

March 21, 1967

W. B. LAWROW

3,310,076

WIRE TYING TOOL

Filed March 2, 1965

2 Sheets-Sheet 1

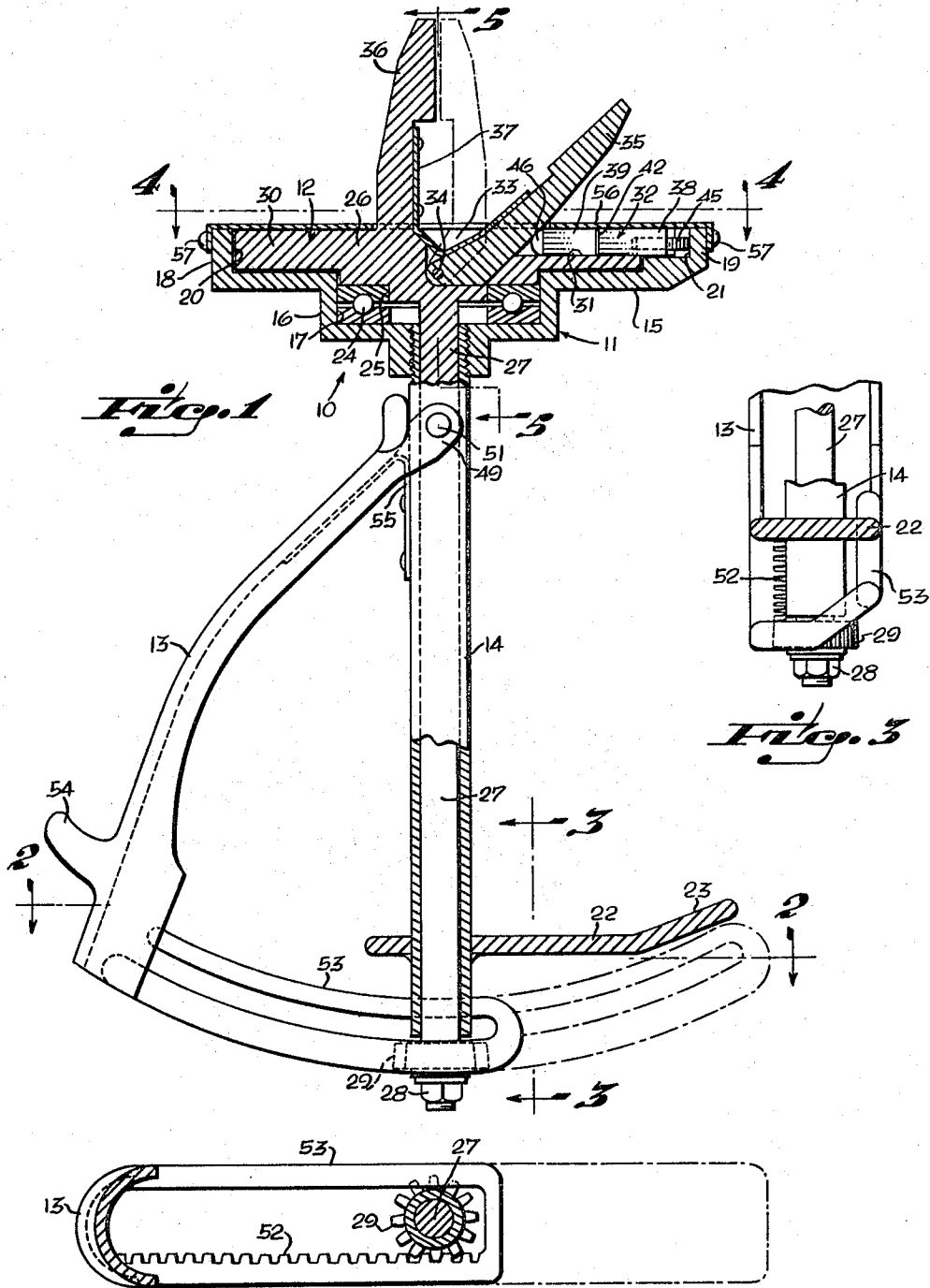


Fig. 1

Fig. 2

Fig. 3

INVENTOR.
WSEWOLOD LAWROW
BY *James J. Cannon*
ATTORNEY.

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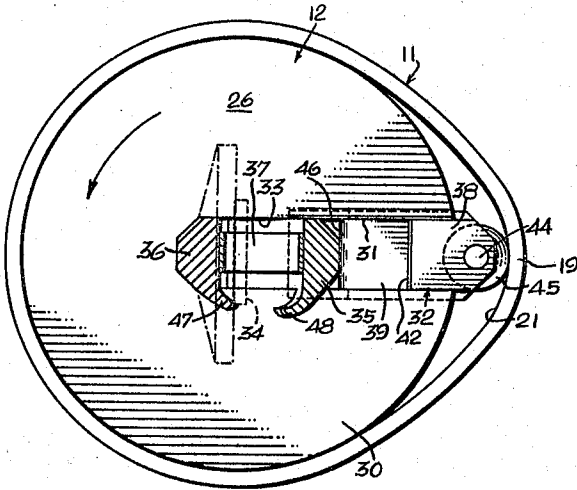


Fig. 4

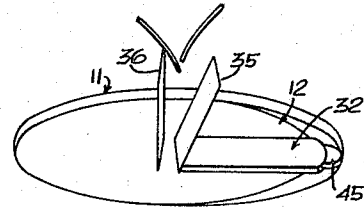


Fig. 7

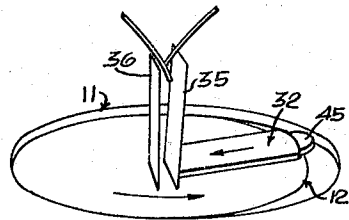


Fig. 8

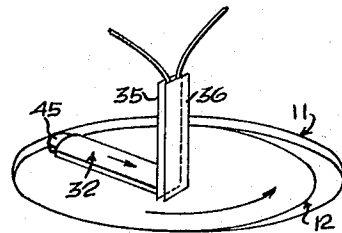


Fig. 9

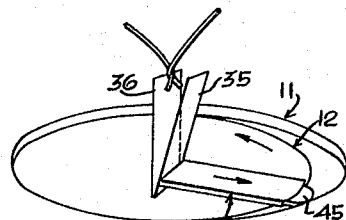


Fig. 10

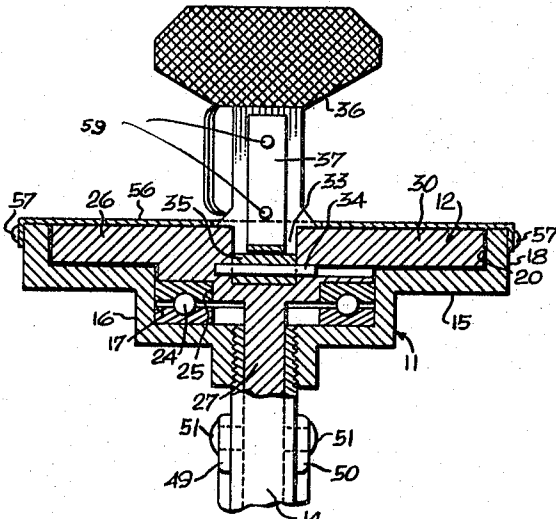


Fig. 5

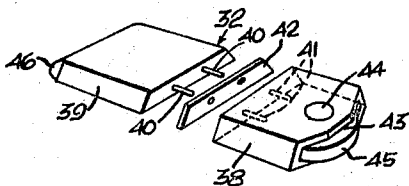


Fig. 6

INVENTOR.
WSEWOLOD LAWROW
BY *James J. Cannon.*
ATTORNEY.

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3,310,076

WIRE TYING TOOL

Wsewolod B. Lawrow, 8 Elm St., Clifton, N.J. 07013

Filed Mar. 2, 1965, Ser. No. 436,500

9 Claims. (Cl. 140—119)

My invention relates to wire-working tools and is directed particularly to a plier-like tool for grasping and twisting wire, for binding together metal rods used in reinforced concrete construction and the like.

In placing reinforcing steel bars and the like in concrete forms prior to depositing the cement, it is common practice to secure the steel in place by tying with wire. This is ordinarily done by the use of hand tools such as pliers used to grasp and twist the ends of the wire together. Such procedure is not only difficult, because of the limited twisting movement that can be made by the wrist, especially when working in confined areas, but is time consuming and expensive, a factor of great importance when a large amount of reinforced concrete is involved in a construction project.

It is accordingly the principal object of my invention to provide a plier-like hand tool for grasping and twisting tie wire around reinforcing rods and the like, that is operated by simply squeezing the handles together, thereby completing the tying operation in a fraction of the time previously required with ordinary hand tools.

It is a more particular object to provide a wire tying tool of the character described which comprises a pair of relatively movable grasping jaws arranged on a rotary head, and plier-like handles operatively connected with the jaws and the rotary head to close the jaws and then turn the jaw supporting head through a complete twisting revolution upon the operator squeezing the handles together as in the use of ordinary pliers.

Yet another object of my invention is to provide a wire tying tool of the above nature which includes means for automatically cutting away of the wire ends during the tying operation.

Still another object is to provide a wire tying tool of the above nature which will be simple in construction, easy to handle and use, efficient and dependable in performance, and readily adjustable for use with various gauges or diameters of wire.

Other objects, features and advantages of the invention will be apparent from the following description when read with reference to the accompanying drawings. In the drawings, wherein like reference numerals denote corresponding parts throughout the several views:

FIG. 1 is a side elevational view, partly in section, of a wire tying tool embodying the invention;

FIG. 2 is a transverse cross-sectional view taken along the line 2—2 of FIG. 1 in the direction of the arrows;

FIG. 3 is a vertical cross-sectional view taken along the line 3—3 of FIG. 1 in the direction of the arrows;

FIG. 4 is a horizontal cross-sectional view taken along the line 4—4 of FIG. 1 in the direction of the arrows;

FIG. 5 is a vertical cross-sectional view taken along the line 5—5 of FIG. 1 in the direction of the arrows;

FIG. 6 is a perspective view of the cam member assembly, parts of which are shown in separated or "exploded" relation; and

FIGS. 7 through 10 illustrate, schematically, the rotary and clamping movement of the tool jaws in a cycle of operation.

Referring now in detail to the drawings, 10 in FIG. 1 designates a wire tying tool embodying my invention, the same comprising, generally, a body member 11, a rotary

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head assembly 12, and a movable handle member 13. The body member 11 comprises a tubular handle portion 14 fixed to one end of which, as by being screw threaded thereon, is a head housing member 15 having a concentric cylindrical first wall portion 16 defining a cylindrical recess 17, which first wall portion extends into a second wall portion 18 of increased diameter and concentric with said first wall portion except for an outwardly-extending lobe portion 19. The second wall portion 18 thus defines a recess 20 that is for the most part concentric with the cylindrical recess 17 and the tubular handle portion 14, but has an outwardly-extending eccentric zone 21 of limited angular extent, an extent of approximately 45 circular degrees by way of example. Welded or otherwise secured near the other end of the handle portion 14 is a sidewardly-extending bar 22 the outer end portion of which is bent up slightly, as indicated at 23, said bar constituting a guard preventing the hand moving into the vicinity of the gear and rack operating mechanism, hereinbelow described.

Seated within the cylindrical recess 17 of the head housing member 15 is a ball bearing unit 24 upon which the reduced diameter portion 25 at the underside of the rotary head 26 of the head assembly 12 rests. The rotary head 26 is integrally formed at the underside with a concentric shaft portion 27 which extends through and projects from the tubular handle portion 14 of the body member 11. The projecting end of the shaft portion 27 has fixed thereon, as by nut 28, a spur gear 29, for cooperative action with a gear rack forming part of the movable handle member 13, as is hereinbelow more fully described.

The rotary head 26 is also integrally formed at its upper end with an increased diameter portion 30 within which is formed a radially-extending slot 31 the bottom surface of which is flush with the bottom surface of the eccentric zone 21 of the recess 20 in the head housing member 15, and the side walls of which are concavely recessed to provide opposed parallel guide channels received within which are similarly formed edge portions of a cam member 32. The inner end of the slot 31 in the rotary head 26 extends into a central recess 33 receiving fulcrumed therein, as by a cross-pin 34 in a central transverse opening in said rotary head, the lower end of a movable jaw member 35. Integrally formed with the rotary head 26 is an outwardly-extending fixed jaw member 36, complementary to the movable jaw member 35. A U-shaped spring 37 fixed at one end against the inside of the fixed jaw member 36 and bearing at its other end against the inside of the movable jaw member 35 normally holds said movable jaw member in open or relatively spaced relation, as illustrated by the full-line representation of said movable jaw member in FIG. 1.

In order for the cam member 32 to be adjusted in length to accommodate various sizes of wire to be tied and cut, it is comprised of centrally divided front and back portions 38, 39, respectively, held in axial alignment by a pair of pins 40 in said back portion received in bores 41 in said front portion (see FIG. 6). A shim 42 of selected thickness is placed between the front and back portions 38, 39 in assembled relation to provide the proper cam length for use with a given size of tying wire, as will be apparent from the operation of the tool as hereinafter described. Journalled in a transverse slot 43 at the front end of front portion 38 of cam member 32 as by pin 44, is a cam roller wheel 45 which, as illustrated in FIGS. 1 and 4, bears against the interior peripheral wall of the

recess 20 of the head housing member 15. The outer end of the back portion 39 of the cam member 32 is rounded, as indicated at 46, and bears against the outside of the movable jaw member 35 at a central position therealong, as best illustrated in FIG. 1. As illustrated in FIG. 5, outer end portions of the jaws 35 and 36 are of substantially increased width to permit grasping of well-spaced ends of the wire to be tied, so that they will be readily pulled together or tightened about the work before the twisting action is completed in a tying operation. Side portions of the jaws 35 and 36 are provided with claw portions 47 and 48, respectively, the opposing edges of which are sharpened to cut away wire end portions as the wire ends are grasped in a tying operation.

The movable handle member 13 is bifurcated at its upper end to provide opposed arm portions 49, 50 straddling the tubular handle portion 14 of the body member 11 and journalled thereto as by a pair of short journal pins 51. The lower end of the handle member 13 is integrally formed with an arcuate gear rack 52 in mesh with the gear 29 on the outer end of the shaft portion 27 of the rotary head 26. The outer end of the arcuate gear rack 52 is integrally formed with an arcuate bar 53 upwardly spaced from said gear rack at the opposite side of the gear 29, which bar serves the double purpose of strengthening the movable handle structure and guarding against portions of the hand coming into accidental contact with the gear and rack mechanism during use of the tool. An outwardly-extending arcuate protrusion 54 integrally formed at the lower end of the movable handle member 13 serves to keep the hand of the user from slipping down too low along said movable handle. A U-shaped leaf spring 55 one end of which is secured to the tubular handle portion 14 of the body member 11 and the other end of which bears against the inside of the movable handle member 13 serves to resiliently constrain said movable handle member in outermost position with respect to said handle portion, as illustrated in FIG. 1, in which position the rotary head assembly 12 is so rotatively disposed in the body member 11 that the cam member 32 will be in fully extended position in the eccentric zone 21 of the head housing member recess 20 under the influence of jaw spring 37, and in which position the movable jaw member 35 will be in fully open position, as shown by the full-line representation thereof in FIG. 1. A cover plate 56 having a suitable central opening for operation of the wire gripping and twisting jaws 35, 36 is secured over the top of the body member 11 as by machine screws 59.

FIGS. 7 through 10 illustrate, schematically, the operation of the tying tool as the plier-like handles are squeezed together in a tying operation. FIG. 7 shows the jaws in open or rest position. As the handles begin to move together, the movement of the gear rack 52 rotates the gear 29 which, in turn, rotates the rotary head 26 through its shaft 27. The cam member 32 will thus be moved away from the eccentric zone 21 of the recess 20 to cause the movable jaw member 35 to swing into clamping relation with respect to the fixed jaw member 36 as the rotary head member keeps turning in the anti-clockwise direction. The wire ends will thus be clamped and twisted together as illustrated in FIGS. 8 and 9 until the head member completes a full revolution, at which time the cam member will be in the eccentric zone 21 again to release the tied and cut wire ends as the jaws separate. It will be understood that if a single twisting turn of the wire ends is not sufficient to securely bind the work pieces, another squeeze on the tool handle can quickly be accomplished for additional twisting.

While I have illustrated and described herein only one form in which my invention may conveniently be embodied in practice, it is to be understood that this form is given by way of example only and not in a limiting sense. My invention, in brief, comprises all the modifications and embodiments coming within the scope and spirit of the following claims.

What I claim as new desire to obtain by Letters Patent is:

1. A wire tying tool comprising, in combination, an elongated fixed handle member, a housing secured to one end of said handle member, a head member rotatably disposed in said housing, said head member having a fixed jaw member extending outwardly thereof, a movable jaw member journalled at one end with respect to said head member for swinging movement in and out of clamping position with respect to said fixed jaw member, manually actuated mechanism for rotating said head member with respect to said housing and handle member, and means controlled by the rotation of said head member for swinging said movable jaw member into and out of clamping engagement with respect to said fixed jaw member.

2. A wire tying tool as defined in claim 1 wherein said manually actuated rotating means comprises a shaft secured to said head member coaxial with the axis of rotation thereof, said shaft extending longitudinally through an opening in said fixed handle member and projecting outwardly of the other end thereof, a gear secured on the projecting end of said shaft, and a movable handle member pivotally mounted at one end to said fixed handle member near said one end thereof and having an arcuate gear rack at the other end in mesh with said gear.

3. A wire tying tool as defined in claim 2 wherein said movable jaw swinging means comprises a cam member slidable in a slot in said head member and having one end in abutment with the outside of said movable jaw member, said housing having a wall portion eccentric with respect to the axis of rotation of said head member, spring mechanism for resiliently urging said movable jaw member away from said fixed jaw member, the other end of said cam member being in sliding contact along said eccentric wall portion under the influence of said spring mechanism.

4. A wire tying tool as defined in claim 3 including means for adjusting the length of said cam member to change the clamping position of said movable jaw member with respect to said fixed jaw member to accommodate different sizes of wire to be tied.

5. A wire tying tool comprising, in combination, a tubular fixed handle member, a housing member fixed at one end of said handle member and having a transversely-extending recess defining a peripheral wall having a circular wall portion concentric with said tubular fixed handle member and an eccentric lobe portion, a flat head member rotatably seated in said housing member and having a perpendicular shaft extending through said tubular fixed handle member, a fixed jaw member secured to and projecting outwardly of said housing member near the center of rotation thereof, a movable jaw member journalled at one end with respect to said head member for swinging movement in and out of clamping position with respect to said fixed jaw member, a flat cam member slidably arranged in a radially-extending guide slot in said head member, resilient means constraining said movable jaw member in the open direction with respect to said fixed jaw member, the inner end of said cam member being in abutting engagement with the outside of said movable jaw member, the outer end of said cam member being in sliding contact with said peripheral wall of said housing member, and manually actuated mechanism for rotating said head member with respect to said housing and handle member.

6. A wire tying tool as defined in claim 5 wherein said manually actuated rotating means comprises a gear fixed at the outer end of said shaft, and a movable handle member pivotally mounted at one end to said fixed handle member near said one end thereof and having an arcuate gear rack at the other end in mesh with said gear.

7. A wire tying tool as defined in claim 6 wherein the outer end of said cam member is fitted with a roller.

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8. A wire tying tool as defined in claim 7 including means for adjusting the length of said cam member to change the clamping position of said movable jaw member with respect to said fixed jaw member to accommodate different sizes of wire to be tied.

9. A wire tying tool as defined in claim 8 including cutters at the sides of each of said jaw members for cutting excess wire when the jaw members are brought into clamping engagement with respect to wire lengths to be tied.

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WILLIAM J. STEPHENSON, *Primary Examiner.*