

May 28, 1963

V. A. STANFORD

3,091,264

WIRE TYING TOOL

Filed March 2, 1960

3 Sheets-Sheet 1

Fig. 1.

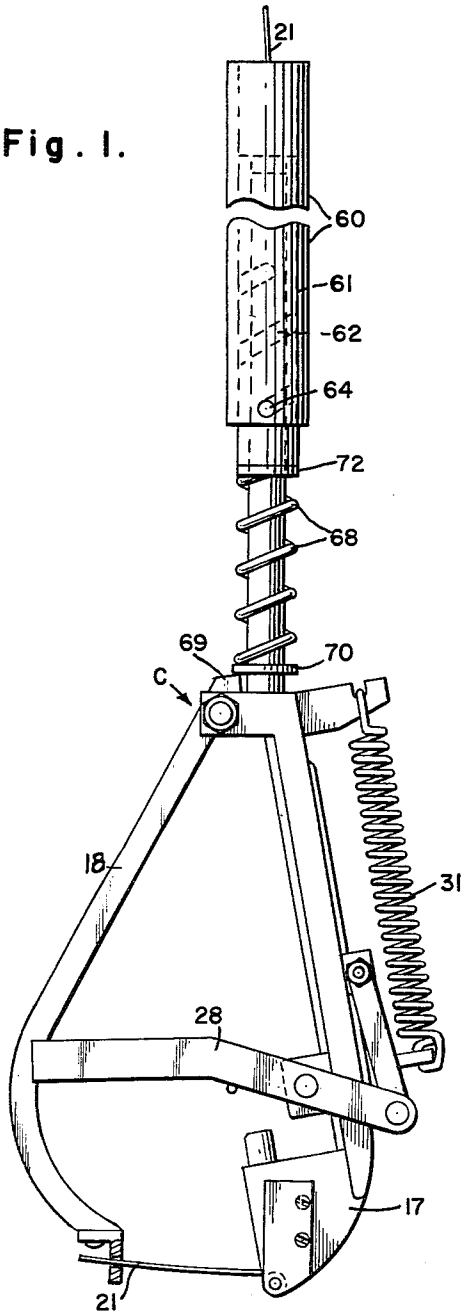


Fig. 5.

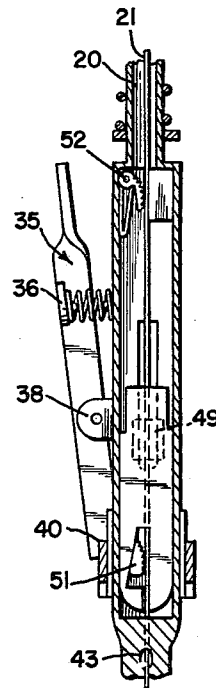
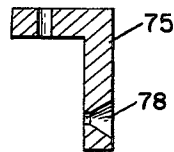


Fig. 6.

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Fig. 2.

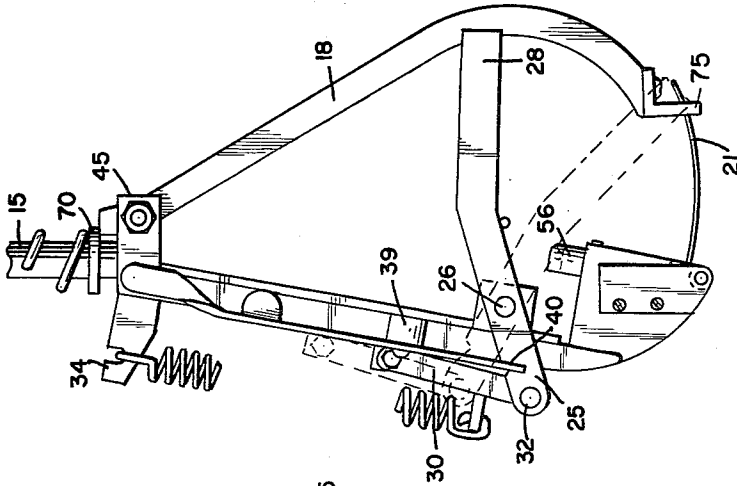


Fig. 4.

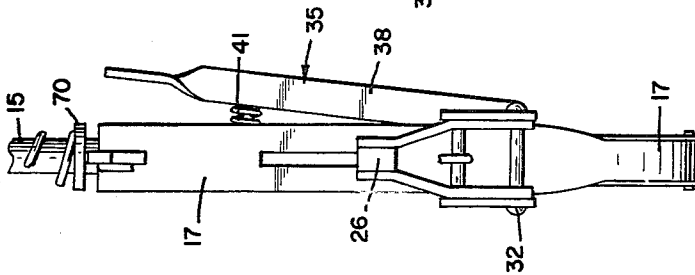
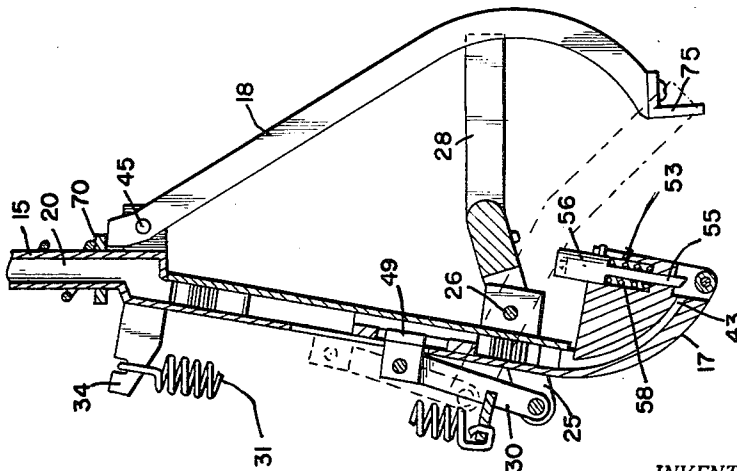


Fig. 3.



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Fig. 7A

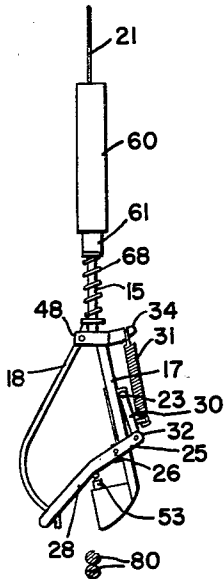


Fig. 7B

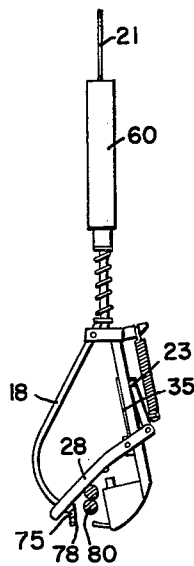


Fig. 7C

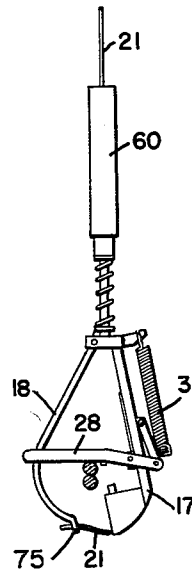


Fig. 7D.

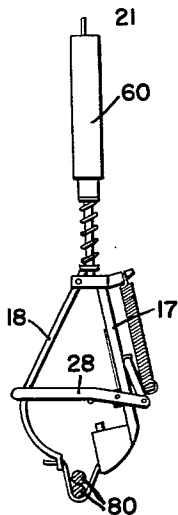


Fig. 7E.

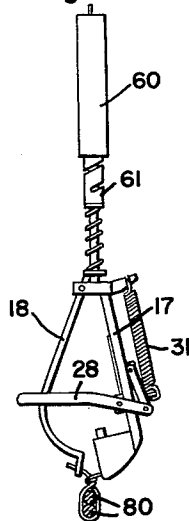
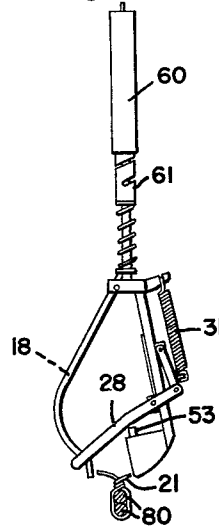


Fig. 7F.



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WIRE TYING TOOL

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5 Claims. (Cl. 140—118)

This invention relates to a wire tying device and more specifically relates to a device for tying a loop of wire around one or more objects, such as concrete reinforcing steel bars.

It is contemplated that the present invention will have special utility in the field of wire-tying together steel reinforcing bars as conventionally used in reinforced concrete construction. Generally speaking, it is common practice in the field of reinforced concrete construction projects for workmen, using only pliers and wire cutters, to manually wire-tie the reinforcing bars in proper position relative to the supporting bars and relative to one another so as to hold the bars against displacement from pre-located positions during concrete pouring operations. Usually, a workman performing this task carries a reel of tying wire on his belt. Each tie which he makes requires that he manually loop the free end around the bars and with the aid of pliers, twist the free end extremity around the standing part of the wire. After the twist is formed, wire cutters are employed to cut the loop free from the standing part of the wire reel. The cost in terms of both human effort and monetary expenditure in the wire tying of reinforcing bars according to conventional practices as above indicated constitutes a significant proportion of the overall costs in any reinforced concrete construction project.

A principal object of this invention is to provide a novel wire tying tool which will do the job of engaging the wire with the work, twisting the wire and severing the wire from the tool in a series of semi-automatic operative steps.

The particular embodiment of the invention, which is illustrated in the drawings and which will hereinafter be described in greater detail, comprises a hand operated tool including a handle mounted about an operating shaft. The lower part of the shaft forms a wire delivery jaw upon which a wire receiving jaw is mounted for pivotal movement relatively toward and away from the delivery jaw. The handle is slidably mounted relative to the delivery shaft and is operative to engage the wire receiving jaw to cause the wire receiving jaw to open when the handle is depressed. The delivery jaw is arranged to guide a length of wire into registry with the outer end of the receiving jaw when the jaws are in the open position. The receiving jaw is provided with lock means for engaging and clamping to prevent retractable movement of the free end of the wire delivered from the delivery jaw as aforesaid. By the provision of the jaw opening feature of the tool of this invention the device allows the jaws to be urged to open and allows the jaws to straddle the work so that the wire will be in proper position for tying the work pieces together when the tie wire is delivered to and locked by the wire receiving jaws.

A further novel feature of the invention resides in the provision of a pressure responsive means for automatically advancing a tie wire along the delivery jaw into registry and engagement with the receiving jaw when the tool is pressed against the workpiece or object to be tied. In the particular embodiment illustrated in the drawings the wire advancing means comprises a lever arm pivotally carried by the delivery arm and extending transversely toward the opposite jaw. The pivoted end of the lever

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is operably associated with a mechanism which engages and feeds the tie wire along the delivery jaw when the lever arm is pressed against the workpiece and swung about its pivotal axis.

A further principal object of the present invention is to provide a tool of the general character heretofore mentioned and by which it is possible for a workman through simple operation thereof to cause a loop to be formed around the workpiece or bars and automatically tightly twist and cut, with very little expenditure of time or physical effort.

A further object is to provide a wire tying device which is composed of a novel combination of mechanical elements and also incorporates elements which are novel per se.

Although the present invention will be described in specific reference to the tying of reinforcing steel bars together, it is appreciated that the scope of the invention is not limited to this particular application of use or to any one of several specific applications of use.

Other objects of the present invention will become apparent upon reading the following specification and referring to the accompanying drawings in which similar characters of reference represent corresponding parts in each of the several views.

In the drawings:

FIG. 1 is a side elevational view of the wire tying device of this invention.

FIG. 2 is a fragmentary side elevational view of the jaw portion of the wire tying tool taken from the side opposite FIG. 1.

FIG. 3 is a view similar to FIG. 2 taken in cross-section.

FIG. 4 is an end view showing the outside face of the fixed jaw with the spring removed.

FIG. 5 is a cross-sectional view taken from the inside portion of the fixed jaw.

FIG. 6 is an enlarged view of the wire engaging and locking mechanism mounted on the movable arm.

FIGS. 7a through 7f are schematic views showing the device in different phases of operation in which:

FIG. 7a depicts the device prior to being operated; FIG. 7b depicts the device at the starting phase of operation;

FIG. 7c depicts the device with the lever actuating arm being in the locked position and prior to the timing phase of operation;

FIG. 7d depicts the device in the phase of operation just prior to the wire twisting;

FIG. 7e depicts the device after the twist; and

FIG. 7f depicts the device after the severance of tied wire from the device.

In the preferred embodiment of the invention there is provided a wire tying tool formed by an operating shaft 15 having a fixed jaw 17 and a pivotally mounted jaw 18 depending from the bottom of the shaft.

An internal channel 20 is formed within operating shaft 15 which continues through fixed jaw 17. A tie wire 21 is positioned within channel 20 for delivery from the bottom end of fixed jaw 17 thus allowing fixed jaw 17 to function as a wire delivery jaw.

A wire advancing mechanism 23 is mounted on fixed jaw 17 and operably engaged with tie wire 21 within channel 20 to advance the wire through the channel. Wire advancing mechanism 23 is operated by a lever arm 25 which is pivotally mounted as at 26 on fixed jaw 17 and is actuated by a lever actuating arm 28 which is formed of bifurcated members which straddle movable jaw 18.

A linkage 30 connects wire advancing mechanism 23 to lever arm 25 so that when lever actuating arm 28 is moved

upwardly the wire advancing mechanism will cause the wire to advance through channel 20.

A return spring 31 is connected to lever arm 25 via linkage 30 as at 32 and to a fixed anchor point 34 to forcefully bias lever arm 25 in the upper position. By this means lever actuating arm 28 is normally biased in the down position.

A lever arm retaining device 35 is mounted on fixed jaw 17 and operable to lock lever actuating arm 28 in the upper or cocked position against the force of spring 31 when the arm has been moved past a predetermined upper limit.

Lever arm retaining device 35 includes a trigger bar 38 which is pivotally mounted at 39 on fixed jaw 17 and having on its lower end a sear 40 which is adapted to engage and lock lever actuating arm 28 in the upper position. Upon pivotally moving trigger bar 38 sear 40 disengages lever actuating arm 28 so that spring 31 is free to forcefully move lever actuating arm 28 to the down position.

Trigger bar 38 is normally biased by a spring 41 to cause sear 40 to engage lever actuating arm 28 when the arm is moved to a predetermined upper position and to bias trigger bar 38 in a position to hold sear 40 in engagement to hold lever actuating arm 28 in the cocked position. Trigger bar 38 is simply manually pushed against the force of spring 41 to cause disengagement of the sear with lever actuating arm 28.

The lower end of channel 20 on the bottom of jaw 17 is formed to provide a tie wire guide in the area indicated at 43 which will cause the wire delivered through the delivery tube to be guided by the guide 43 in a path which will deliver the tie wire to mate with a wire receiving and locking device 75 on the end of movable jaw 18 thus causing movable jaw 18 to function as a wire receiving jaw.

Movable jaw 18 is pivotally mounted on a pivot point as at 45 for movement to a closed position immediately against fixed jaw 17 and to a spread position spaced a considerable distance from jaw 17. Guide 43 is arranged to cause the wire to engage wire receiving and locking device 75 when jaw 18 is in the spread position. The stroke of wire advancing mechanism 23 is great enough to cause sufficient wire advance to allow the advanced tie wire 21 to engage wire receiving and latching device 75 of jaw 18 when the jaw is in the spread position.

Wire advancing device 23 includes a ratchet bearing slider 49 which is provided with teeth arranged to function in a ratchet or clutch like function so that it will move the wire downwardly through channel 20 but not in a reverse direction with the return or retraction stroke of ratchet slider 49.

Two clutch ratcatchers 51 and 52 are provided within channel 20 to lock the wire against reverse or upward movement through channel 20 in order to prevent the frictional drag of slider 49 from inadvertently moving tie wire 21 in the reverse or upward direction during the return stroke of the slider.

The end of fixed jaw 17 is provided with a wire cutting device 53. The wire cutting device comprises a cutting blade 55 having an actuating head 56 which extends upwardly above the inside face of fixed jaw 17. Head 56 is aligned with lever actuating arm 28 so that when the lever actuating arm, after being cocked, is released the lever arm will engage head 56 to force blade 55 into cutting contact with the wire extending through guide 43 of channel 20 and thereby sever the wire. Cutting blade 55 is normally biased out of contact with channel 20 by a spring 58. By this means the blade is only in wire contact when hit by the action of lever actuating arm 28 being returned to its down position by the action of spring 31.

A handle 60 is reciprocally and rotatably mounted on operating shaft 15. Handle 60 is telescopically and slidably mounted over sleeve 61 which is affixed to shaft 15.

Sleeve 61 is provided with a spiral channel 62 formed therein.

Handle 60 is provided with a pin 64 which engages channel 62 so that reciprocal movement of the handle relative to the sleeve will impart rotary motion to the entire wire tying tool.

Movable jaw 18 is cammed in the open position by a spring 68 mounted on shaft 15 and operable to engage the top edge 69 of movable jaw 18. The washer 70 is provided on the bottom of spring 68 so that the spring forces the washer against edge 69 in such a manner as to cause a biasing force that will force jaw 18 to be moved to the spread position. The force is sufficiently slight, however, so that operating forces of the wire, as will be hereinafter described, can easily overcome the jaw opening biasing effect of spring 68. The opposite end of spring 68 is urged against the bottom of sleeve 61 as at 72.

The wire latching and engaging mechanism in the preferred embodiment comprises an L-shaped plate 75 having a conical aperture 78 facing and aligned with guide 43 of channel 20 and the narrow portion of the conical section being of a size only slightly larger than tie wire 21. The effect of such a configuration will cause the wire to bind within the conical aperture and resist removal. The wider face of the aperture allows the wire to be aligned into the smaller diameter section.

The tips of jaws 17 and 18 are aligned in axial alignment with shaft 15 when the jaws are closed to their wire-twisting position as seen in FIG. 7e so that when the shaft is rotated within handle 60 the tips will rotate concentrically about a common axis.

In operation handle 60 is in the down position and jaw 18 is in the spread position due to the action of spring 68 against top edge 69 of the movable jaw. Such is indicated in FIG. 7a. During the same condition of operation lever actuating arm 28 is in the down position.

The device is placed over two work pieces to be joined, such as indicated at 80.

The two jaws 17 and 18 are then arranged to straddle work pieces 80 with lever actuating arm 28 being forced downwardly against work pieces 80 as indicated in FIG. 7b, and is continually pushed down until lever actuating arm 28 is moved to the cocked position as indicated in FIG. 7c.

Wire advancing mechanism 23 is actuated by the cocking of lever actuating arm 28 so that tie wire 21 is moved into engagement with wire latching and locking mechanism 75 on jaw 18.

The entire device is then pulled upwardly by exerting upward force on handle 60. This causes additional wire to be pulled through channel 20 in sufficient amount to allow the wire tying device to be raised above the work piece. It will be observed that the work piece will completely resist any rotation of the device until jaws 17 and 18 are clear of the work piece.

The handle rotating mechanism will cause the entire device to rotate when the jaws are raised high enough to clear work piece 80. The rotation will cause a twist of the wire above the work piece as indicated in FIG. 7e. After the twist has been completed trigger bar 38 is actuated to release lever actuating arm 28. The arm upon release hits head 56 of wire cutting mechanism 53 thus causing blade 55 to sever the wire whereupon the wire is severed from the device. The opposite end of the wire is then simply removed from conical aperture 78 and the device is again ready for another tying operation.

It is obvious that a spool of wire may be either mounted on the handle of the device itself or may be carried by the operator separately.

The device is useful in all wire tying operations where it is desirable to twist a strand of wire about one or more objects in order to either bind them together or to establish a tying point for whatever purpose desired.

Although the foregoing invention has been described in some detail by way of illustration and example for

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purposes of clarity of understanding, it is understood that certain changes and modifications may be practiced within the spirit of the invention as limited only by the scope of the appended claims.

What is claimed:

1. In a wire tying device for tying a twisted loop of wire around a workpiece the combination of: a wire delivery jaw; a wire receiving jaw; an operating shaft; means carried adjacent one end of said shaft mounting said jaws for pivotal movement relative to each other to relatively spread and closed positions; guides means carried by said delivery jaw for guiding a length of tie wire along said jaw into registry with the outer end of said wire receiving jaw; means on the outer end of said receiving jaw for engaging the free end of a tie wire delivered from said delivery jaw; wire advancing means carried by said delivery jaw operable upon actuating to advance a tie wire toward and into registered engagement with the outer end of said receiving jaw; and actuating means connected to said wire advancing means and carried by one of said jaws; said actuating means mounted for movement in response to pressure exerted thereagainst by pressing the tool against the workpiece to be tied from a first position to a second position to actuate said wire advancing means.

2. In a wire tying device for tying a twisted loop of wire around a workpiece the combination of: a wire delivery jaw; a wire receiving jaw; an operating shaft; means carried adjacent one end of said shaft mounting said jaws for pivotal movement relative to each other to relatively spread and closed positions; guide means carried by said delivery jaw for guiding a length of tie wire along said jaw into registry with the outer end of said wire receiving jaw; means on the outer end of said receiving jaw for engaging the free end of a tie wire delivered from said delivery jaw; wire advancing means carried by said delivery jaw operable upon actuation to advance a tie wire toward and into registered engagement with the outer end of said receiving jaw; wire cutting means mounted on the tip of said wire delivery jaw; actuating means connected to said wire advancing means and carried by one of said jaws; said actuating means mounted for movement in response to pressure exerted thereagainst by pressing the tool against the workpiece to be tied from a first position to a second position to actuate said wire advancing means; spring means urging said actuating means to move to the first position; cocking means operable to lock said actuating means in said second position; and cocking means release means operable to release said actuating means for movement under said spring pressure to forcefully move from the second to the first position; said wire cutting means being registered to be actuated by said actuating means when said actuating means is moved from the second to the first position.

3. In a wire tying device for tying a twisted loop of wire around a workpiece of the type having a pair of relatively movable jaws and in which the tips of said jaws

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are movable between closed and relatively spread positions and having a wire transport tube disposed within one of said jaws and a wire receiving and locking means mounted on the tip of the other of said jaws the improvement comprising: wire moving means operable to move a sufficient length of wire through the transport tube to engage the wire receiving and locking means when said jaws are in the spread position; wire guide means carried by said wire transport tube to guide the wire to register with said wire receiving and locking means; and pressure actuated means pivotally mounted on one of said jaws and extending toward the opposite jaw to be operable from a position between said jaws to operate said wire advancing means whereby the pressure actuating means may be operated by forcing the device against the workpiece while the workpiece is located between said jaws.

4. In a wire tying device for tying a twisted loop of wire around a workpiece of the type having a pair of relatively movable jaws and in which the tips of said jaws are movable between closed and relatively spread positions and having a wire transport tube disposed within a first one of said jaws and a wire receiving and locking means mounted on the tip of the second of said jaws the improvement comprising: wire moving means mounted on the first one of said jaws to move a sufficient length of wire through the transport tube to engage the wire receiving and locking means when said jaws are in the spread position; wire guide means comprising said wire transport tube to guide the wire to register with said wire receiving and locking means; a lever arm pivotally mounted on the first of said jaws and extending to a position between said jaws; means connecting said lever arm to operate said wire moving means when said lever arm is moved from a lower to an upper position; spring means urging said arm to the lower of said two positions; cocking means to retain said lever arm in the upper of said two positions; release means to release said cocking means; and wire cutting means mounted on the tip of the first of said jaws operable to cut wire extending from said transport tube; said lever arm operable to actuate said wire cutting means when said lever arm is moved from the upper to the lower position.

5. The invention of claim 4 having in combination therewith a shaft attached to said first jaw, a handle rotatably mounted on said shaft, and means to cause relative rotation between said handle and said shaft, said shaft being attached to said first jaw so that the tip of said first jaw is in axial alignment with said shaft.

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