is formed in a support ring 18 (FIGURES 2 and 3), which has a threaded portion 19 at one end thereof adapted to threadingly engage the casing 11 of the wrench 10 and thus secure the gripping means 12 in operative position with the opening 16 concentric with the longitudinal axis of the casing 11. The opening 16 is sized to snugly receive the workpiece 15 with which the wrench is to be used, and the removable mounting of the gripping means 12, through the provision of the threaded support ring 18, permits ready substitution of other gripping means (such as the alternate means 12' of FIGURE 5) when it is desired to use the wrench of my invention with workpieces of other external dimensions. In FIGURE 5, primed numerals are used to identify parts of the substitute gripping means which are the same as those indicated by unprimed numerals in FIGURES 1—4.

In order to grippingly engage a workpiece, such as the pipe 15, the workpiece gripping means 12 includes a plurality of chucking members 20 disposed about the opening 16 and movable radially thereof between workpiece engaging positions (FIGURE 3) and workpiece disengaging positions (FIGURE 2). Preferably, the chucking members 20 are of a predetermined suitable axial length, pivotally connected to the support ring 18 at one end thereof adjacent that ring, and have conically tapered exterior cam surfaces. The interior surfaces of the chucking members 20 are longitudinally grooved to provide secure engagement with a workpiece, such as the pipe 15.

In order to control gripping engagement of the chucking members 20 with a workpiece, my invention provides grip controlling means including a control member 21 within the casing 11 and movable axially thereof in camming engagement with the chucking members 20 for moving the chucking members in unison radially of the opening 16. The control member 21 preferably is an annular pinch ring, having an internal conical surface adapted to engage the external conical surface of the chucking members when moved from a position out of engagement with those members (FIGURE 2) to a position in engagement with those members (FIGURE 3).

In order to readily provide for movement of the control member 21 into engagement with the chucking members 20, and thus for movement of the chucking members 20 into power transmitting engagement with a workpiece, my invention provides a resilient biasing means within the casing 11 for biasing the control member 21 axially toward the chucking members 20 and for thus biasing those members 20 radially inwardly toward a workpiece penetrating the opening 16 and extending longitudinally within the casing 11. Preferably, the resilient biasing means is in the form of a coil compression spring 22, extending longitudinally of the casing within the casing 11 and engaging the control ring 21. In order to permit the spring 22 to exert a force on the control ring 21, I provide an abutment member 24 within the casing 11 remote from the end which is threadingly engaged by the gripping means 12 as described heretofore. The abutment 24, while providing one of two members between which the spring 22 is compressed to apply force to the control member 21, additionally provides a stop to limit the penetration of a workpiece into the hollow interior of the casing 11 (FIGURE 3).

In order to permit an operator to control the engagement and disengagement of the gripping means 12 with a workpiece, my invention provides manually engageable means secured to the control member 21 and penetrating the casing 11 for manual control of movement of the control member 21 within the casing 11. More particularly, the manually engageable means is a pair of handles 25, 26, each rigidly connected to the control member 21 and penetrating the casing 11 perpendicular to the longitudinal axis thereof through one of a pair of elongate slots 28, 29 (respectively) therein. Each of the elongate slots 28, 29 has a generally L or J configuration, with the base of the L or J shape at the end of the respective slot toward the power connector means 14. This slot configuration permits an operator to move the handles 25, 26 along the casing 11 toward the power connector 14 and then rotate the handles relative to the casing to move the handles into the base portion of the slots and thus lock the control member 21 in a retracted position (FIGURE 2). A workpiece may then be positioned for engagement by penetration of the opening 16 and extension within the hollow casing 11 to engage the abutment 24, and the handles removed from the detent position so that the compression spring 22 moves the control member into engagement with the chucking members and the chucking members into engagement with the workpiece.

Inasmuch as the wrench 10 is rotating about its longitudinal axis during assembly and disassembly of threaded workpieces, such as the pipe 15, the handles 25, 26 present a possible danger to an operator who is careless or not watchful. For this reason, these handles 25, 26 should be made no longer than necessary to permit exertion of a force so as to compress the compression spring 22. Where the spring 22 is sufficiently powerful to cause the exertion of considerable force, telescopic handles are used so that the exposed rotating length may be reduced to provide additional operator protection.

In order to facilitate proper engagement of the chucking members 20 with a workpiece, such as the pipe 15, the slots 28, 29 extend along a substantial portion of the length of the casing 11. Thus, an operator will draw the

handles 25, 26 toward the abutment 24 and thereby store substantial energy in the compression spring 22. Upon release of the handles 25, 26, the pinch ring 21 is driven toward the open end of the casing 11 with considerable force and drives the chucking members 20 radially inwardly of the opening 16 with considerable impact force, thus assuring that proper engagement with the workpiece is obtained.

In the event that proper engagement of the chucking members 20 with the workpiece cannot be obtained through use of the pinch ring 21, my invention provides emergency forcing means in the form of a plurality of jack screws 30 (FIGURE 6), engaging threaded openings in the casing 11 and aligned with the chucking members 20. When required, the jack screws 30 may be brought into engagement with the exterior camming surface of the chucking members 20 to force movement of those members into engagement with the workpiece.

In order to obtain quick disconnection of the wrench 10 of my invention from a workpiece, I provide chucking member biasing means for each of those members 20 in the form of a torsion coil spring 31 (FIGURE 6). One coil spring 31 encircles each of the pivot rods by which a respective one of the chucking members 20 is mounted from the support ring 18 and applies a force biasing the respective chucking member 20 radially outwardly of the central opening 18. When the pinch ring 21 is withdrawn from its encircling engagement with the chucking members 20 (FIGURE 2), the biasing force of the torsional springs 31 causes the chucking members 20 to move to the retracted position out of engagement with any workpiece penetrating the casing 11.

In order to assure that the pinch ring 21 will properly engage the external cam surfaces of the chucking members 20 when the handles 25, 26 are released, I provide means for limiting the radial outward movement of the chucking members under the biasing force of the springs 31. Preferably, this limiting means is in the form of an inwardly projecting ring 27 (FIGURE 6), secured to the threaded portion 19 of the support ring 18 and spaced sufficiently far along toward the location of pivotal connection of the chucking members 20 to the support ring 18 so as not to interfere with camming engagement of the pinch ring 21 with the chucking members 20.

In order to permit a workpiece engaged by the chucking member (FIGURE 3) to be driven in rotation about its longitudinal axis, my invention provides power connector means 14 secured to the end of the casing 11 remote from the gripping means 12 and aligned with the longitudinal axis of the casing 11. The connector means 14 is adapted for connection to a selected one of a number of possible rotating power means such as an electric drill, an electric motor, the power takeoff of a tractor, or an auger motor for driving the casing 11 in rotation about the longitudinal axis thereof and thus driving a workpiece, such as the pipe 15, gripped by the gripping means 12. Preferably, the power connector means 14 is a universal joint which is capable of accommodating angular misalignment between the axes of rotation of the power means and the casing. One member 32 of the universal joint is secured to a reduced diameter portion at the extremity of the casing 11, while the other member 33 of the universal joint has a stub-shaft 34 secured thereto for operative connection with a suitable power means (not shown).

In order to assure that the gripping means 12 is not inadvertently removed from the casing 11 during use of the wrench 10, I provide a plurality of set screws 36 which extend through the casing 11 and the threaded portion 19 of the support ring 18 to lock these members against relative rotation and thus retain the gripping means 12 secured to the casing 11. The set screws 36 are readily removed and do not present difficulty in sub-

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stituting another replaceable gripping means as mentioned above.

In the drawing and specification, there has been set forth a preferred embodiment of the invention, and although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claims.

I claim:

1. A readily portable power wrench for facilitating the assembly of threaded workpieces by transmitting rotation thereto to drive the same in rotation about the longitudinal axis thereof and adapted for quick connection to and disconnection from a workpiece and comprising:

an elongate hollow casing open at one end thereof for receiving therein a terminal extremity of a workpiece and closed at the other end thereof,

a support ring threadingly engaging said casing adjacent said one end thereof and having a workpiece guiding opening therein for substantially aligning the longitudinal axes of a workpiece and said casing,

a plurality of chucking members spaced circumferentially about said opening and supported by said ring for movement radially thereof into and out of clamping engagement with a workpiece extending therethrough,

means for controlling said gripping means to actuate the same between clamping engagement and disengagement with a workpiece encircled thereby, and

power connector means secured to said other end of said casing and aligned with the longitudinal axis thereof, said connector means being adapted for connection to a rotating power means for transmitting rotational force to said casing in alignment with the longitudinal axis thereof.

2. A power wrench as claimed in claim 1 wherein control means comprises a control member within said casing and movable axially thereof in camming engagement with said chucking members for moving the same in unison radially of said opening, a manually operable member connected to said control member for moving the same axially of said casing, and resilient biasing means within said casing and acting on said control member to bias the same into engagement with said chucking members.

3. A power wrench as claimed in claim 2 wherein each

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of said chucking members is pivotally connected adjacent one end thereof to said support ring and has a conically tapered exterior cam surface, said control member is a pinch ring having a conically tapered interior cam surface and is movable between a position encircling said chucking members and a position remote therefrom, and further comprising chucking member biasing means for biasing said chucking members radially outwardly of said opening and limiting means for limiting the extent of outward radial movement of said chucking members so as to maintain said chucking members in position to be encircled by said control member.

4. A power wrench as claimed in claim 2 wherein said resilient biasing means comprises a coil spring disposed within said casing substantially concentric with the longitudinal axis thereof so as to encircle a workpiece penetrating said opening, one end of said spring engaging said control member.

5. A power wrench as claimed in claim 4 further comprising a stop within said casing for limiting the penetration of a workpiece therein and said spring is a compression spring with the other end thereof abutting said stop.

6. A power wrench as claimed in claim 2 wherein said manually operable member is rigidly connected to said control member and penetrates said casing perpendicular to the longitudinal axis thereof, said casing having a longitudinally extending slit therein for accommodating said member and movement thereof axially of said casing.

7. A power wrench as claimed in claim 6 further comprising means for releasably detaining said manually operable member at one extremity of said slit wherein said control member is withdrawn from encircling engagement with said chucking members, so that insertion and removal of workpieces is facilitated.

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