Feb. 8, 1949. K. E. SCHULZE 2,460,846

WIRE TYING MACHINE

Filed Oct. 5, 1946 5 Sheets-Sheet 1

Fig. 1.

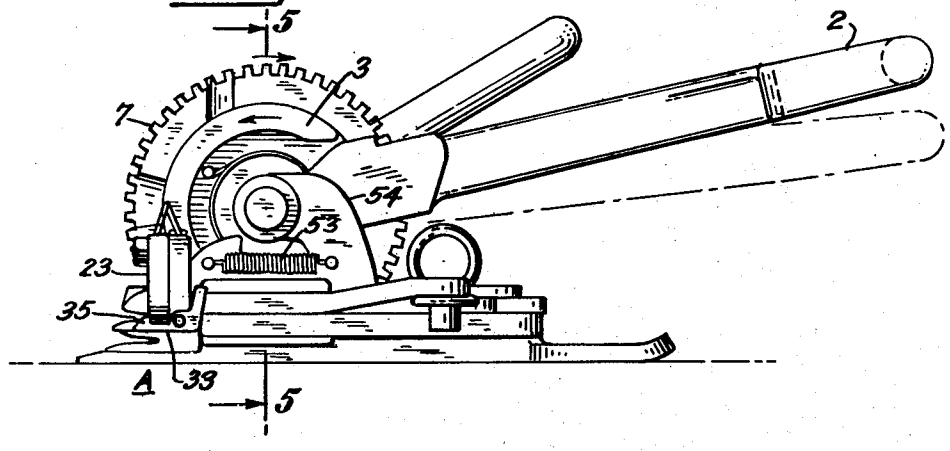


Fig. 2.

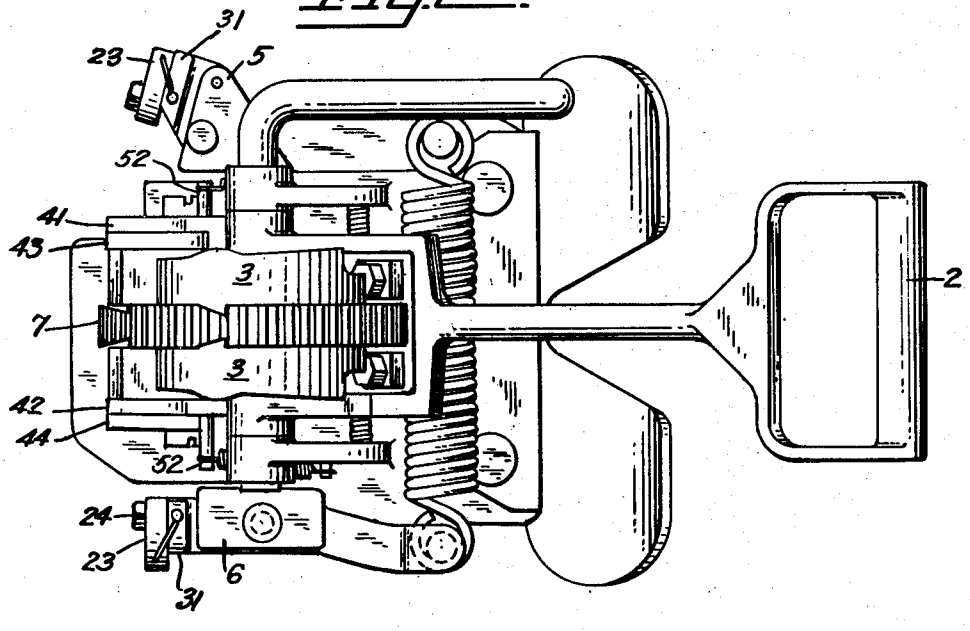
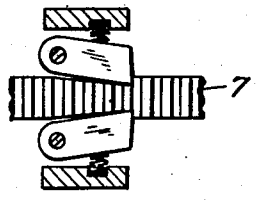


Fig. 9.



INVENTOR.
KURT E. SCHULZE
BY
Stephen S. Townsend
ATTORNEY

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Fig. 3.

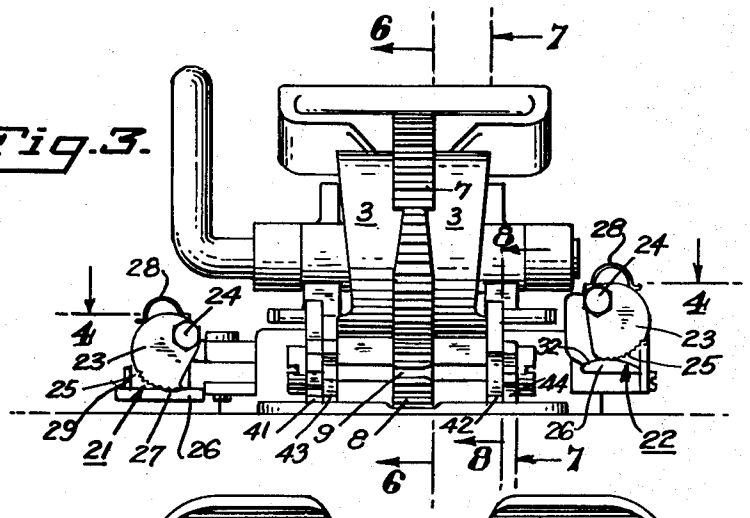


Fig. 4.

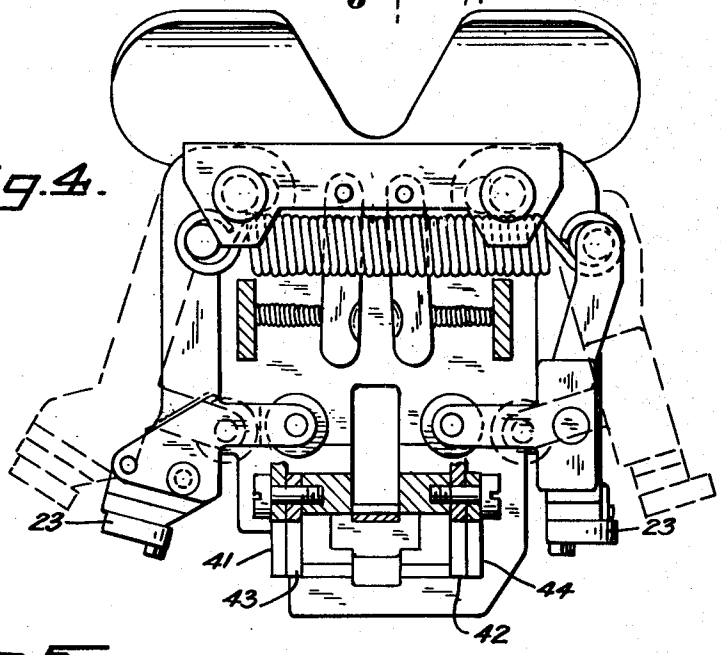
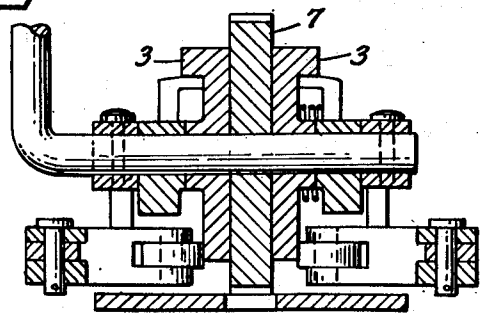


Fig. 5.



INVENTOR.
KURT E. SCHULZE
BY
Stephen S. Townsend
ATTORNEY

Feb. 8, 1949. K. E. SCHULZE 2,460,846

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Fig. 6.

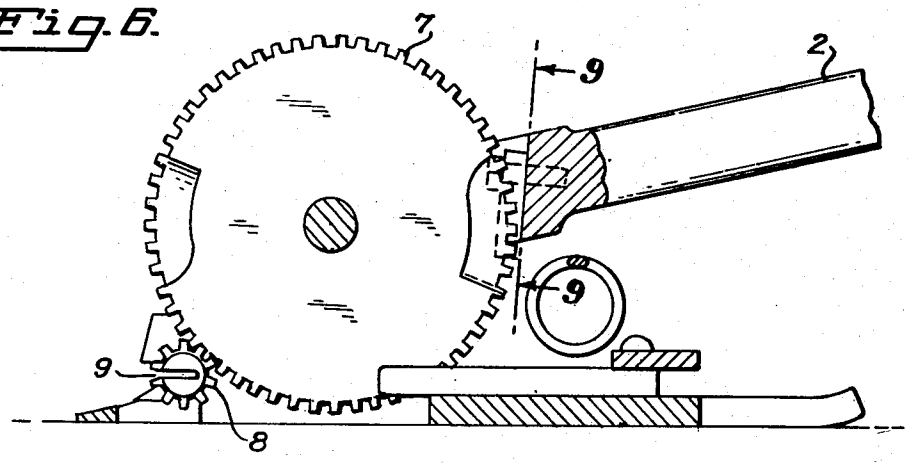


Fig. 7.

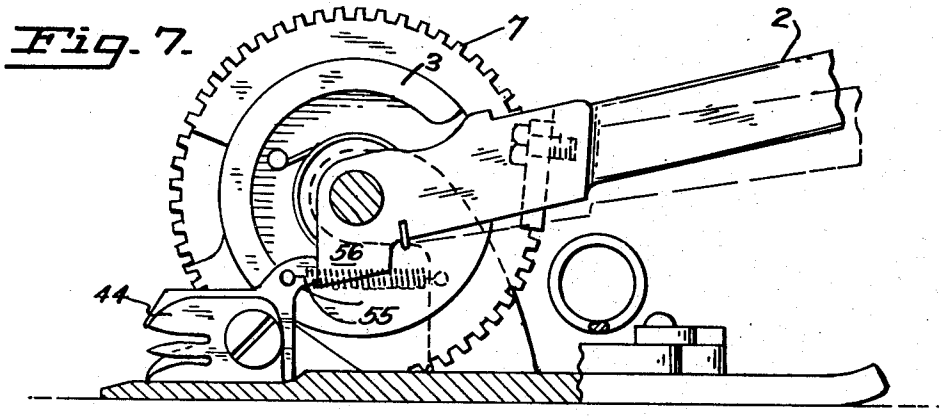
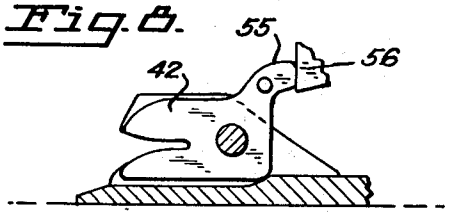


Fig. 8.



INVENTOR.
KURT E. SCHULZE
BY
Stephen S. Townsend
ATTORNEY

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WIRE TYING MACHINE

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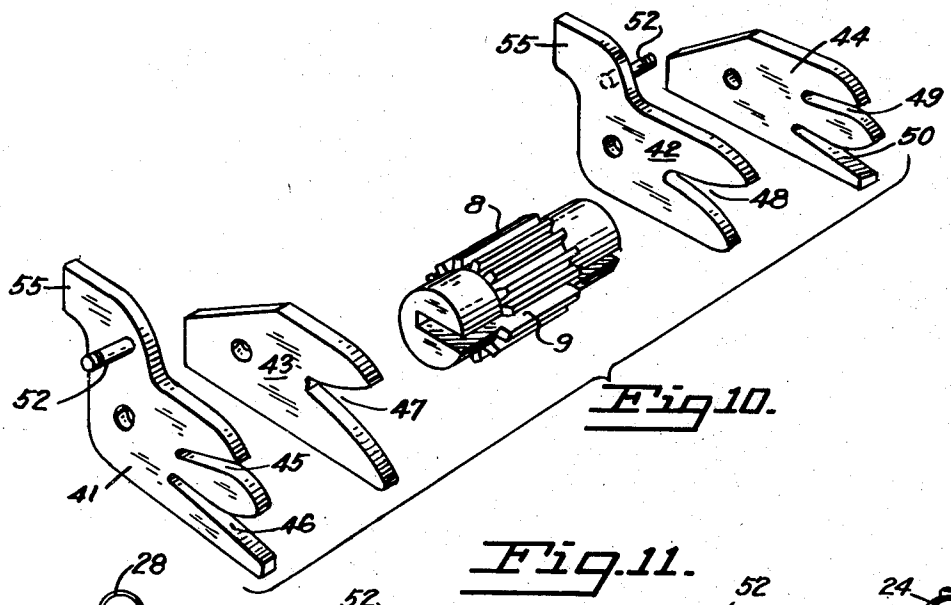


Fig. 10.

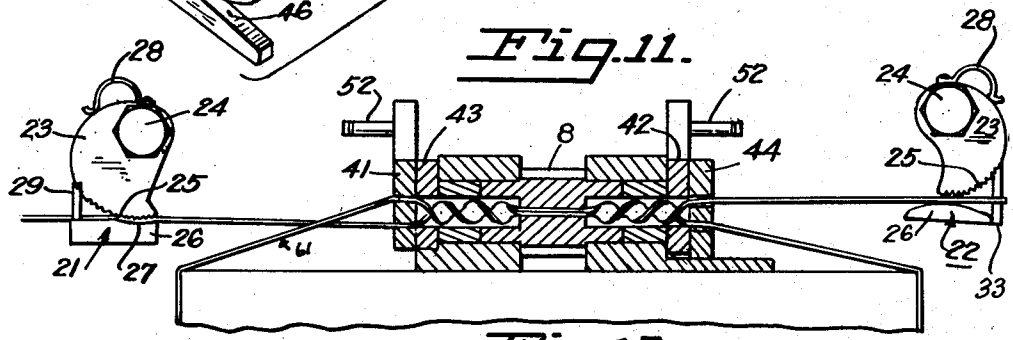


Fig. 11.

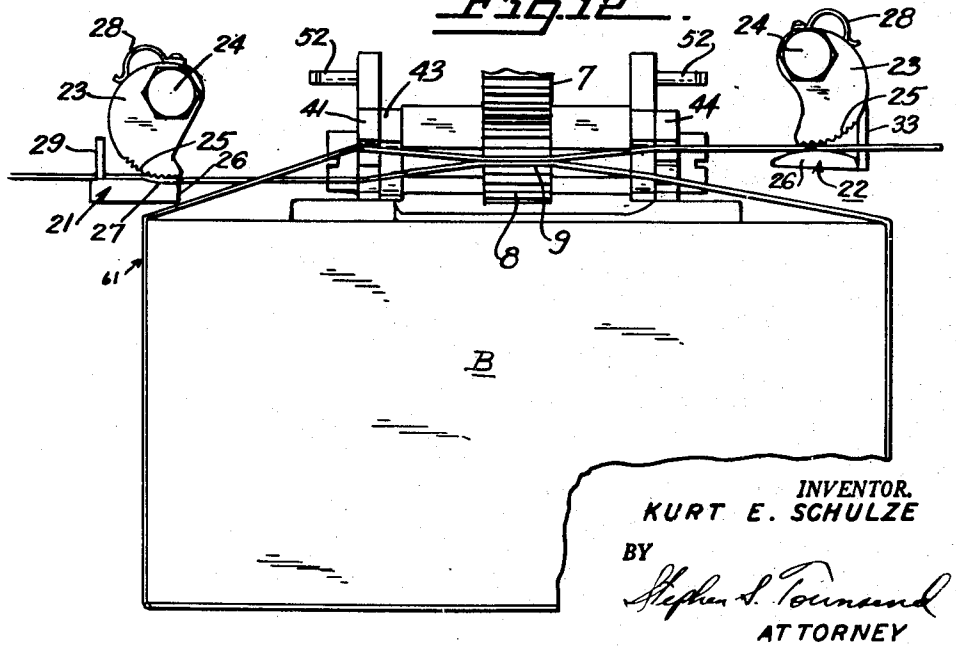


Fig. 12.

INVENTOR.
KURT E. SCHULZE
BY
Stephen S. Townsend
ATTORNEY

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WIRE TYING MACHINE

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Fig. 13.

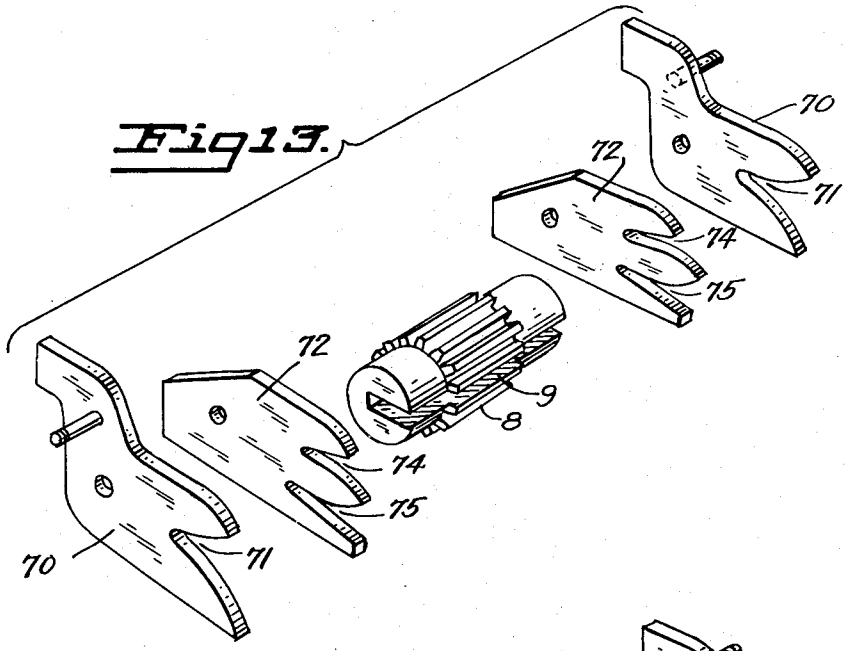
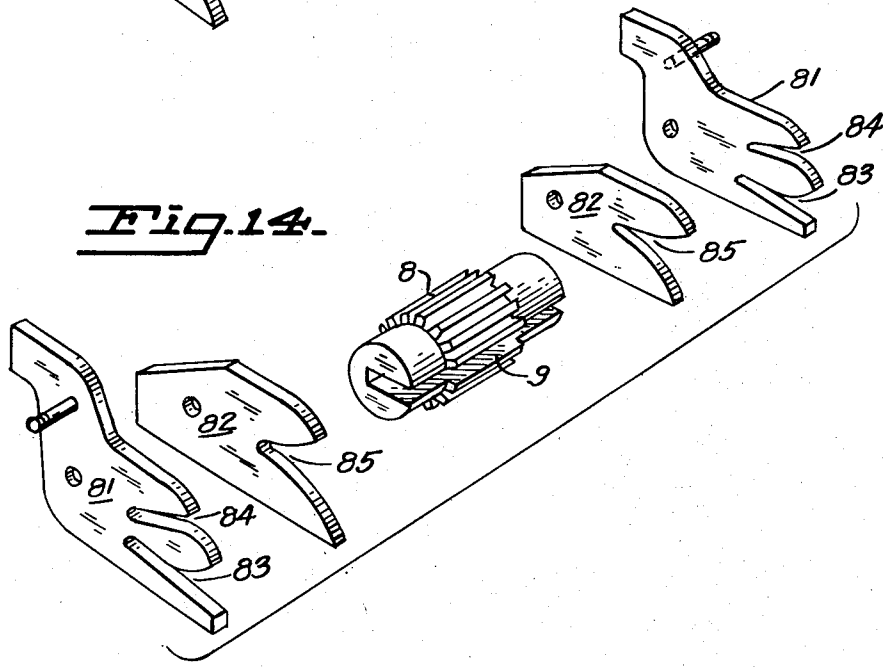


Fig. 14.



INVENTOR.
KURT E. SCHULZE
BY
Stephen Townsend
ATTORNEY

Patented Feb. 8, 1949

2,460,846

UNITED STATES PATENT OFFICE

2,460,846

WIRE TYING MACHINE

Kurt Eric Schulze, San Francisco, Calif., assignor to Ernest Roe, doing business as Coast Wire Company, San Francisco, Calif.

Application October 5, 1946, Serial No. 701,530

15 Claims. (Cl. 140—93)

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This invention relates to wire tying machines, and more particularly to improvements in wire tying machines of the character utilized to secure a flat wire or band around a box, package, bundle, or the like.

It is desirable, on occasion, to utilize a flat wire or band, as distinguished from conventional round wire, to tie or strap packages, as for example, to prevent cutting of relatively soft material from which a container may be fabricated.

The object of the present invention is to provide a machine for tightening and securing a flat wire or band around a box, or the like, and cutting the ends of the wire after completion of the tie. More specific objects of the invention are to provide means to cut the ends of the flat wire, after completion of the tie; and to provide gripping means to tighten the flat wire band and hold the said wire taut during the tying operation. A further object of the invention is to provide a machine of the character mentioned, which is portable, simple to operate, relatively inexpersive to manufacture, and which is sturdy of construction.

Other objects and advantages of the invention will become apparent upon reference to the specification and drawings, in which similar characters of reference represent corresponding parts in the several views.

Referring to the drawings:

Fig. 1 is a side elevational view of a portable wire tying machine of the character embodying the invention.

Fig. 2 is a top plan view thereof.

Fig. 3 is a front elevational view thereof.

Fig. 4 is a sectional view taken on line 4—4 of Fig. 3.

Fig. 5 is a sectional view taken on line 5—5 of Fig. 1.

Fig. 6 is a sectional view taken on line 6—6 of Fig. 3.

Fig. 7 is a sectional view taken on line 7—7 of Fig. 3.

Fig. 8 is a fragmentary sectional view taken on line 8—8 of Fig. 3.

Fig. 9 is a sectional view taken on line 9—9 of Fig. 6.

Fig. 10 is an exploded view of the wire cutting members, guide members and twisting gear.

Fig. 11 is a front elevational view, partly in section, illustrating the cutting and gripping members.

Fig. 12 is a front elevational view similar to Fig. 11 but prior to the formation of the wire tie and tightening of the wire.

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Fig. 13 is an exploded view of a modified arrangement of the wire cutting members and twisting gear.

Fig. 14 is an exploded view of a further modified arrangement of the wire cutting members and twisting gear.

The machine may comprise any suitable structure of the general character disclosed in United States Letters Patent No. 1,545,407, issued July 7, 1925, to C. L. Drew et al., which consists, generally, of a portable tool constructed to rest on a package, or the like, to be strapped, and provided with means for tightening a wire around the package, means for twisting together the wire to form a tie, and means for cutting off the ends of the wire extending beyond the tie, and a single operating lever. Movement of the lever from its normal position serves to tighten the wire and movement of the lever in a reverse direction serves to tie the wire and cut the end portions thereof.

As mentioned, the present invention comprises essentially improvements in the wire gripping means adapted to grip the wire during tightening thereof and in the means for cutting the wire end portions after completion of the tie, bearing in mind that the instant invention relates to machines for tying flat, usually relatively small gauge, wire as distinguished from conventional round wire.

The machine comprises an operating handle 2, adapted to be moved forwardly from the neutral position indicated in Fig. 1 toward the tying end of the machine, indicated generally at A. Forward movement of the handle 2 causes cam 3 to rotate in the direction of the arrow (Fig. 1), thereby causing pivotally mounted arms 5 and 6 to move laterally away from the machine, which, when the wire is positioned properly in the machine, causes the wire to be tightened around the package to be tied. Movement of the handle 2 in a reverse direction, i. e. away from the tying end A of the machine to neutral position (Fig. 1), causes rotation of gear 7 in the direction of the arrows (Fig. 1), which, in turn, imparts a rotative movement to wire twisting gear 8 provided with a wire receiving slot 9, which, when the wire is positioned properly in the machine, causes the tie to be formed. Further movement of the handle 2 to the position indicated in dotted lines in Figs. 1 and 7 actuates the cutting means.

The above elements and functions are described in detail in United States Letters Patent No. 1,545,407, previously mentioned. I will now refer

more particularly to the gripping and cutting means which comprise the herein invention.

The wire gripping means comprises a left gripper, generally indicated at 21, and a right gripper, generally indicated at 22, carried by arms 5 and 6, respectively. The grippers 21 and 22 each comprises a mutilated disk 23 mounted pivotally and eccentrically, as at 24, on the free ends of arms 5 and 6. The peripheries of the disks are knurled, as at 25, to engage and hold the flat wire against the bed, generally indicated at 26, of the said arms 5 and 6, as indicated in Figs. 11 and 12. The bed 26 underlying gripper 21 is preferably formed with a slight concavity, as at 27, to insure a tighter and easier wire gripping action. Preferably, a spring tension member 28 is provided to bias normally the grippers into closed or gripping position. An upwardly projecting peg 29 is preferably provided on the bed underlying gripper 21 and spaced from the vertical arm wall 31 to which the disk is connected in order to prevent lateral movement of the wire relative to the gripping surface 25.

The bed 26 underlying gripper 22 is preferably inclined, as at 32, in order to provide for easy positioning of the wire for gripping thereof. A notched lever 33, pivoted to vertical arm wall 31 of arm 6, is preferably provided to prevent lateral movement of the wire away from engagement with the gripping surface 25. The lever 33 may be provided with spring means to urge the said lever into the wire retaining position indicated in Fig. 1 and the front end of the lever may be inclined, as at 35, to allow the wire to cam thereover into the notch when moved laterally thereagainst.

The wire cutting means comprises movable blade members, generally indicated at 41 and 42 and positioned, respectively, outside and inside stationary guide members, generally indicated at 43 and 44 disposed at opposite ends of twisting gear 8. The movable cutter blade 41 is illustrated as provided with an upper relatively narrow wire receiving slot 45 and a lower relatively narrow wire receiving slot 46, while adjacent stationary guide member 43 is illustrated as provided with a relatively deep inclined wire receiving slot 47. Blade 42 is provided with a relatively deep inclined slot 48, similar to guide member 43, and adjacent guide member 44 is provided with relatively narrow upper and lower slots 49 and 50 similar to cutter blade 41. It is noted that the members, whether cutter or guide, provided with two wire receiving portions or slots are disposed outside the single slot members.

Cutter blades 41 and 42 are pivotally mounted relative to the frame of the machine and stationary guide members 43 and 44 and are provided with laterally protruding pins 52 which, in turn, are connected to coil spring 53 attached to the rigid ears 54 carried by the frame of the machine. The springs 53 operate normally to bias the blades into open or wire receiving position, as indicated in Figs. 1 and 7 in full lines. It is noted that the blade members are provided with strike portions 55 adapted to abut against lugs 56 carried by handle 2 at the lower pivoted end thereof. Figs. 1 and 7 illustrate that movement of the handle 2 to the dotted line position which will move the blade 42 to the dotted line cutting position. Blade 41 is similarly moved.

It is noted that lower slot 46 of blade member 41 in normal position lies in substantially the same horizontal plane as the bottom of slot 47 of stationary guide member 43. The top of slot 48 of blade member 42, in normal position, lies in substantially the same horizontal plane as the upper slot 49 of stationary guide member 44. Downward movement of blade members 41 and 42 relative to guide members 43 and 44 cause a scissors cutting action to occur as between slots 46 and 47 on the one hand and slots 48 and 49 on the other. No cutting action results as between slots 45 and 47 and as between slots 48 and 50 because of the relative positioning of said slots and the fact that the movable blade members are limited in pivotal movement by the bottom surfaces thereof striking against the base of the frame of the machine or in some other suitable fashion, whereby the pivotal movement of the cutter members is limited to prevent movement of the top of slot 45 downwardly beyond the horizontal plane of the bottom of slot 47 and to prevent movement of the top of slot 50 beyond the horizontal plane of the bottom of slot 48.

In operation, the machine is conventionally positioned on the top portion of a package B to be tied. Referring to Figs. 11 and 12, the end of a flat wire, indicated generally at 61, is inserted under disk 23 of gripper 21 and the gripper exerts a compressive action against the wire to clamp it releasably in position. The wire is then fed through lower slot 46 of cutter member 41, slot 47 of guide member 43, slot 9 of gear 8, slot 48 of cutter member 42, lower slot 50 of guide member 44, thence around the package B, then through upper slot 45 of cutter blade 41, slot 47, slot 9 where it crosses over itself, slot 48 of cutter 42, upper slot 49 of guide 44 and thence under disk 23 of gripper 22 where it is held and gripped in position.

It is noted that various arrangements of the cutter and guide members may be utilized to produce the necessary scissors action to cut the wire ends after formation of the tie. For example, in Fig. 13 the movable cutter members 70 may be disposed nearest the gripper (not shown) and each may be provided with a single wire receiving portion 71, while the adjacent stationary members 72, positioned on the inside of the cutters, are provided with a plurality of slots 74 and 75 arranged so that movement of the cutter members relative to the stationary member acts to cut the wire disposed in one of the wire receiving slots 74 of said guide member but not a wire positioned in another slot 75 of said stationary guide member, or in Fig. 14 the movable cutter members 81 may each be provided with a plurality of wire receiving slots 83 and 84 and the stationary guide members 82 with a single slot 85 and arranged so that relative movement therebetween causes cutting of wire disposed in one slot 83 of each cutter but not another slot 84.

When the handle 2 is moved forwardly toward the tying end A of the machine, arms 5 and 6 swing laterally from the machine (Fig. 11) and dotted lines (Fig. 4), thereby tightening the wire positioned around the package B. When the handle 2 is moved in reverse to its normal full line position (Fig. 1), the wire twisting gear 8 is rotated, thereby twisting the ends of the wire together to form a tie (Fig. 11). When the handle is moved to the dotted line position (Figs. 1 and 7), the movable cutter members 41 and 42 are moved by pressure of lugs 56 thereagainst to cut the wire ends and the package tie is complete.

It is noted that gripper 21 is illustrated as mounted at an oblique angle relative to the axis of rotation of twisting gear 8. It is sometimes preferable to mount gripper 22 at a similar angle

in order to facilitate positioning of wire in gripping position or to prevent bending of the wire end upon return of arm 6 to neutral or full line position indicated in Fig. 11. Further, it is noted that the bottom of gripper 22 lies in substantially the same horizontal plane as upper slot 49 of guide member 44.

As previously indicated, this invention lies in the provision of improved means to grip and hold flat wire, namely, the grippers 21 and 22, and, again, in the provision of means to cut the ends of flat wire without severing the package encircling portions of the wire. Heretofore known methods of gripping and cutting round wire are not usable with respect to flat wire ties.

While I have described the invention in more or less specific detail for purposes of clarity of illustration, example, and description, various changes, modifications and alterations may be made and practiced within the spirit of the invention as defined in the appended claims.

I claim:

1. In a wire tying machine having a wire twisting gear and means to rotate said gear to twist wires together to form a tie, the combination of means to cut the ends of said wires twisted together to form a tie comprising a member having at least two wire receiving portions and a member having a single wire receiving portion arranged side by side adjacent to each end of said twisting gear, and means to move one of said members relative to an adjacent said member to produce a scissor action therebetween, one of said wire receiving portions arranged with respect to another said portion and said single wire receiving portion so that wire disposed in one said portion is cut but not wire disposed in another said portion upon movement of said members relative to one another.

2. In a device of the character described having a wire twisting gear provided with a longitudinal wire receiving slot adapted to twist wires together to form a tie, means to cut the ends of a wire twisted together to form a tie comprising at least two members each having an upper and a lower wire receiving portion and at least two members each having at least one wire receiving portion, said members arranged in pairs whereby a member having two wire receiving portions is disposed beside a single wire receiving portion member and adjacent to opposite ends of said twisting gear, and means to cause relative movement between each member of each said pair of members, said wire receiving portions of said members arranged with respect to one another so that wire disposed in one wire receiving portion of a member having a plurality thereof is cut but not wire disposed in another wire receiving portion of said member upon relative movement of said members.

3. A device according to claim 2 and wherein said wire receiving portions provided in said members lie normally in substantially the horizontal plane of said longitudinal slot provided in said twisting gear.

4. In a device of the character described, means to cut the ends of wires twisted together to form a tie comprising a pair of movable cutter members, means to move said cutter members, one of said cutter members having a pair of vertically spaced wire receiving slots, and a pair of guide members, one of said guide members having a pair of vertically spaced wire receiving slots positioned adjacent to one of said guide members and the other of said cutter members

positioned adjacent to the other of said guide members, said slots of said guide and cutter members arranged with respect to one another so that wire disposed in one slot of a member having a plurality thereof is cut but not wire disposed in another slot of said member upon movement of said movable cutter member relative to an adjacent guide member.

5. In a device of the character described, means to cut the ends of wires twisted together to form a tie comprising a pair of movable cutter members, means to move said cutter members, and a pair of guide members, a pair of vertically spaced wire receiving portions formed in one cutter member and in one guide member, a single wire receiving portion formed in said other cutter member and in said other guide member, said cutter having two wire receiving portions disposed side by side with said guide member having a single wire receiving portion and said cutter having a single wire receiving portion disposed side by side with said guide having two wire receiving portions, said wire receiving portions of said guide and cutter members arranged with respect to one another so that wire disposed in one wire receiving portion of a member having a plurality thereof is cut but not wire disposed in another wire receiving portion of said member upon movement of said movable cutter member relative to an adjacent guide member.

6. In a wire tying machine having a wire twisting gear and means to rotate said gear to twist wires together to form a tie, the combination of means to cut the ends of said wires twisted together to form a tie comprising a member having at least two vertically spaced wire receiving portions and a member having a single wire receiving portion arranged side by side adjacent to each end of said twisting gear, said members having at least two wire receiving portions disposed outside of said members having a single wire receiving portion, and means to move one of said members relative to an adjacent said member to produce a scissor action therebetween, said wire receiving portions of said member arranged with respect to one another so that wire disposed in one wire receiving portion of each member having a plurality thereof is cut but not wire disposed in another wire receiving portion of said member upon movement of a member relative to an adjacent member.

7. In a wire tying machine having a wire twisting gear and means to rotate said gear to twist wires together to form a tie, the combination of means to cut the ends of said wires twisted together to form a tie comprising a member having at least two vertically spaced wire receiving portions and a member having a single wire receiving portion arranged side by side adjacent to each end of said twisting gear, said members having at least two wire receiving portions disposed inside of said members having a single wire receiving portion, and means to move one of said members relative to an adjacent said member to produce a scissor action therebetween, said wire receiving portions of said members arranged with respect to one another so that wire disposed in one wire receiving portion of each member having a plurality thereof is cut but not wire disposed in another wire receiving portion of said member upon movement of a member relative to an adjacent member.

8. In a wire tying machine having means to tension wire comprising an arm movable laterally

from said machine and means to move said arm, a gripper for flat wire carried by said arm and comprising a pivotally and eccentrically vertically mounted disk having a wire gripping surface overlying a portion of said arm, resilient means to urge said disk into contact with said portion of said arm, and means comprising a peg carried by said arm to limit lateral movement of the wire relative to said gripping surface of said disk.

9. In a wire tying machine having means to tension wire comprising an arm movable laterally from said machine and a wire twisting gear having a longitudinal wire receiving slot provided therein and means to rotate said gear to twist the ends of wire together to form a tie, a gripper for gripping wire carried by said arm and comprising a pivotally and eccentrically, vertically mounted, mutilated disk having a wire gripping surface overlying a portion of said arm, means to urge said wire gripping surface into contact with said portion of said arm comprising a spring tension member, said gripping surface lying normally in substantially the same horizontal plane as the said longitudinal slot, and means comprising stop means carried by said arm to limit lateral movement of a wire relative to said gripping surface.

10. In a wire tying machine having means to tension wire comprising an arm movable laterally from said machine and a wire twisting gear having a longitudinal wire receiving slot provided therein and means to rotate said gear and move said arm laterally from said machine, the combination of means to cut the ends of said wires twisted together to form a tie comprising a member having a wire receiving portion and another member having a plurality of vertically spaced wire receiving portions disposed side by side adjacent to each end of said twisting gear, means to move one of said members relative to an adjacent said member to produce a scissor action therebetween, a gripper for gripping flat wire during tensioning thereof carried by said arm and comprising a pivotally and eccentrically, vertically mounted, mutilated disk having a gripping surface overlying a portion of said arm, and means to urge said wire gripping surface into contact with said portion of said arm comprising a spring tension member, said gripping surface lying normally in substantially the same horizontal plane as one of said wire receiving portions of said members having a plurality thereof, said wire receiving portions of said members arranged with respect to one another so that wires disposed in said wire receiving portions lying normally in the same horizontal plane as said gripping surface are not cut and wires disposed in other said wire receiving portions are cut upon movement of a said member relative to an adjacent member.

11. In a wire tying machine having means to tension wire comprising an arm movable laterally from said machine and a wire twisting gear having a longitudinal wire receiving slot provided therein and means to rotate said gear and move said arm laterally from said machine, the combination of means to cut the ends of said wires twisted together to form a tie comprising a member having a wire receiving slot and another member having a plurality of vertically spaced wire receiving slots disposed side by side adjacent to each end of said twisting gear, means to move one of said members relative to an adjacent said member to produce a scissor action

therebetween, a gripper for gripping flat wire during tensioning thereof carried by said arm and comprising a pivotally and eccentrically, vertically mounted, mutilated disk having a gripping surface overlying a portion of said arm, means to urge said wire gripping surface into contact with said portion of said arm comprising a spring tension member, said gripping surface lying normally in substantially the same horizontal plane as one of said wire receiving slots of said members having a plurality thereof, said wire receiving slots of said members arranged with respect to one another so that wires disposed in said wire receiving slots lying normally in the same horizontal plane as said gripping surface are not cut and wires disposed in other said wire receiving slots are cut upon movement of a said member relative to an adjacent member, and means to limit lateral movement of a wire relative to said gripping surface.

12. In a wire tying machine according to claim 11 and wherein said slots in said member having a plurality thereof are spaced vertically from one another and said gripping surface lies normally in substantially the same horizontal plane of a said slot of said multi-slotted member, said slots and gripping surface arranged with respect to one another so that a wire leading from a slot to said gripper is vertically aligned with the portion of the wire encircling an object to be tied.

13. In a wire tying machine having a wire twisting gear and means to rotate said gear to twist wires together to form a tie, the combination of means to cut the ends of said wires twisted together to form a tie comprising a pair of members disposed side by side adjacent to each end of said twisting gear, a plurality of wire receiving portions provided in one member of each pair and at least one wire receiving portion provided in the other member of each pair, at least one wire receiving portion in each member having a plurality thereof arranged to receive a portion of a wire encircling an object to be tied and another wire receiving portion in said member arranged to receive a portion of said wire adjacent to an end thereof to be cut, and means to move a said member of a pair to produce a scissors action therebetween to cut said wire adjacent to an end thereof but not said wire portion encircling an object to be tied.

14. In a wire tying machine having a wire twisting gear and means to rotate said gear to twist wires together to form a tie, the combination of means to cut the ends of said wires twisted together to form a tie comprising a member having a plurality of vertically spaced wire receiving portions and a member having a single wire receiving portion arranged side by side adjacent to each end of said twisting gear, one wire receiving portion of said member having a plurality thereof arranged to receive an end of a wire to be cut, another wire receiving portion of said member having a plurality thereof arranged to receive a portion of wire encircling an article to be tied, and means to move one of said members relative to an adjacent member to produce a scissor action therebetween, said members arranged so that a wire end disposed in one said wire receiving portion is cut and wire disposed in an adjacent said wire receiving portion is not cut upon movement of said members relative to one another.

15. In a wire tying machine having means to tension wire comprising an arm movable lat-

erally from said machine and a wire twisting gear having a longitudinal wire receiving slot provided therein and means to rotate said gear and move said arm laterally from said machine, the combination of means to cut the ends of said wires twisted together to form a tie comprising a member having a plurality of vertically spaced wire receiving portions and a member having a single wire receiving portion arranged side by side adjacent to each end of said twisting gear, one wire receiving portion of said member having a plurality thereof arranged to receive an end of a wire to be cut, another wire receiving portion of said member having a plurality thereof arranged to receive a portion of wire encircling an article to be tied, means to move one of said members relative to an adjacent member to produce a scissor action therebetween, said members arranged so that a wire end disposed in one said wire receiving portion is cut and wire disposed in an adjacent said wire receiving portion is not cut upon movement of

said members relative to one another, and a gripper for gripping flat wire carried by said arm, said gripper and wire receiving portions arranged with respect to one another so that a wire end leading from a said wire receiving portion to said gripper is in substantial vertical alignment with the wire encircling said article to be tied.

KURT ERIC SCHULZE.

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