

May 20, 1958

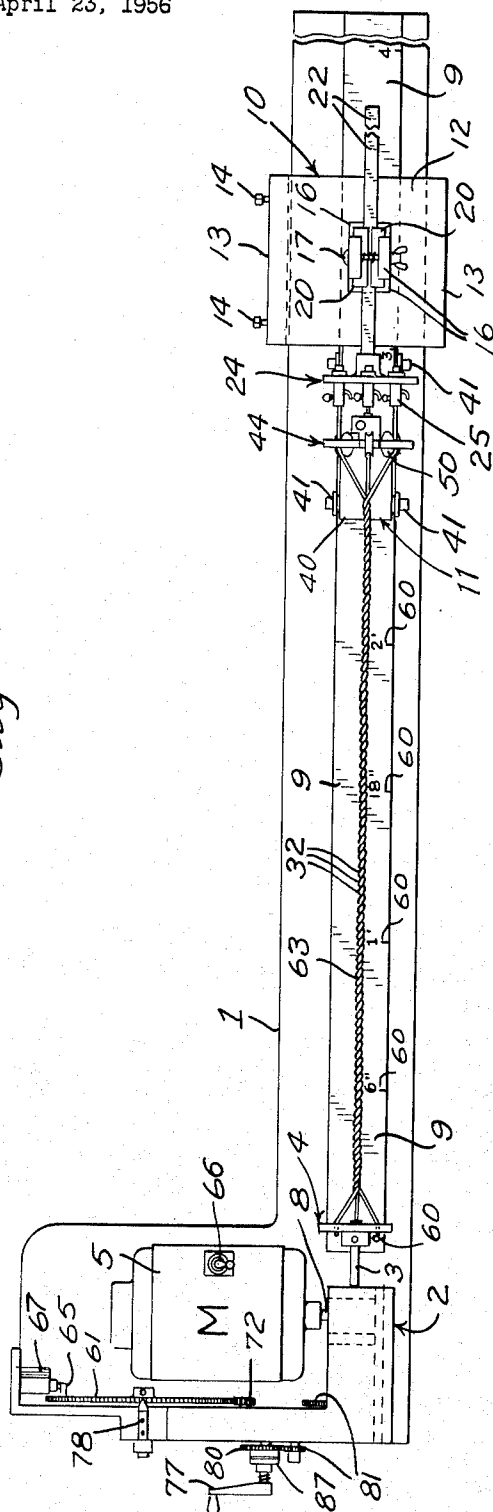
K. THONE ET AL
WIRE TWISTING MACHINE

2,835,283

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4 Sheets-Sheet 1

Fig. 1.



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4 Sheets-Sheet 2

Fig. 2A.

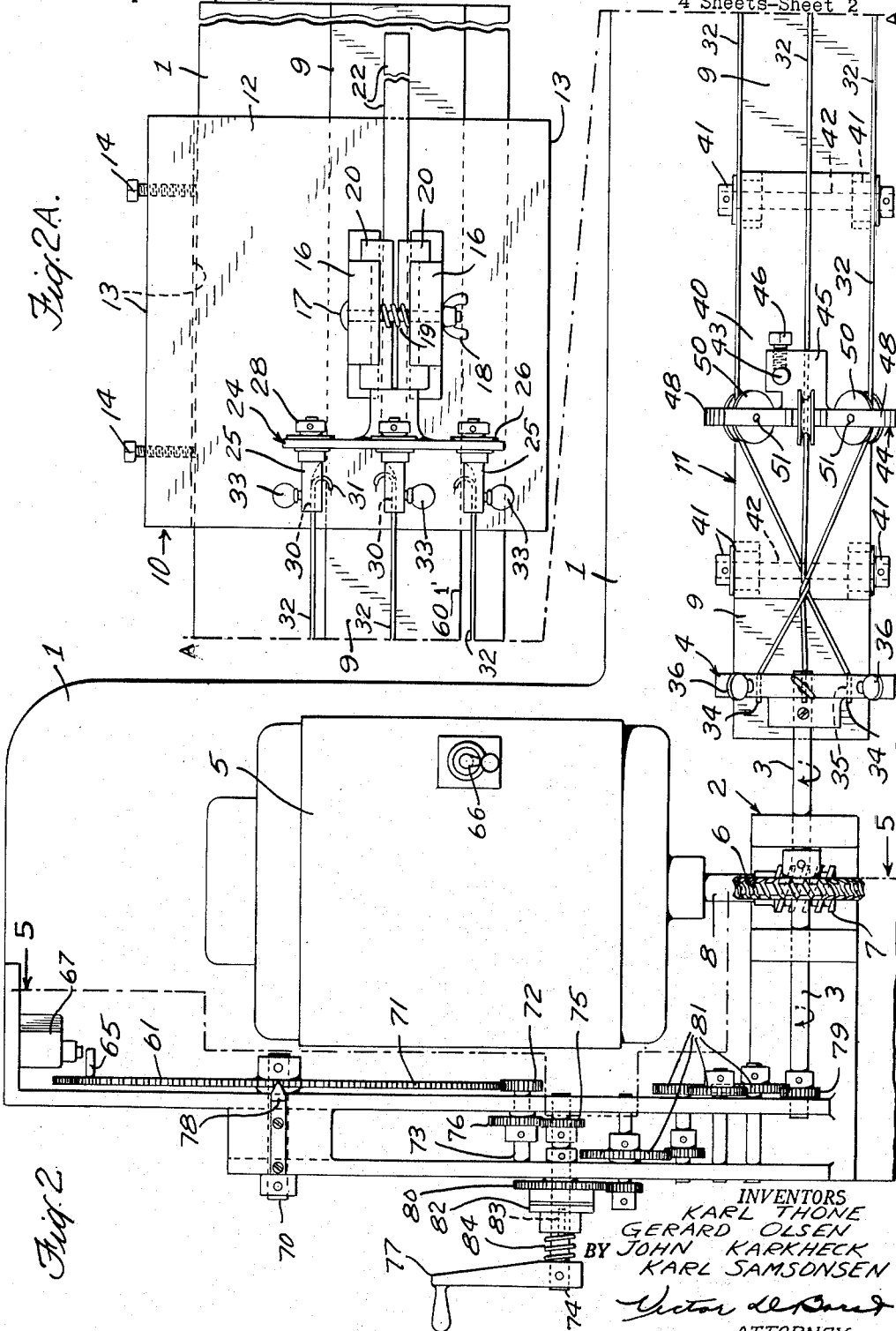


Fig. 2

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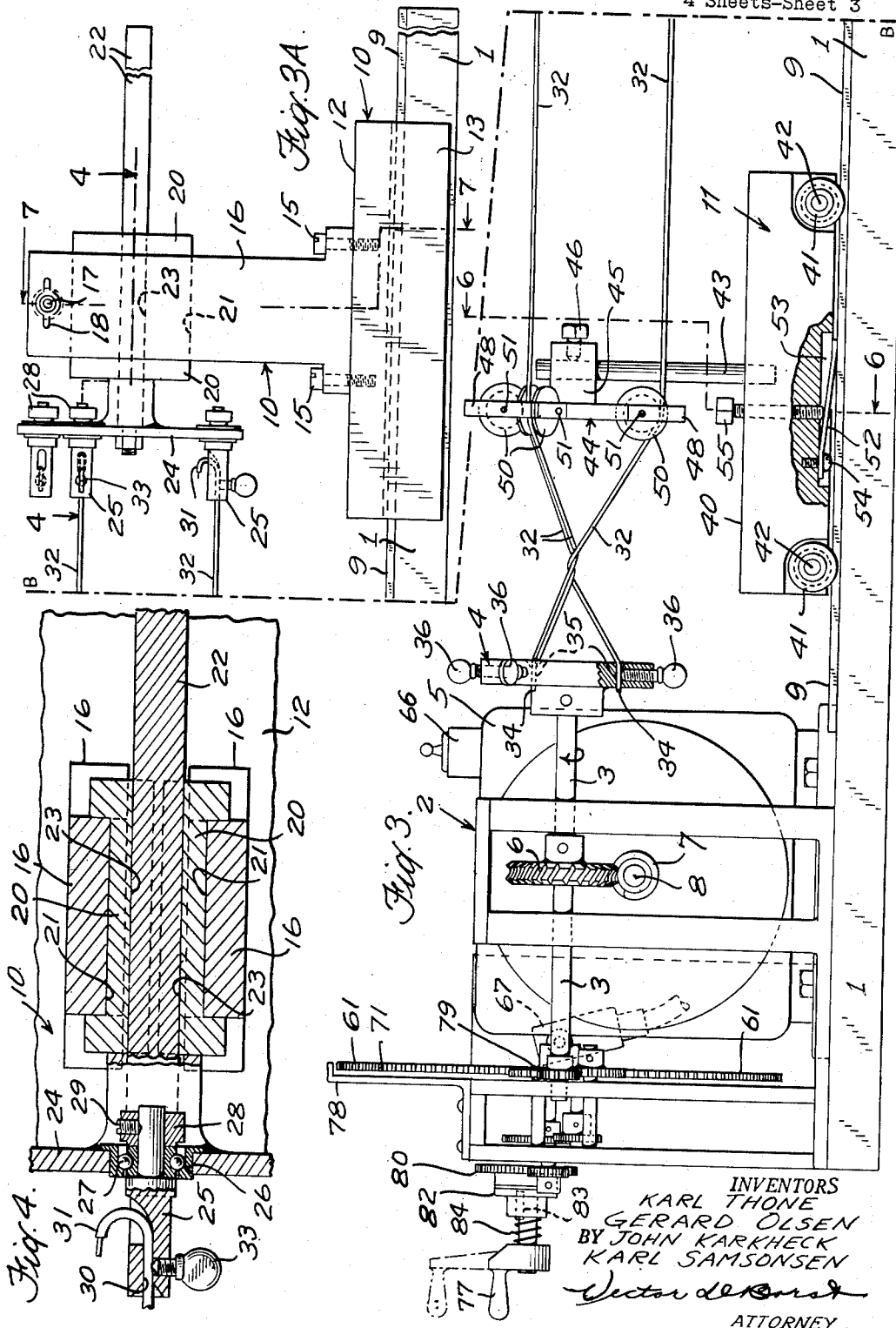
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4 Sheets-Sheet 3



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4 Sheets-Sheet 4

Fig. 5.

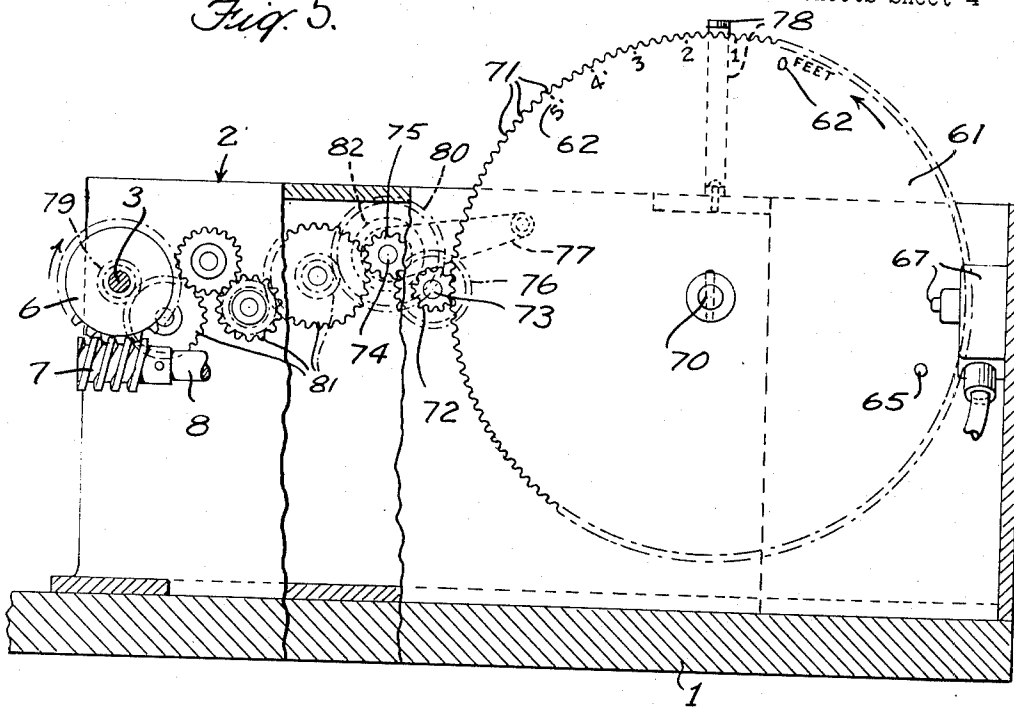


Fig. 6.

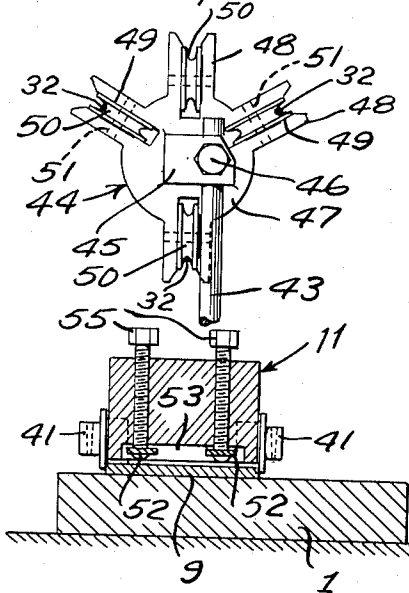
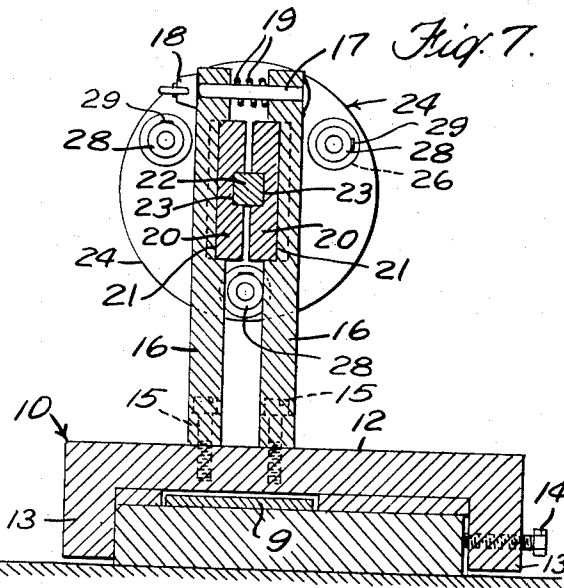


Fig. 7.



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1

2,835,283

WIRE TWISTING MACHINE

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6 Claims. (Cl. 140-149)

This invention relates to a wire twisting machine by which a plurality of individual strands of wire are automatically twisted together into a single cable such as is used in the production wiring of complex electronic instruments. Although the machine was developed in connection with the production of cables having a plurality of insulated strands of wire, generally of contrasting colors, for use in electrical instruments it is equally well adapted for producing cables for various other uses.

The principal object of the invention is to provide an extremely simple, completely automatic wire twisting machine which can be safely operated by an unskilled operator without sacrificing uniform quality in the cables produced.

Another object of the invention is to provide an automatic wire twisting machine by which a plurality of individual strands of wire, of varying gauges, color combinations and lengths can be uniformly twisted together into cables of various different predetermined lengths.

Another object of the invention is to provide a machine of the aforesaid character by which a fixed ratio of turns or twists per foot throughout the entire length of the cable being produced is assured to thereby produce a cable having a minimum diameter commensurate with the maximum flexibility thereof.

Another object of the invention is to provide a machine of the aforesaid character in which all twisting of each of the individual wires being twisted together is eliminated.

Another object of the invention is to provide a machine of the aforesaid character in which means are provided by which any elongation of the individual wires during twisting is prevented.

Still other and more limited objects of the invention will be apparent from the following specification and the accompanying drawing in which the preferred embodiment of our invention is shown and described.

The wire twisting machine of our invention comprises generally a head stock which is mounted in fixed position upon a base and includes a chuck secured to the forward end of a spindle which is adapted to be rotated at a constant speed by an electric motor through suitable reduction gearing. An elongated rail or track is permanently secured to the table and extends forwardly from the head stock parallel to the axis of rotation thereof. A tail stock is adjustably secured to the rail or track for adjustment towards or away from the head stock to accommodate the twisting of multiple wire cables of various different predetermined lengths as desired.

The tail stock comprises a base and two vertically disposed clamping members which are adjustably and resiliently secured together. An elongated rod is slidably but non-rotatably, frictionally gripped between these clamping members. A disc or plate which is rigidly secured to the forward end of said rod carries a plurality of chucks which are swivelly connected to said disc by suitable anti-friction means whereby they are free to rotate with respect thereto. A carriage having a suitable wire

2

guide secured thereto is mounted upon the rail or track between the head stock and the tail stock.

The track is calibrated in feet by means of which the adjustable tail stock is properly set in correct position with respect to the head stock for twisting cables of any desired predetermined length within the capacity of the machine. An adjustable rotary dial, which is also calibrated in feet in conformity with the calibration of the track, is suitably mounted upon the base adjacent the drive motor and is driven from the head stock spindle through suitable reduction gearing. A fixed index pointer is provided in connection with the dial by means of which the dial can be set in accordance with the length of the cable to be twisted.

The operation of the drive motor is controlled by a starting switch which is adapted to be manually actuated by the operator to initiate operation and a stopping switch which is adapted to be actuated by a pin carried by the rotary dial to terminate operation.

The operation of the machine will now be described in connection with the twisting of a plurality of individual wires into a cable three feet (3') long. The tail stock is clamped to the track at the three foot (3') mark with the swivel chuck plate in its fully retracted position; and the dial is manually set with the three foot (3') mark thereon in register with the fixed index pointer. The take-up carriage is then manually moved along the track into close proximity with the head stock chuck. The wires to be twisted, of known predetermined length to form a three foot (3') cable, are then selected and mounted in the machine with one end of each of the wires secured to the head stock chuck and the other ends thereof secured to the tail stock swivel chucks, and passing through the wire guide carried by the take-up carriage. The operation of the machine is then initiated by actuating the manual switch. The rotation of the head stock chuck will then progressively twist the sections of the wires between the head stock chuck and the wire guide together. As the twisting of the wires progresses the take-up carriage will be propelled along the track toward the tail stock by the power supplied by the twisting action of the wires. The speed at which the carriage is propelled along the track determines the number of twists per foot of cable imparted to the wires and is controlled or regulated by adjustable friction drags carried by the carriage and engaging the track. As the wires are shortened due to twisting the tail stock rod and the swivel chuck plate carried thereby are drawn forwardly from the clamping members between which the rod is frictionally gripped. This forward movement of the tail-stock chuck plate, which is frictionally resisted in accordance with the adjustment of the clamping members, maintains the wires taut at all times during twisting and prevents any elongation or stretching of the wires due to twisting; and the swivelling of the tail stock chucks prevents the imparting of any spin or twist to the individual wires during the twisting of the several wires into a cable. When the take-up carriage reaches the tail stock the twisting of the several wires into a cable having a predetermined number of twists per foot of cable therein is complete, at which time the pin carried by the dial engages and actuates the stopping switch thus terminating operation. The finished cable is then removed from the machine.

The construction of the machine will now be described in detail in connection with the accompanying drawing wherein:

Fig. 1 is a plan view of a wire twisting machine embodying our invention and showing the various parts thereof in the position they assume at the completion of the twisting of a plurality of wires into a single cable of predetermined desired length;

Figs. 2 and 2A joined together as indicated by the line A—A constitute a plan view on an enlarged scale, of the machine of Fig. 1, showing the various parts thereof in the positions they occupy at the beginning of the twisting of a plurality of wires into a cable;

Figs. 3 and 3A joined together as indicated by the line B—B constitute a front elevation of the machine as shown in Figs. 2 and 2A;

Fig. 4 is an enlarged horizontal section taken on the line 4—4 of Fig. 3A;

Fig. 5 is a transverse vertical section taken on the line 5—5 of Fig. 2;

Fig. 6 is a transverse vertical section taken on the line 6—6 of Fig. 3; and

Fig. 7 is a transverse vertical section taken on the line 7—7 of Fig. 3A.

Referring now to the drawings by reference characters, the numeral 1 indicates a base upon which the various mechanisms constituting our improved wire twisting machine are mounted. A head stock, generally indicated by the numeral 2, is permanently secured to the base 1 in fixed position thereon. The head stock 2 includes a spindle 3 which is rotatably mounted therein and has a chuck 4 rigidly secured to the forward end thereof for rotation therewith. The spindle 3 is adapted to be rotated at a constant rate by an electric motor 5 through suitable reduction gearing which comprises a worm gear 6 carried by the spindle 3 and a meshing worm 7 carried by the armature shaft 8 of the motor 5.

An elongated track 9 which is permanently secured to the base 1 and extends outwardly from the head stock 2 parallel with the axis of rotation of the spindle 3 has a tail stock, generally indicated by the numeral 10, slidably mounted thereon for adjustment towards and away from the head stock 2. A take-up carriage, generally indicated by the numeral 11, is also slidably mounted on the track 9 for back and forth movement between the head stock 2 and the tail stock 10.

The tail stock 10 comprises a base 12 having the downwardly extending flanges 13 which engage the sides of the base 1. A pair of set screws 14 are provided in one of the flanges 13 to clamp the tail stock 10 in adjusted position during operation. The base 12 has secured thereto, by screws 15, a pair of upwardly extending clamping members 16 which are adjustably tied together at the upper ends thereof by a bolt 17 and wing nut 18. The upper ends of the clamping members 16 are resiliently urged apart by a coil spring 19 which is mounted on the bolt 17 between the members 16. The clamping members carry a pair of opposed similar friction blocks 20 which are secured in recesses 21 in the inner faces of the members 16. An elongated horizontally disposed square rod 22 is slidably mounted in complementary notches 23 in the opposed faces of the blocks 20 and is frictionally engaged thereby. The frictional engagement of the blocks 20 with the rod 22 may be adjusted as desired by tightening or loosening the wing nut 18 on the bolt 17. One end of the rod 22 has a head 24 rigidly secured thereto facing the head stock 2, which is provided with a plurality of angularly disposed clamps 25. The clamps 25 are rotatably mounted in apertures 26, in the head 24, upon anti-friction bearings 27 and are retained in position by collars 28 and set screws 29. The clamps 25 are provided with central longitudinal bores 30 in which the ends 31 of the wires 32, being twisted, are removably secured during twisting by set screws 33. The other ends 34 of the wires 32, during twisting, are removably secured in angularly spaced apertures 35 in the chuck 4 by set screws 36.

The take-up carriage 11 comprises a base 40 which is mounted upon the track 9 for back and forth rolling movement thereon by flanged wheels 41 which are mounted on axes 42 carried by the base 40. The base 40 has an upwardly extending vertical post 43, suitably mounted thereon on which a wire guide generally indicated by the

numeral 44, is slidably mounted for vertical adjustment by means of an apertured boss 45, carried by the wire guide 44 and a set screw 46. The wire guide 44, as shown herein, comprises a central disc 47 having a plurality of spaced radially extending arms 48. The outer ends of the arms 48 are bifurcated as indicated at 49 and have grooved rollers 50 rotatably mounted therein on shafts 51. During operation, as previously stated and as will be hereinafter described more in detail, the carriage 11 is adapted to be propelled along the track 9 towards the tailstock 10 by the power supplied by the twisting action of the wires 32. In order to control or regulate the speed at which the carriage 11 is moved along the track 9 a pair of friction drags or brakes 52 are provided. These brakes which are in the form of leaf springs are mounted in a recess 53 in the underside of the base 40 over the track 9. One end of each of these spring brakes is secured to the base 40 as indicated at 54 and the other ends thereof bear against the track 9. Set screws 55 are provided to regulate the force of the frictional engagement of the brakes 52 with the track 9, to thereby regulate the braking action thereof and consequently the speed of the carriage 11 as it is propelled along the track 9.

The adjusting means by which the machine is set to automatically twist a plurality of individual strands of wire into a single cable of predetermined length having a predetermined number of twists per foot will now be described in detail. This means comprises calibrations 60 on the track 9 by which the tail stock 10 is adjustably clamped in correct position to twist a cable of predetermined length, and an adjustable rotary dial 61, which is calibrated as indicated at 62, in conjunction with the calibrations 60 on the track 9, and is operative to automatically terminate the twisting of the individual wires 32 into a cable 63 after a predetermined number of twists per foot have been imparted to the cable being produced. The dial 61 is driven from the spindle 3 and is set in adjusted position in accordance with the position of the tail stock 10 on the track 9 by means now to be described. The operation of the machine is initiated by the manual actuation of a switch 66 and is automatically terminated by a switch 67 which is automatically actuated by a pin 65 carried by the dial 61 after the dial 61 has been rotated through a predetermined number of degrees according to the setting thereof.

The dial 61 is mounted upon a suitable shaft 70 and is provided with teeth 71 throughout the periphery thereof which mesh with a small spur gear 72 secured to a shaft 73. The shaft 73 is adapted to be rotated either manually or automatically, by a shaft 74 through a gear 75 secured to the shaft 74 and a meshing gear 76 secured to the shaft 73. The shaft 74 is provided with a crank 77 by means of which the shaft 74, and from it the dial 61, are manually rotated when setting the desired calibration 62 on the dial 61 opposite a fixed index pointer 78. The shaft 74 and dial 61 are automatically driven during operation from the spindle 3 by a gear 79 fixed on the spindle 3 and a gear 80 mounted on the shaft 74 which are connected together by a gear train generally indicated by the numeral 81. The gear 80 which is rotatably mounted upon the shaft 74 is connected to the shaft 74 by means of a friction disc clutch 82 which is slidably keyed on the shaft 74 as indicated at 83 and is resiliently pressed into frictional engagement with the gear 80 by a coil spring 84 mounted on the shaft 74 between the clutch 82 and the crank 77. This means of connecting the gear 80 to the shaft 74 permits the manual setting of the dial 61 independently of the spindle 3 and gear train 79, 80, and 81.

The specific construction of the preferred embodiment of our invention shown herein having been described, the operation thereof will now be described in detail. To twist a plurality of individual strands of wire 32 into a cable 63 of predetermined length, for instance three feet, the tailstock 10 is clamped to the track 9 at the three

5

foot (3') mark thereon, and the dial 61 is set with the three foot (3') mark thereon opposite the index pointer 78. The take-up carriage 11 is moved up into close proximity with the head stock 2 as shown in Figs. 2 and 3, and the rod 22 and the clamping head 24 carried thereby are set in fully retracted position as shown in Figs. 2A and 3A. The ends 34 of the several wires are then secured in the apertures 35 in the chuck 4 by the set screws 36, and the other ends 31 thereof are secured in the bores 30 of the swivel clamps 25 by the set screws 33 with the wires 32 stretched taut. Between the head stock 2 and the tail stock 10 the wires pass over and engage the grooved rollers 50 carried by the wire guide 44. Everything is now in readiness for the several wires 32 to be twisted into the cable 63. Operation is then initiated by the manual actuation of the switch 66 which energizes the motor 5 by which the spindle 3 and chuck 4 carried thereby are rotated. The rotation of the chuck 4 twists the wires 32 together, all twisting being done between the chuck 4 and the wire guide 44. As the twisting together of the wires progresses the take-up carriage 11 is propelled along the track 9 towards the tail stock 10 by the power supplied by the twisting together of the wires 32. The constantly decreasing length of the wires 32 during twisting is compensated for by the head 24 and rod 22 being gradually pulled outwardly from the tail stock 10 from the position shown in Figs. 2A and 3A to the position shown in Fig. 1. The frictional clamping of the rod 22 between the clamping members 16 is so adjusted by the wing nut 18 on the bolt 17 that any elongation of the wires 32 during twisting is prevented; and all twisting of the individual wires 32 being twisted together is eliminated by the swivelling of the clamps 25 in the head 24. When the take-up carriage 11 reaches and engages the tail stock 10, as shown in Fig. 1, the twisting of the cable 63 is complete at which time the pin 65 carried by the dial 61 reaches and actuates the switch 67 thereby de-energizing the motor 5 and terminating operation of the machine. The finished cable 63 is then removed from the machine, leaving it in readiness for the twisting of the next cable, with the exception of the dial 61 which must be reset in accordance with the setting of the tail stock 10 on the track 9 for each cable produced.

From the foregoing it will be apparent to those skilled in this art that we have provided a very simple and efficient mechanism for accomplishing the objects of our invention; and it is to be understood that we are not limited to the specific construction shown and described herein as various modifications may be made therein within the spirit of the invention and the scope of the appended claims. For instance various different means may be provided in the tail stock 10 for maintaining the several wires being twisted taut and for compensating for the progressively decreasing length thereof during twisting. Also the specific construction of the take-up carriage 11 and the wire guide 44 may be changed in various different ways within the spirit of the invention. And furthermore various different means by which the machine may be set to automatically twist a plurality of individual strands of wire into a single cable of predetermined number of twists per unit of length therein may be substituted for the specific construction shown and described herein.

Having thus described our invention we claim:

1. A wire twisting machine adapted for twisting a plurality of individual strands of wire into a single cable of predetermined length comprising, a base, a head stock secured to said base in fixed position, an elongated track secured to said base and extending outwardly from said head stock, a tail stock slidably mounted on said track for movement towards and away from said head stock, means by which said tail stock is clamped to said track in selected positions, a spindle rotatably mounted in said head stock, means by which said spindle is rotated, a chuck rigidly

6

secured to said spindle for rotation therewith and adapted to have one end of each of a plurality of strands of wire to be twisted removably secured thereto in angularly spaced relation with respect to each other, retaining means attached to said tail stock for supporting said wires in angularly spaced relation with respect to each other, means associated with one of said stocks to compensate for the foreshortening of said wires as the wires are twisted by said chuck, a take-up carriage slidably mounted on said track between said head stock and said tail stock, and a wire guide through which said wires pass in angularly spaced relation to each other carried by said take-up carriage, said take-up carriage being adapted to be propelled along said track towards said tail stock by the power supplied by the twisting action of the several wires while being twisted.

2. A wire twisting machine adapted for twisting a plurality of individual strands of wire into a single cable of predetermined length comprising, a base, a head stock secured to said base in fixed position, an elongated track secured to said base and extending outwardly from said head stock, a tail stock slidably mounted on said track for movement towards and away from said head stock, means by which said tail stock is clamped to said track in selected positions, a spindle rotatably mounted in said head stock, means by which said spindle is rotated, a chuck rigidly secured to said spindle for rotation therewith and adapted to have one end of each of a plurality of strands of wire to be twisted removably secured thereto in angularly spaced relation with respect to each other, retaining means attached to said tail stock for supporting said wires in angularly spaced relation with respect to each other, means associated with one of said stocks to compensate for the foreshortening of said wires as the wires are twisted by said chuck, a take-up carriage slidably mounted on said track between said head stock and said tail stock, a wire guide through which said wires pass in angularly spaced relation to each other carried by said take-up carriage, said take-up carriage being adapted to be propelled along said track towards said tail stock by the power supplied by the twisting action of the several wires while being twisted, and cooperating index means by means of which said tail stock may be set in correct position on said track and said spindle rotated the requisite number of revolutions to twist a plurality of wires into a cable of predetermined length having a predetermined number of twists per unit of length thereof.

3. A wire twisting machine adapted for twisting a plurality of individual strands of wire into a single cable of predetermined length comprising, a base, a head stock secured to said base in fixed position, an elongated track secured to said base and extending outwardly from said head stock, a tail stock slidably mounted on said track for movement towards and away from said head stock, means by which said tail stock is clamped to said track in selected positions, a spindle rotatably mounted in said head stock, power means by which said spindle is rotated, a chuck rigidly secured to said spindle for rotation therewith and adapted to have one end of each of a plurality of strands of wire to be twisted removably secured thereto in angularly spaced relation with respect to each other, a non-rotary head carried by said tail stock, rotatable clamps by which the other ends of said wires are removably secured to said head in angularly spaced relation with respect to each other, means associated with said tail stock to compensate for the foreshortening of said wires as the wires are twisted by said chuck, a take-up carriage slidably mounted on said track between said head stock and said tail stock, a wire guide through which said wires pass in angularly spaced relation to each other carried by said take-up carriage, said take-up carriage being adapted to be propelled along said track towards said tail stock by the power supplied by the twisting action of the several wires while being twisted, manually operable starting means by which the rotation of said spindle

by said power means is initiated, and stopping means by which the rotation of said spindle by said power means is automatically terminated after a predetermined number of revolutions of said spindle.

4. A wire twisting machine as defined in claim 3 in which said compensating means comprises an elongated rod to one end of which said non-rotary head is rigidly secured, said rod being slidable but non-rotatably frictionally clamped between a pair of clamping members constituting a part of said tail stock, and adjusting means by which said clamping members are maintained in frictionable engagement with said rod.

5. A wire twisting machine adapted for twisting a plurality of individual strands of wire into a single cable of predetermined length comprising, a base, a head stock secured to said base in fixed position, an elongated track secured to said base and extending outwardly from said head stock, a tail stock slidably mounted on said track for movement towards and away from said head stock, means by which said tail stock is clamped to said track in selected positions, a spindle rotatably mounted in said head stock, power means by which said spindle is rotated, a chuck rigidly secured to said spindle for rotation therewith and adapted to have one end of each of a plurality of strands of wire to be twisted removably secured thereto in angularly spaced relation with respect to each other, a non-rotary head carried by said tail stock, attaching means by which the other ends of said wires are remov-

ably secured to said head in angularly spaced relation with respect to each other, means associated with one of said stocks to compensate for the foreshortening of said wires as the wires are twisted by said chuck, a take-up carriage slidably mounted on said track between said head stock and said tail stock, a wire guide through which said wires pass in angularly spaced relation to each other carried by said take-up carriage, said take-up carriage being adapted to be propelled along said track towards said tail stock by the power supplied by the twisting action of the several wires while being twisted, and a rotatable dial adapted to be rotated through suitable reduction gearing by said spindle.

6. A wire twisting machine as defined in claim 5 in which a manually operable switch is provided for initiating operation, and an automatically operable switch is provided for terminating operation, said automatically operable switch being adapted to be actuated by a pin carried by said dial after said dial has been rotated through a predetermined number of degrees by said spindle.

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