May 31, 1960 C. KOSTKA 2,938,415

PIN-AND-SLOT, ANGLE-DRIVE WRENCH

Filed May 14, 1958

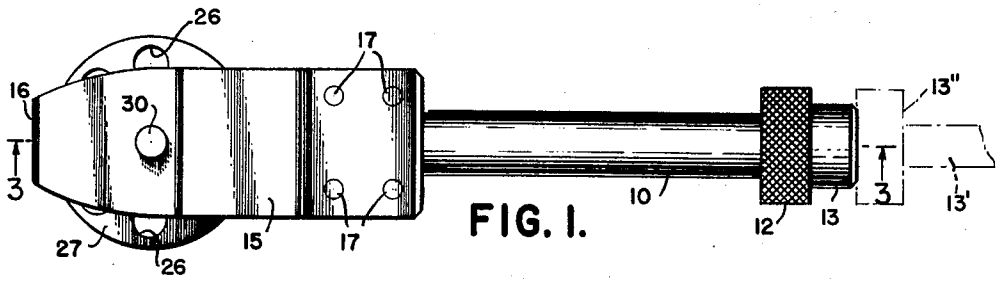


FIG. 1.

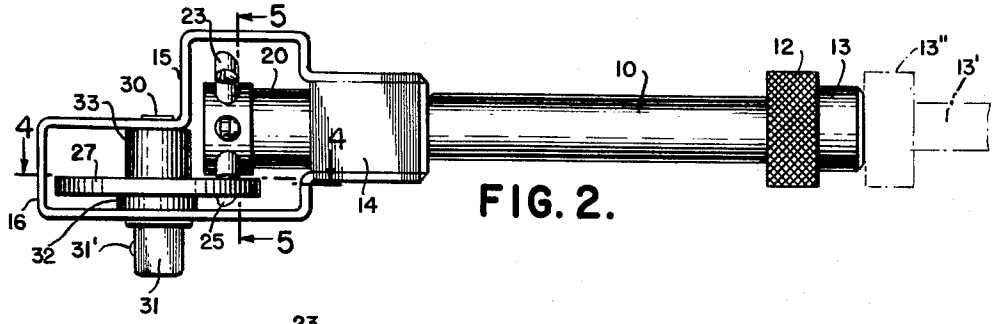


FIG. 2.

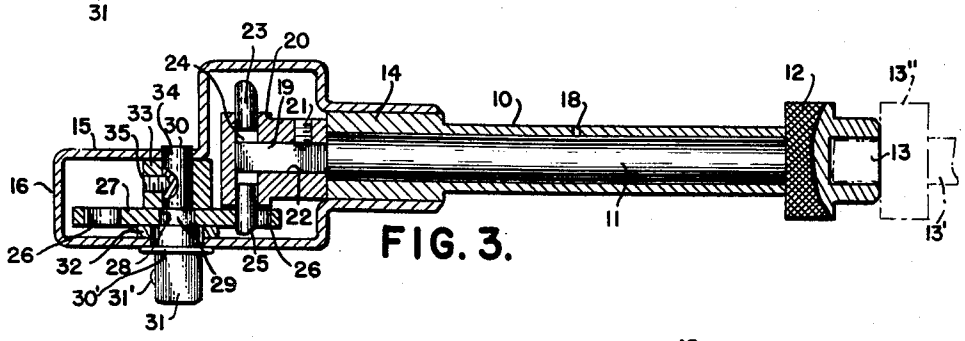


FIG. 3.

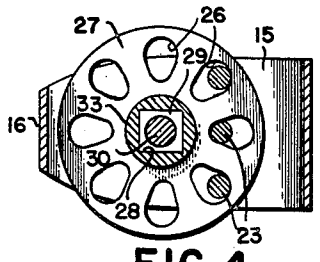


FIG. 4.

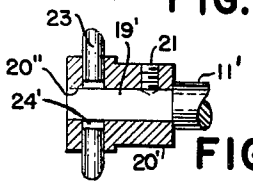


FIG. 6.

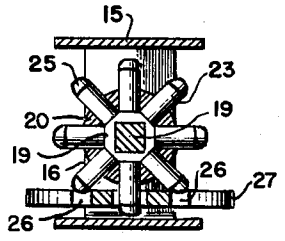


FIG. 5.

INVENTOR.
Charles Kostka

BY L. S. Salisbury

ATTORNEY

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A PIN-AND-SLOT, ANGLE-DRIVE WRENCH

Charles Kostka, Bronx, N.Y.
(4 Dock St., Mount Vernon, N.Y.)

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5 Claims. (Cl. 81—57)

This invention relates to gearless, strip-proof, pin-and-slot, angle-drive socket wrenches.

It is the principal object of the present invention to provide a gearless, strip-proof, pin-and-slot, angle-drive socket wrench which has an input shaft and an output shaft that lies at the angle of ninety degrees from the input shaft.

It is another object of the invention to provide a gearless, strip-proof ninety-degree, pin-and-slot, angle-drive socket wrench in which the angle drive parts comprise a spoke member on one of the shafts and a wheel or plate in the other shaft having circumferentially-spaced holes in which the spokes run freely to effect a positive driving action upon the wheel and without lag or lost motion.

It is still another object of the invention to provide a gearless, strip-proof, pin-and-slot, angle-drive socket wrench with a simple U-shaped body for supporting the spoke member and the wheel that will be open at the sides to prevent dirt from accumulating in the body and interfere with the operation of the wrench and at the same time permit the wrench to be easily cleaned.

It is a further object of the invention to provide a gearless, strip-proof, pin-and-slot, angle-drive socket wrench in which one of the drive parts is in the form of a wheel and in which the periphery thereof extends outwardly of the wheel supporting body so that the wheel can be grasped by the fingers and thumb and hand turned if desired independently of the input drive shaft.

It is a further object of the invention to provide a gearless, strip-proof, pin-and-slot, ninety-degree angle-drive socket wrench in which the drive parts can be inexpensively stamped and fabricated and does not require the expensive cut gear parts.

It is a still further object of the invention to provide a gearless, pin-and-slot, ninety-degree, angle-drive socket wrench which will be strip-proof and in which multiple spokes will be in simultaneous engagement with multiple radially elongated holes in the wheel or drive plate, and in which the spoke ends are so shaped and timed with the elongated holes in the drive plate to give as smooth and as effective drive as a gear drive.

Other objects of the invention are to provide a gearless, strip-proof, pin-and-slot, ninety-degree, angle-drive socket wrench that has the above objects in mind, which is of simple construction, has a minimum number of parts, inexpensive to manufacture, compact, easily and quickly assembled with other socket wrench parts, durable and effective and efficient in use.

For a better understanding of the invention, reference may be had to the following detailed description taken in connection with the accompanying drawing, in which:

Figure 1 is a top plan view of the gearless, strip-proof, ninety-degree, angle-drive socket wrench embodying the features of the present invention;

Fig. 2 is a side elevational view of the wrench;

Fig. 3 is a vertical sectional view of the wrench as viewed on line 3—3 of Fig. 1;

Fig. 4 is a fragmentary transverse sectional view looking in plan upon the perforated drive wheel or plate and as viewed on line 4—4 of Fig. 2;

Fig. 5 is a vertical transverse sectional view taken on line 5—5 of Fig. 2 and looking in elevation on the drive spokes penetrating and leaving the openings in the drive plate; and

Fig. 6 is a longitudinal view of a modified spoke member that may replace the one that is shown.

Referring now to the figures, **10** represents a handle sleeve in which is journalled an input drive shaft **11** having an integral knurled turning knob **12** with a socket opening **13** therein to which a drive extension **13'** can be connected. The extension **13'** may have knurled turning knob **13''**. The handle sleeve **10** has an enlarged square end portion **14** to opposite flat top and bottom sides of which a generally U-shaped wheel-supporting body **15** is connected. The U-shaped body **15** has a closed end **16** and leg portions that are made secure to the square end portion **14** by a plurality of fastening rivets **17**. The handle sleeve **10** has an oil hole **18** into which oil can be injected to lubricate the input shaft **11**. The drive shaft **11** has a reduced square end portion **19** to which a spoke drive part or member **20** is secured by a set screw **21** that enters a recess **22** in the portion **19**. The spoke drive part **20** has eight drive spokes **23** extending radially outwardly from respective supporting holes **24**. The outer ends of the spokes are beveled and rounded as shown at **25** to more effectively enter radially elongated holes or perforations **26** of perforated drive wheel plate **27**. The number of spokes can be varied but the construction will be kept such that a plurality of spokes engage the drive plate **27** simultaneously.

The perforated drive plate **27** has the same number of radially elongated holes as there are spokes **23**. The diameter of each of the spokes is about half the radial length of the radially elongated holes **26** in the drive wheel or plate **27**. The holes **25** in the drive plate **27** are generally egg-shaped, radially elongated and tapering from a large diameter outer end to a small diameter inner end. The diameter of the inner end of the holes is the same as the diameter of the spokes. The spoke enters the large diameter outer end and bears against the tapered sides of the hole and as the wheel is turned and the wheel and spoke reach a center position with the spoke axis in the vertical position as shown in Fig. 4, there can be little chance of lost motion. With three spokes **23** in the openings simultaneously there will always be at least two spokes in engagement with a leading side edge of one hole and a trailing side edge of another hole so that at all times the spoke member and the perforated plate are held against lost motion or play between them. The ends of the spokes **25** have a camming engagement with the sides of the holes **26** and will ride upon the edges and sides of the holes until the sides of the spokes will engage flush with the sides of the holes for maximum turning effect when passing through the center position, all of this makes for a smooth drive connection of the spokes with the wheel with little opportunity for the same to bind and without lost motion or play.

The drive wheel or plate **27** has a squared recess **28** for receiving square portion **29** of a wheel shaft **30**. A socket head **31** having a detent **31'** projects downwardly from the underside of the body **15** and is adapted to receive a nut socket or an extension. A wear washer or spacer **32** is disposed under the drive plate **27** and its thickness or number of such washers or spacers which may be used will depend upon the extent of inter-locking adjustment desired of the spokes with the wheel holes **26**.

The spoke driving member **20** and drive plate **27** can be made in different sizes depending upon the work thrust required of the wrench. The top surface of the plate **27**

can be adjusted close to the periphery of the spoke driving member **20** so that the spokes **23** will be strongly coupled with the driving plate, the spokes penetrating to substantially the full extent through the openings **26** in the drive wheel **27**. The spacing between the spokes **23** at the surface where they enter the hub body holes **24** is such as to accommodate if necessary the portion of the plate laying between the openings. Another spacer or bushing **33** is disposed on the wheel shaft **30** about a cylindrical portion **34** of the shaft **30** that is journalled in the upper portion of the body **15**. The wheel shaft assembly is made secure within the frame **15** by a set screw **35** joining the sleeve **33** to the shaft **30** and a bottom flange **30** thereof against the underface of frame **15**.

It will be apparent that by merely releasing the set screw **35** that the shaft **30** can be dropped from the assembly and the driving plate **27** removed from the body **15** laterally by merely turning the spoke member **20**. The spoke wheel **20** can also be quickly and easily removed by releasing the set screw **21**. Thus the assembly has been made so simple the parts can be disassembled by merely releasing the set screws. When the set screw **21** has been released, the driving shaft **11** can readily be removed from its sleeve **10**.

In Fig. 6, there is shown a spoke member **20'** that has the square opening running fully through the member as indicated at **20''** to receive a squared end portion **19'** of shaft **71'**. The spokes **23** are extended from holes **24'**.

It will be understood that this ninety degree angle-drive socket wrench can be made in different sizes. The number of holes and the size and thickness of the spokes can be varied as desired depending upon the use to which the drive is put. It should also be apparent that a smooth drive, gearless and strip-proof angle drive socket wrench has been provided.

While various changes may be made in the detailed construction, it shall be understood that such changes shall be within the spirit and scope of the present invention as defined by the appended claims.

What is claimed is:

1. A gearless, strip-proof, ninety-degree, pin-and-slot, angle-drive socket wrench comprising a handle sleeve, a drive shaft journalled in said handle sleeve, a spoke member fixed to the inner end of said drive shaft to be driven thereby, said spoke member having a hub and spokes extending radially therefrom and circumferentially-spaced from one another, a wheel suporting frame fixed to the handle sleeve and extending about the spoke member, a drive wheel plate having circumferentially-spaced perforations adapted to receive the spokes of the spoke member and adapted to be driven thereby, said spokes being adapted as the drive shaft is turned to engage with the sides of the openings in the plate to turn the same, and a shaft connected to the drive wheel plate, said drive wheel shaft being journalled in said frame and having a socket adapting head, said wheel supporting frame being open at the sides thereof and having an upper portion with a raised part over the spoke wheel and a dropped part over the drive wheel plate to accommodate its shaft, and the perforated drive wheel plate having its sides extending outwardly through the open sides of the wheel supporting frame so that it may be grasped by the operator for effecting direct turning of the output shaft when loose turning a nut or bolt is desired, said spoke member lying wholly within the lateral confines of the wheel supporting frame.

2. A gearless, strip-proof, ninety-degree, pin-and-slot, angle-drive socket wrench comprising a handle sleeve, a drive shaft journalled in said handle sleeve, a spoke member fixed to the inner end of said drive shaft to be driven thereby, said spoke member having a hub and spokes extending radially therefrom and circumferentially-spaced from one another, a wheel supporting frame fixed to the handle sleeve and extending about the spoke member, a drive wheel plate having circumferentially-spaced perforations adapted to receive the spokes of the spoke member and adapted to be driven thereby, said spokes being adapted as the drive shaft is turned to engage with the sides of the openings in the plate to turn the same, and a shaft connected to the drive wheel plate, said drive wheel shaft being journalled in said frame and having a socket adapting head, said drive wheel shaft being journalled in the upper and lower portions of said wheel supporting frame and spacing members disposed under and above the perforated drive wheel plate, and one of the spacing members having a set screw for the securement of the spacing member to the drive wheel shaft, whereby the perforated drive wheel may be removed by release of a single set screw.

3. A gearless, strip-proof, ninety-degree, pin-and-slot, angle-drive socket wrench comprising a handle sleeve, a drive shaft journalled in said handle sleeve, a spoke member fixed to the inner end of said drive shaft to be driven thereby, said spoke member having a hub and spokes extending radially therefrom and circumferentially-spaced from one another, a wheel supporting frame fixed to the handle sleeve and extending about the spoke member, a drive wheel plate having circumferentially-spaced perforations adapted to receive the spokes of the spoke member and adapted to be driven thereby, said spokes being adapted as the drive shaft is turned to engage with the sides of the openings in the plate to turn the same, and a shaft connected to the drive wheel plate, said drive wheel shaft being journalled in said frame and having a socket adapting head, said drive shaft having a knurled knob on one end thereof and a square end portion on the other end thereof, said spoke member being mounted on the square end portion within the wheel supporting frame and a set screw for releasably retaining the spoke member on the drive shaft, said drive shaft being removable from said sleeve upon release of the spoke member, whereby all parts can be disassembled upon release of but two set screws.

4. A gearless, strip-proof, ninety-degree, pin-and-slot, angle-drive socket wrench comprising a handle sleeve, a drive shaft journalled in said handle sleeve, a spoke member fixed to the inner end of said drive shaft to be driven thereby, said spoke member having a hub and spokes extending radially therefrom and circumferentially-spaced from one another, a wheel supporting frame fixed to the handle sleeve and extending about the spoke member, a drive wheel plate having circumferentially-spaced perforations adapted to receive the spokes of the spoke member and adapted to be driven thereby, said spokes being adapted as the drive shaft is turned to engage with the sides of the openings in the plate to turn the same, and a shaft connected to the drive wheel plate, said drive wheel shaft being journalled in said frame and having a socket adapting head, said spokes having their ends substantially rounded to have camming relationship with the sides of the perforations in the drive wheel plate, said perforations being radially-elongated and egg-shaped to readily accommodate the ends of said spokes, each of said perforations having an outer diameter greater than the diameter of the spoke inclined sides extending from the outer diameter and terminating in an inner diameter equal to the diameter of the spoke.

5. A gearless, strip-proof, ninety-degree, pin-and-slot, angle-drive socket wrench comprising a handle sleeve, a drive shaft journalled in said handle sleeve, a spoke member fixed to the inner end of said drive shaft to be driven thereby, said spoke member having a hub and spokes extending radially therefrom and circumferentially-spaced from one another, a wheel supporting frame fixed to the handle sleeve and extending about the spoke member, a drive wheel plate having circumferentially-spaced perforations adapted to receive the spokes of the

spoke member and adapted to be driven thereby, said spokes being adapted as the drive shaft is turned to engage with the sides of the openings in the plate to turn the same, and a shaft connected to the drive wheel plate, said drive wheel shaft being journalled in said frame and having a socket adapting head, said drive wheel plate lying with its upper surface in close proximity to the periphery of the hub member of the spoke wheel and said spokes as turned to drive said drive wheel plate fully penetrating the perforations of the drive wheel plate and engaging the sides of the perforations near to and adjacent the root of the spoke to permit a maximum turning thrust.

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