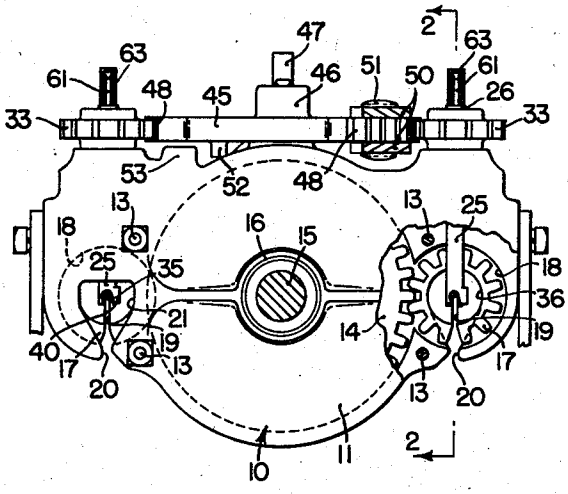
April 27, 1954 H. W. BLOSS 2,676,623

WIRE TYING MECHANISM

Original Filed July 2, 1945

FIG. 1



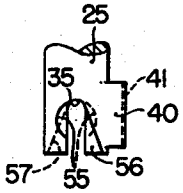
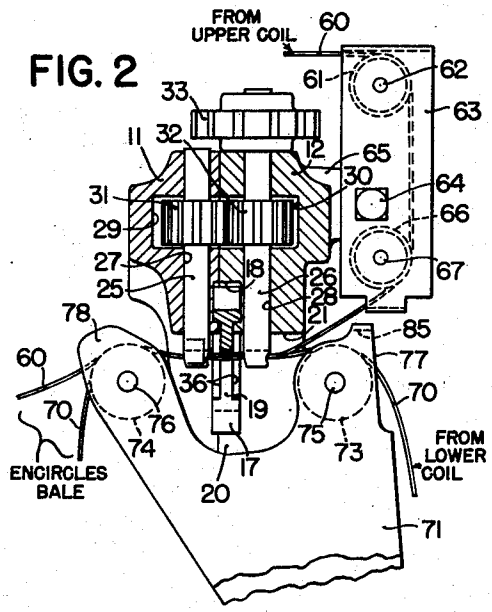


FIG. 7

FIG. 2



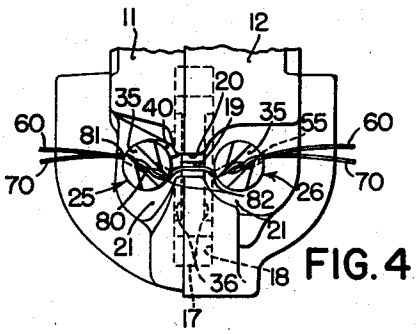


FIG. 4

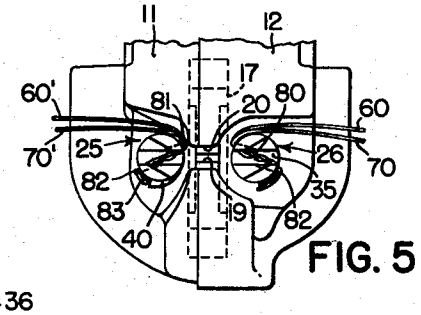


FIG. 5

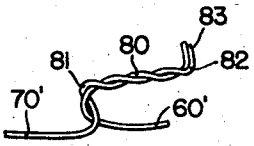


FIG. 6

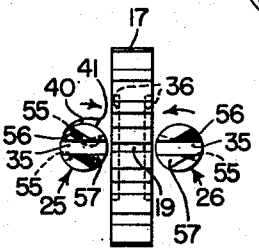


FIG. 3

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2,676,623

WIRE TYING MECHANISM

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Continuation of application Serial No. 602,810, July 2, 1945. This application September 16, 1949, Serial No. 116,038

6 Claims. (Cl. 140—93)

1

The present invention relates generally to wire-tying mechanism, with particular reference to mechanism used in connection with hay pick-up baling presses and is in the nature of an improvement over the mechanism disclosed in an application Serial No. 594,684, filed May 19, 1945, by Miles H. Tuft, now Patent No. 2,512,754.

The instant application is a continuation of my co-pending application, Serial No. 602,810, filed July 2, 1945, now abandoned.

In mechanism of this type, two strands of wire are received within a radially extending slot in a twisting gear and the gear is rotated to twist the strands together to form an elongated double-stranded twist that projects at both sides of the gear. Kinking members at opposite sides of the twisting gear have slots for loosely receiving the twisted strands. These kinking members are rotated about axes perpendicular to the axis of rotation of the twisting gear and thus bend or kink the twisted portions of the wire strands, conditioning them against untwisting and pulling apart. Simultaneously, the twisted portion is severed at the center thereof, by a shearing action between an edge of the slot in the twisting gear and an edge of the slot in one of the kinking members, thereby providing two separate knots or ties. The knot in the kinking member which does the severing thus has but one bend or kink therein, but the knot on the other side of the twisting gear has two spaced bends or kinks, because the end of the twist that lays in the twisting gear slot is pulled through and bent around the inner end of the slot in the proximate kinking member.

It has been found under test that the knot having two spaced bends is more resistant to untwisting and pulling apart than is the knot having only one bend therein. Hence, the principal object of this invention resides in the provision of novel and improved wire-tying mechanism that produces two knots or ties, each of which is bent or kinked at two spaced points in the twisted portion of the strands.

More specifically, an object of my invention relates to the provision of wire-tying mechanism which twists two strands of wire together, bends the twisted portion in four spaced points thereon, and severs the twisted portion adjacent the center thereof to provide two knots, each of which has a pair of spaced bends in the twisted portion thereof.

These and other objects and advantages of my invention will become apparent as a complete disclosure of a preferred embodiment of the in-

2

vention is made in the following description and drawings appended thereto, in which

Figure 1 is an end elevational view of a wire-tying device embodying the principles of the present invention and having a portion of the casing broken away to expose the twisting gear and one of the kinking members;

Figure 2 is a sectional view taken along the line 2—2 in Figure 1, showing the strands of baling wire and also showing the upper portion of the needle in tying position;

Figure 3 is a bottom plan view of the twisting gear and the two kinking members, showing the relative positions thereof, the casing being omitted;

Figure 4 is a bottom plan view of the tying mechanism on one side of the casing, showing the associated portion of the casing and also showing the strands of baling wire in place in the mechanism, the needle being omitted and the kinking members being shown in a partially rotated position;

Figure 5 is a view similar to Figure 4 but showing the kinking members in their extreme position wherein the twisted portions of the wire strands are kinked after having been severed;

Figure 6 is a perspective view of one of the completed knots; and

Figure 7 is an enlarged elevational view of the lower end of one of the kinking members.

Referring now to the drawings, the wire-tying mechanism includes a support or casing 10 comprising two complementary casing section 11 and 12 connected rigidly together by a plurality of bolts 13. The central portion of the casing 10 houses a drive gear 14, of comparatively large diameter, keyed to a drive shaft 15 journaled in a bearing 16.

A pair of twisting elements in the form of gears 17 are disposed on opposite sides of the drive gear 14, respectively, and have teeth meshing with the latter. Each of the twisting gears 17 is rotatably carried within a circular chamber 18 within the casing 10 and is supported on the ends of its teeth, which slidably engage the peripheral wall of the chamber 18. Each gear 17 is provided with wire-receiving means comprising a radially extending slot 19, which extends radially outwardly from the axis of rotation of the gear and between a pair of teeth of the gear, which teeth define an outwardly flaring opening to the slot 19 through which the wires can be shifted. The slot 19 at the center of the gear 17 is sufficiently wide to receive a strand of baling wire but not wide enough for two strands of wire

to pass each other in the slot; therefore, when two wires are placed within the slot 19 and the gear is rotated about its axis, the two strands of wire will be twisted together.

Normally, the slot 19 opens downwardly in register with a corresponding slot 20 in the bottom of the casing 10. The slot 20 communicates with the gear chamber 18 and extends upwardly on each side of the latter, where it is flared into an enlarged opening 21.

Disposed within the enlarged openings 21 on opposite sides of each of the twisting gears 17 is a pair of bending elements or kinking members 25 and 26, each of which comprises a shaft rotatable on an axis perpendicular to the axis of rotation of the associated twisting gear 17 and journaled in a corresponding passage 27 and 28 in the housing sections 11, 12, respectively. The kinking member shafts 25 and 26 extend upwardly at laterally opposite sides of the twisting gear 17, respectively, through gear chambers 29 and 30 in the casing 10, these chambers being in communication with each other to receive a pair of intermeshing drive gears 31 and 32, respectively, which are fixed to the kinker shafts 25 and 26. One of the shafts 26 extends through the top of the casing 10 and is keyed to a drive gear 33. Thus, rotation of the gear 33 effects rotation of the kinking member 26 which in turn drives the other kinking member 25 through the gears 31 and 32, the two kinking members rotating in opposite directions.

Each of the kinking members 25 and 26 is provided at its lower end with wire-receiving means in the form of a slot 35, extending diametrically across the end thereof and normally disposed in alignment with the slot 19 in the twisting gear 17 associated therewith; but the slots 35 are appreciably wider than the slot 19 and may receive the two strands of wire as they are moved into the twisting gear slot 19. The slots 35 provide sufficient clearance so that, when the twisting gear rotates, the wire strands within the slots 35 can twist freely without interference from the kinking members.

Each of the twisting gears 17 is provided with a central recessed portion 36 in each side thereof, so that, with the slots 35 in the kinking members 25 and 26 normally in alignment with the slot 19 in the gear 17, there is a space between the inner end of each slot 35 and the adjacent end of the slot 19. The kinking member 25 is provided with an axially extending, radially outwardly projecting cutting means 40 that has an axially extending cutting edge 41 (see Figure 3), which is moved by rotation of the kinking member 25 into cooperative shearing relation with the edge of the slot 19 in the twisting gear 17. Hence, when the kinking member 25 rotates in a clockwise direction (as viewed in Figure 3), the cutting edge 41 approaches the indented side 36 of the gear 17 and cuts or severs the wire strands at the adjacent end of the slot 19. The cutting means or element 40 is spaced peripherally around the side of the kinking member 25 to position the cutting edge 41 in angularly spaced relation to the slot 35, for the purpose of postponing or delaying the severing action until the kinking member has rotated through a sufficient angle to at least partially bend or kink the twisted strands of wire. After the strands have been severed, the kinking members 25 and 26 continue to rotate until each has rotated through an angle of approximately 180 degrees to complete the kinking of the twisted strands. The kinkers then reverse their direction of movement and return to their original positions.

The kinkers are oscillated in this manner by a horizontal drive gear 45 having a hub 46 which is journaled on a vertical spindle 47 fixed to the gear casing 10. The gear 45 has teeth 48 which mesh with the pinions 33 on the kinking members 26, and therefore an oscillation of the gear 45 rotates the kinking members 26 first in one direction and then in the other. The kinking members 25 are rotated simultaneously by means of the meshing gears 31 and 32. This oscillatory movement of the gear 45 is imparted by means of a link comprising a pair of strap members 50 disposed above and below the gear 45 and pivotally connected thereto by means of a pivot bolt 51. The means for actuating the link members 50 does not form an essential part of the present invention and therefore is not described herein in detail. It is sufficient to say that the link members 50 are reciprocated after the twisting gear 17 has been rotated to twist the wire strands together, and a pair of stops 52 and 53 on the bottom of the gear 45 and the top of the casing 10, respectively, prevent the gear 45 from being rotated through a greater extent than is necessary to move the kinking members through 180 degrees each.

In order that the twisted wire strands will be retained within the slots 35 in the kinking members 25 and 26 during angular movement of these members, the walls of the slots 35 are undercut, as indicated at 55, on the sides of the slots that engage the twisted strands during that part of the angular movement of the kinking members in which the twisted portions are being bent. Each undercut portion 55 is formed preferably by the drilling of a hole transversely through the kinking member at an angle to the slot 35. An angle of 15 degrees between the axis of the hole 55 and the axis of the slot 35 will give satisfactory results.

When the kinking members reverse their direction of rotation, the twisted strands, which are now bent at two spaced points at each side of the twisting gear 17, engage the sides of the slots 35 which are not undercut. During this return movement, the twisted and kinked wires are ejected downwardly from the slots 35, this ejecting action being effected by beveled portions 56 and 57 along the edges of the slots 35, which portions bear against the wires during the return movement and provide inclined camming surfaces which, while the kinkers are being returned to their normal position, act to force the twisted portions of the wires downwardly out of the slots.

The wire for each bale tie is fed from a pair of coils of wire (not shown), disposed respectively above and below the bale case. The wire from the upper coil is shown at 60 and passes downwardly over a sheave 61 mounted on a shaft 62 journaled in a bracket 63. The bracket 63 is attached by a bolt 64 to a supporting lug 65 on the casing portion 12. The wire 60 passes downwardly under a second sheave 66 mounted on a shaft 67 journaled on the bracket 63. From the sheave 66, the wire 60 extends through the slot 20 in the housing and lies in the aligned slots 19 and 35 in the twisting gear 17 and the kinking members 25 and 26, respectively, whence the wire 60 extends laterally toward the left, as viewed in Figure 2, over the top of a bale being formed (not shown).

A wire strand 70 from a lower coil (not shown) extends outwardly along a needle 71, only the

upper end of which is shown in Figure 2, and passes over a pair of spaced sheaves 73 and 74 mounted on stub shafts 75 and 76 journaled in a pair of spaced fingers 77 and 78, respectively, at the end of the needle. From the sheave 74, the wire strand 70 passes along the bottom of the bale and up the outer end thereof, at which point it is tied to the upper wire 60 by a knot that was formed in the preceding tying operation, as will be made clear presently.

While the bale is being formed, the needle is retracted below the bale case and the bale is formed between the upper and lower wire strands 60 and 70; and when the bale attains a predetermined length, the needle 71 is moved upwardly to bring the lower strand 70 up along the end of the bale. As the needle moves into the position shown in Figure 2, the strand 70 is shifted upwardly through the slot 19 in the twister gear 17 and into the two aligned slots 35 in the kinking members 25 and 26. It is to be noted that there are two such needles 71 which move simultaneously and bring two parallel wires 70 upwardly into the opposite sides of the tying mechanism case 10.

The drive shaft 15 is then rotated through one revolution, turning the twister gears 17 through three revolutions; and, since the slot 19 in each of the twister gears 17 is but slightly wider than the diameter of one of the wires, the two double-stranded wires lie in close proximity and are twisted by the rotation of the gear 17 into a relatively elongated double-stranded helix or twist which has contiguous twisted portions 80 extending in both directions from the gear 17. The slots 35 in the kinking members are, as stated above, large enough to permit the wires to twist therein without interference.

As soon as the twister gears 17 cease rotating, the horizontal gear 45 is oscillated by reciprocation of the link 50 through a sufficient range to turn the pinions 33 through 180 degrees each and then to return them to their original positions. As shown in Figure 4, as soon as the kinking members begin to turn while the twister gear 17 is held stationary, the twisted portion 80 at each side of the twister gear is bent at two spaced points 81, 82 at opposite ends of the slot 35 in which such twisted portion is lying. Thus, the elongated double-stranded twist is engaged and bent at four points spaced lengthwise thereof to provide two pairs of bends, one pair at each side of the twisting gear 17. It will be noted that each of the short lengths of wire strands 83 which span the space between the kinking member 25 and the twister gear 17 is bent substantially at right angles to the twisted portion 80, which lies in the slot 35 of the kinking member 25, before the wires are severed by the cutting edge 41 on the cutting element 40. This result follows because the cutting edge 41 is spaced peripherally around the side of the kinking member 25 from the end of the slot 35 and the undercut portion 55.

Further rotation of the kinking members causes the cutting edge 41 to act in cooperation with one edge of the slot 19 in the twisting gear 17 to sever the double-stranded twist intermediate the second and third bends, after which the kinking members continue to move angularly, as indicated in Figure 5, until each slot 35 is turned through an angle of 180 degrees, thereby wrapping the wires 60, 70 around the kinking members to form the inner bend 81 of substantially 90 degrees. The kinking members are then moved angularly back to their original positions, during which movement the beveled portions 56, 57 engage the twisted portions 80 and force them out of the slots 35.

It will now be observed that two knots or twisted portions 80 have been tied and cut apart. One-knot joins the two ends 60', 70' of the wire strand which encircles the bale, leaving the upper and lower strands 60, 70 from the wire coils tied together by the other knot, and each of the knots has been bent or kinked at two spaced points 81, 82. When the needle 71 is retracted downwardly out of the bale case, the bale encircling strands 60', 70' slip off the end of the needle, and the two strands of wire 60, 70 from the wire coils extend vertically through the bale case, ready to receive the new charge of crop material to form a new bale. The wire strand 70 is retained in engagement with the sheave 73 by means of a retaining loop 85 in the end of the finger 77 of the needle 71.

What is claimed is:

1. In wire-tying mechanism, the combination of a rotatable twisting member for receiving a plurality of strands of wire or the like and twisting them together, a rotatable kinking member disposed adjacent said twisting member and having means providing thereon a portion transverse to its axis of rotation for receiving said strands and rotatable after the latter have been twisted to bend the twisted portion at two spaced points, and a cutting element mounted on said kinking member and rotatable therewith into cooperative cutting relation with a portion of said twisting member for severing the twisted portion therebetween, and means for effecting rotation of the kinking member, said cutting element being so positioned peripherally on said kinking member that the latter must rotate through a portion of a revolution before said cutting element and said twisting member are brought into severing relation, to thereby delay the severing of said strands until the latter are at least partially bent.

2. In wire-tying mechanism, the combination of a rotatable twisting member having a radially extending slot therein for receiving a plurality of strands of wire or the like and twisting them together by rotation of said member, a kinking member disposed adjacent said twisting member and rotatable about an axis generally perpendicular to the axis of rotation of said twisting member, said kinking member having a recess normally disposed in alignment with said slot and adapted to receive said strands loosely, permitting the latter to be twisted therein, means for effecting rotation of said kinking member to bend or kink the twisted portion of said strands, and a cutting element mounted on said kinking member and having an edge cooperable with an edge of said slot in said twisting member to sever said strands, said cutting edge being spaced peripherally on said kinking member from said receiving recess to delay the severing of said strands until the twisted portion has been bent.

3. In wire-tying mechanism, the combination of a rotatable twisting member having a radially extending slot therein for receiving a plurality of strands of wire or the like and twisting them together by rotation of said member, a kinking member disposed adjacent said twisting member and rotatable about an axis generally perpendicular to the axis of rotation of said twisting member, said kinking member having a slot in one end thereof normally disposed in alignment with said slot in said twisting member and adapted to receive said strands loosely, permitting the latter to be twisted therein, means for effecting

rotation of said kinking member to bend or kink the twisted portion of said strands at each end of said slot therein, said kinking member being spaced from said twisting member to provide a short length of said twisted strands therebetween, and a cutting element mounted on said kinking member and projecting radially beyond the end of said slot therein to a cutting edge cooperable with an edge of said slot in said twisting member to sever said strands, said cutting edge on said kinking member being spaced peripherally on the latter from said slot therein to delay the severing of said strands until the member has been rotated through a sufficient angle to bend the twisted portion.

4. In wire-tying mechanism, the combination of a rotatable twisting member having a radially extending slot therein for receiving a plurality of strands of wire or the like and twisting them together by rotation of said member, a pair of kinking members disposed on laterally opposite sides of said twisting member, respectively, and rotatable about axes generally perpendicular to the axis of rotation of said twisting member, said kinking members each having a slot in one end thereof normally disposed in alignment with said slot in said twisting member and adapted to receive said strands loosely, permitting the latter to be twisted therein, means for effecting rotation of said kinking members to bend or kink the twisted portions of said strands on both sides of said twisting member, each of said portions being thus bent at both ends of the slot in the respective kinking members, and a cutting element mounted on one of said kinking members and having a cutting edge cooperable with an edge of said slot in said twisting member to sever said strands between the twisted portions, said cutting edge on said kinking member being spaced peripherally on the latter from said slot therein to delay the severing of said strands until said kinking members have been rotated through a sufficient angle to bend the twisted portions.

5. In wire-tying mechanism, the combination of a rotatable twisting member in the form of a gear having a slot therein extending to the center thereof for receiving a plurality of strands of wire or the like and twisting them together by rotation of said gear, a pair of kinking members disposed on laterally opposite sides of said twisting gear, respectively, each of said kinking members comprising a generally cylindrical stub shaft rotatably disposed on an axis substantially perpendicular to the axis of rotation of said twisting gear and having a slot in one end thereof normally aligned with the inner end of said gear slot for receiving said strands and enlarged to permit the latter to be twisted therein, means for

effecting rotation of the kinking members to bend or kink the twisted portions of said strands on both sides of said twisting gear, each of said portions being thus bent at both ends of the slot in the respective kinking member, said kinking members being spaced from the sides of said twisting gear to permit said strands to bend around said stub shafts between the latter and said slot in the gear, and an axially extending cutting element mounted on one of said stub shafts and projecting radially outwardly therefrom to provide a cutting edge cooperable with one edge of said slot in said twisting gear to sever said strands therebetween, said cutting edge on said kinking member being spaced peripherally on the latter from said slot therein to delay the severing of said strands until said kinking members have been rotated through a sufficient angle to bend the twisted portions.

6. In wire-tying mechanism, the combination of twisting means for receiving a plurality of strands of wire or the like and twisting them together to form an elongated double-stranded twist, a pair of kinking members disposed on laterally opposite sides of said twisting member, respectively, and rotatable about generally parallel axes substantially normal to the length of the double-stranded twist, said kinking members each having a slot in one end thereof to receive said twist, means for effecting rotation of said kinking members to bend or kink the twist on both sides of said twisting member, each of said portions being thus bent at both ends of the slot in the respective kinking member, and a cutting element mounted on one of said kinking members and having a cutting edge cooperable with an edge of said slot in said twisting member to sever said strands between the twisted portions, said cutting edge on said kinking member being spaced peripherally on the latter from said slot therein to delay the severing of said strands until said kinking members have been rotated through a sufficient angle to bend the twisted portions.

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