Oct. 25, 1960 W. O. COPLAND ET AL 2,957,406

WIRE TYING MACHINES

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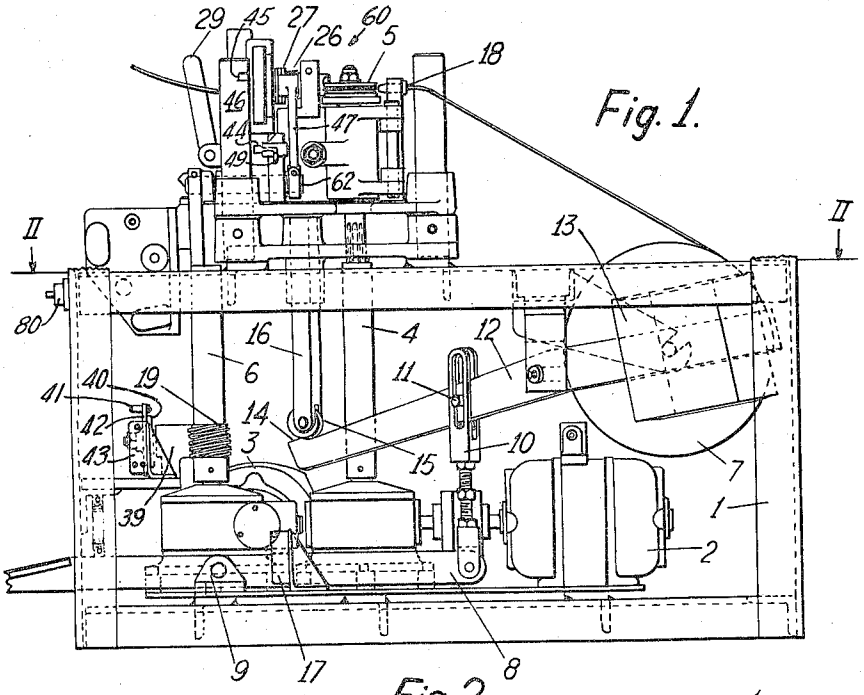

Fig. 1.

Fig. 2.

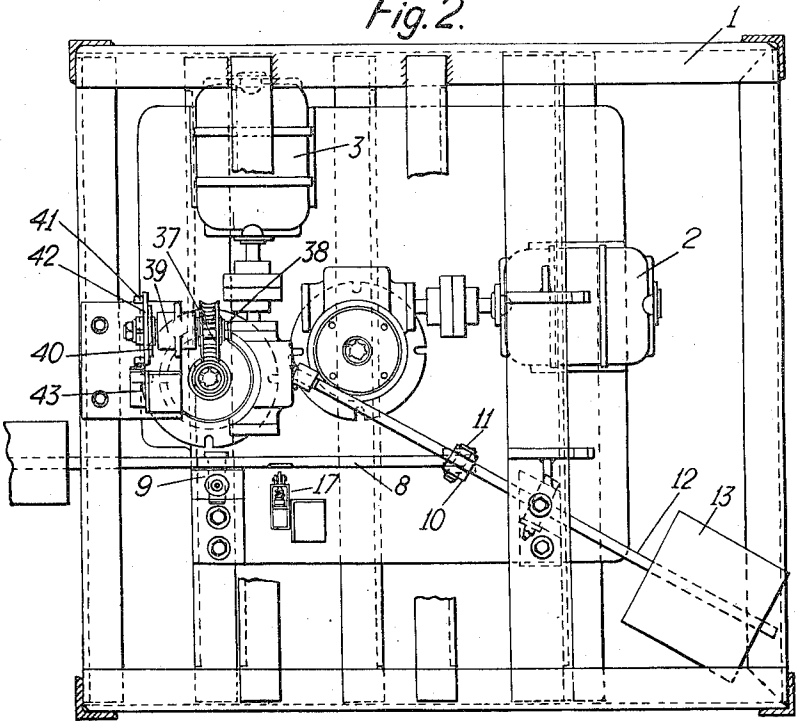

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Fig. 3

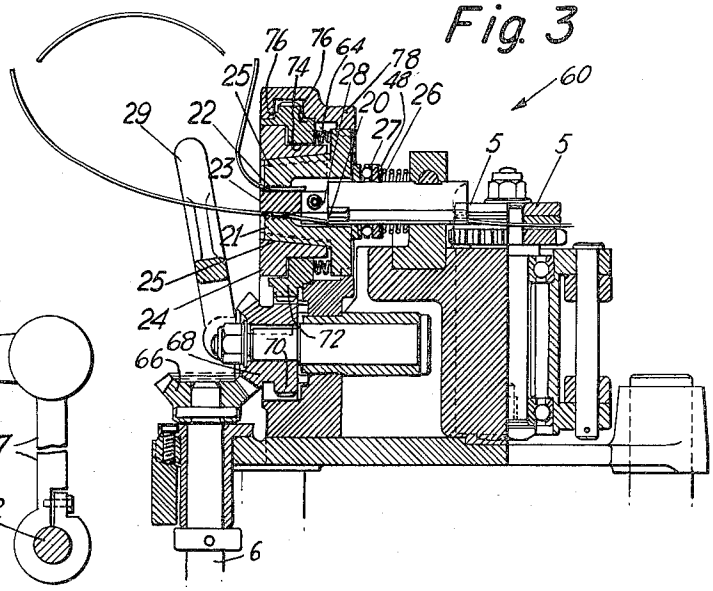


Fig. 5

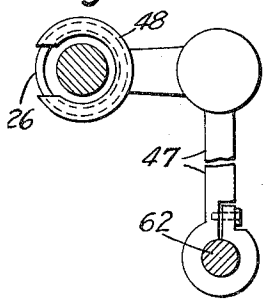
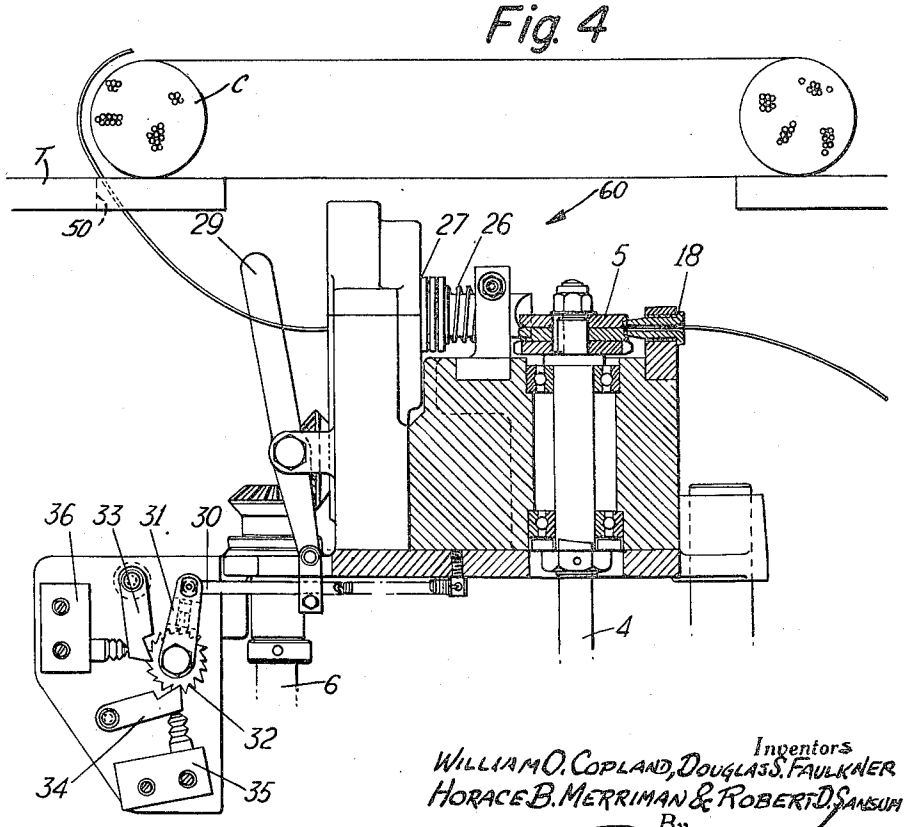


Fig. 4



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WIRE TYING MACHINES

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6 Claims. (Cl. 100—4)

Usually coils of material such as wire or rod, ranging in weights from 12 to 900 lbs. are tied by means of wire, the wire is twisted and thus holds the coil firmly together for handling; this is normally done by hand, he operator using a pair of pliers. The work of forming ties by hand is both hard and tedious.

It is very desirable that the twisting of the wire tie be done on the inside of the coil to simplify rolling and to avoid tearing clothing etc.; the tie after twisting is usually pressed flat against the inside of the coil.

It is the object of the invention to provide a machine by which wire ties may be formed around material wound into coils with greater speed and precision than can be done by hand.

With this object in view the invention provides a wire tying machine having a table for the support of a coil of wound material, a work head movable vertically relatively to the table within the coil, means carried in the work head to feed out tying wire beneath a supported coil, means to raise the work head to bring wire gripping jaws therein to operative position, means to tighten a loop of wire about the coil and means to rotate the gripping jaws to form a twisted tie, and means to sever the wire from the feed out means.

Other features of the invention are included in preferred forms of machine. Such features include the provision of a counterbalanced lever system for the raising of the work head, the provision of an electric motor for operating the wire feeding and tensioning means and of a separate motor for operating the wire twisting and severing mechanism, an automatic trip lever for stopping the wire tensioner and starting the severing and twisting mechanism and the provision of mechanism by which the number of twists in a tie can be selected.

The above and other parts or features of the invention are embodied in a preferred form of machine which will now be described in detail by way of example with reference to the accompanying drawings in which:

Fig. 1 is a side elevation of a machine,

Fig. 2 is a plan view on the line II—II of Fig. 1,

Fig. 3 is a side elevation in part section showing a twisting and severing mechanism incorporated in the machine,

Fig. 4 is a side elevation showing a switch operating mechanism incorporated in the machine,

Fig. 5 is a detail view of the gripper operating lever.

The machine is supported in a substantial fabricated metal frame 1 beneath a table T on which coils C of wound material to be tied are supported.

The table T is mounted for rotation and linear movement upon a supporting frame (not shown) and is apertured within the internal diameter of a coil lying flat upon it.

The arrangement is such that a supported coil may be brought into a first position above and around a work head 60 forming part of the machine and may be rotated after the formation of a tie by that head to a second and subsequent position locating the coil appropriately for the formation of further ties.

Two electric motors 2 and 3 are fixed to the lower part of the machine frame 1. The motor 2 (which is reversible) is connected through gearing and an extensible splined shaft 4 to one of a pair of rollers 5 carried in the head and adapted to feed out or draw back wire depending upon their direction of rotation. The other motor 3 is connected through gearing and an extensible splined shaft 6 to wire severing and twisting mechanism carried in the machine head.

A coil of tying wire is carried by a drum 7 (Fig. 1) mounted for free rotation near one side of the machine frame.

A pedal operated lever 8 is pivotably mounted to the frame of the machine by means of bracket 9 near its centre; the other end of this lever has pivotably attached to it an adjustable slotted link 10. The link is retained in the substantially vertical position by means of a roller 11 carried on a peg which is rigidly attached to a centrally pivoted counterpoise weight lever 12.

One end of the counterpoise weight lever has a balance weight 13 attached to it; the other end incorporates a cam form 14 which co-acts with a roller 15 on a lifting rod 16 fixed to the work head and which is so designed that no side thrust is imparted to that lifting rod. Rigidly mounted to one side of the pedal lever is a micro-switch 17 with its operating arm in the path of a block (omitted from Fig. 2 for clarity) fixed to the side of the lever 8 and arranged so that when the pedal lever is depressed the switch is actuated at the desired instant.

The switch is connected to a relay which actuates a starter for the wire feed and tensioning motor 2 in a sense to drive the rollers 5 to feed out wire.

The free end of tying wire carried by the drum 7 is passed through a guide nozzle 18 to pass between opposed grooved faces of the feed out and draw back rollers 5.

The rollers 5 include a driven roller and an undriven roller and the undriven roller is mounted on a radial arm (not shown) and is spring loaded towards the driven roller to give a driving grip upon the wire.

The extensible splined shaft 6 driving the severing and twisting mechanism has a collar formed with a worm gear 19 splined to its lower end. This worm gear operates a twist selector mechanism described later.

Wire from the grooved rollers 5 passes through a guide slot 20 (Fig. 3) to pass freely between the first of a pair of toothed grippers 21 and 22 and the central post 23 of a rotary block 24 in which the grippers are mounted.

When the feed out and tensioning motor is rotated in one direction wire is fed out from the face of the rotary block 24 and when this motor is rotated in the opposite direction wire is drawn back past the gripper 21 with which it is in contact.

The two grippers are independent of each other and are mounted for axial movement along a tapering slideway 25 a centre portion of which is rigidly affixed to the rotary block or gripper housing.

The grippers are arranged, when actuated by a movement up the slideway to grip the wire against the centre post 23.

The grippers are actuated by means of a spring 26 acting upon a thrust bearing 27 which in turn presses against the rear faces of the grippers 21 and 22. It is desirable that a spherically seated thrust bearing is used to act against a spherical seating ground in the grippers. The grippers are held in or out of engagement with the wire by means of a lever 47 which is movable horizontally and mechanically linked to an axially movable shaft 62. A hand lever (not shown) is connected to shaft 62 to facilitate axial movement thereof and this lever may be locked in position. Thus, spring 26 urges grip-

pers 21 and 22 up the slideway to grip a wire against center post 23. To release the grippers shaft 62 is moved axially to move lever 47 to the right as viewed in Fig. 1. Lever 47 has a yoke 48 and a plate of the thrust bearing 27 is adjacent thereto as seen in Fig. 5. This prevents spring 26 from acting on grippers 21 and 22 whereby springs 64, lighter than spring 26, move the grippers down the slideway to release the wire.

A knife edge 28 formed on the rotary block 24 is adapted to sever wire passing out from the guide slot when the block is turned relatively to the guide slot on commencement of a twisting movement by the rotary block 24. A bevel gear 66 is fixed to the upper end of shaft 6 and meshes with another bevel gear 68 having gear 70 formed integrally therewith. Gear 70 meshes with gear 72 having a large central opening 74 and provided with bearing surfaces 76 by which it is journalled in housing 78. Rotary block 24 is fixed within central opening 74 and the block 24 and gear 72 rotate together. Thus, shaft 6 drives the rotary block 24.

The whole work head incorporating the feed-out and draw-back mechanism and the gripper mechanism is carried at the head of the lifting rod 16, and the adjustable slotted link 10 is arranged to connect the pedal lever to the counterpoise weight lever 12 to raise the lifting rod and work head on a sufficient operational movement of the pedal. A latch comprised for example by a pin 44 for entry into slot 45 in guide post 46 is provided to maintain the work head in the raised position as required, this latch being operatively connected to hand lever 49.

Wire is fed out from the work head in the lowered position (by an initial depression of the pedal which operates switch 17 to start motor 2) through a slot 50 in the table T beneath a coil C supported on the table T. The head is then raised by a further depression of the pedal and the free end of the tying wire (which continues to feed out as long as the pedal is depressed, and is passed manually around the coil to be tied) is inserted between the second (22) of the pair of grippers and the central post 23 of the rotary block 24 and is clamped in position by operating the hand lever connected to shaft 62.

A push-button switch 80 is operable to start the feed-out and draw-back motor 2 in a reverse direction to cause the rollers 5 to draw-back wire past the gripper 21, whose teeth are shaped to permit such movement as is usual in wire gripping jaws required to maintain tension in one sense only, and tighten the loop formed about the coil to be tied.

As the loop tightens about the coil, the coil is drawn bodily over the table top to contact and operate a lever 29 pivoted to the face of the work head.

The free end of this lever 29 is connected through a spring loaded link 30 (Fig. 4) to an arm 31 pivoted about a fixed shaft.

The fixed shaft also carries a freely rotatable ratchet wheel 32 and a conventional spring pawl mechanism connects the arm 31 and the wheel 32 for driving movement in one direction only.

A pair of pawl followers 33 and 34 bearing against teeth of the ratchet wheel 32 are connected to operate a pair of micro-switches 35 and 36.

The whole arrangement is such that movement of the lever 29 by contact with the coil C being tied is sufficient to turn the ratchet wheel 32 to an extent a little over that required to operate both switches 35 and 36 once.

It does not matter in what order the switches actuate. One switch is connected to a relay which will stop the wire feed and draw-back motor 2, the other switch is wired to a relay which will cause the starting up of the twisting mechanism motor 3.

It is desirable that the number of twists in a tie for a particular purpose should be adjustable, and it is for this purpose that the worm 19 on the collar of the extensible shaft 6 of the severing and twisting motor drive is provided.

When the severing and twisting motor 3 is started up the worm 19 drives a worm wheel 37 which is carried on a shaft 38 free to rotate in a bearing 39, and carrying on its other end a circular plate 40.

Pegs 41 can be screwed into one of several radial positions on a selector plate 42 which in itself can be adjusted angularly and clamped by means of screws to the circular plate 40.

The pegs 41 make contact with a micro-switch 43 (after a predetermined rotation of the shaft 6 giving an appropriate number of twists by the grippers 21 and 22) which by means of a relay will stop the severing and twisting motor 3.

The whole cycle of operations may be summarized as follows:

The pedal of the pedal lever 8 is depressed and the block on the lever operates micro-switch 17 to operate motor 2 in forward direction and the binding wire is fed out of the machine by the feed-out rollers 5 towards the operator. It is arranged that this wire is passed beneath the coil C to be tied which lies flat on the table top.

By a further depression on the pedal the work head is raised by the lifting rod 6 and it latches into its highest position.

As long as pressure is retained on the pedal the tying wire will be fed out of the machine. An amount of wire sufficient to encompass the coil C to be tied is fed out. When a sufficient amount of wire has been fed the operator releases the pedal and switch 17 is operated to stop motor 2.

The free end of the wire feeds out between gripper 21 and central post 23 and after the feeding is completed the free end of the wire is placed between the unoccupied gripper 22 and the centre post 23 of the rotary block 24.

The hand lever, referred to above as imparting axial movement to the grippers, is then used to bring the grippers 21 and 22 into gripping engagement with the wire.

The push button 80, referred to above as operable to start the motor 2 in drawback sense, is now depressed and the wire feed-out and draw-back motor 2 is started and runs so as to draw the wire back into the machine.

The wire forms contact with the coil C, and as more wire is retracted into the machine the coil is moved along the top of the machine table until its inner edge strokes the trip lever 29. The trip lever moves through a small angular rotation and in so doing operates the ratchet 32 and pawl follower mechanism 33 and 34 which stops the wire feed-out and tensioning motor 2 and starts up the twisting mechanism driven by the severing and twisting motor 3.

The wire is severed on commencement of such twisting and a number of turns of twist as selected by the positioning of the pins 41 in the selector plate 42 are imparted to the binding wire before the twisting motor 3 stops.

The hand lever is again operated to move shaft 62 axially to the right which moves yoke 48 to the right and prevents spring 26 from urging the grippers to the left. Springs 64 may now move the grippers 21 and 22 to the right so that the wire is free. Movement of hand lever 49 releases the latch that has retained the work head in the raised position, and the work head descends so that no part of it is protruding above the surface of the table.

The coil may now be slid across the table top onto a conveyor.

Any number of ties may be made as is desired.

It will be understood that the invention is not restricted to the details of the specific embodiment de-

scribed which may be varied without departing from the scope of the following claims.

We claim:

1. A wire tying machine having a table for the support of a coil of wound material, a supply of wire, a work head movable vertically relatively to the table and within the coil and including a central post and wire gripping jaws operable against the central post to grip the wire therebetween, means carried in the work head to feed out tying wire beneath a supported coil, means to raise the work head to bring said wire gripping jaws therein to position whereby the free end of wire passed about said coil may be gripped between one of said jaws and said central post, means to reverse said feed out means for tightening a loop of wire about the coil, means for revolving the gripping jaws to form a twisted tie, and means to sever the wire from the feed out means.

2. A machine according to claim 1 wherein said revolving means includes a trip lever for initiating operation thereof and disposed in alignment with and to be operated by contact with the coil.

3. A machine according to claim 1 comprising weighted lever means operatively associated with the work head to counterbalance the latter.

4. A machine according to claim 1 wherein the wire severing means is an integral part of the means to form a twisted tie.

5. A machine according to claim 1 wherein a first electric motor means is used for operating the wire feeding means and a second electric motor means is used for operating the means to form a twisted tie and the means to sever the wire.

6. A machine according to claim 5 wherein said wire feeding means includes at least one extensible driving shaft between said first motor means and the work head.

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