April 27, 1954

E. COOK

2,676,452

WIRE TWINING MACHINE

Filed March 22, 1951

3 Sheets-Sheet 1

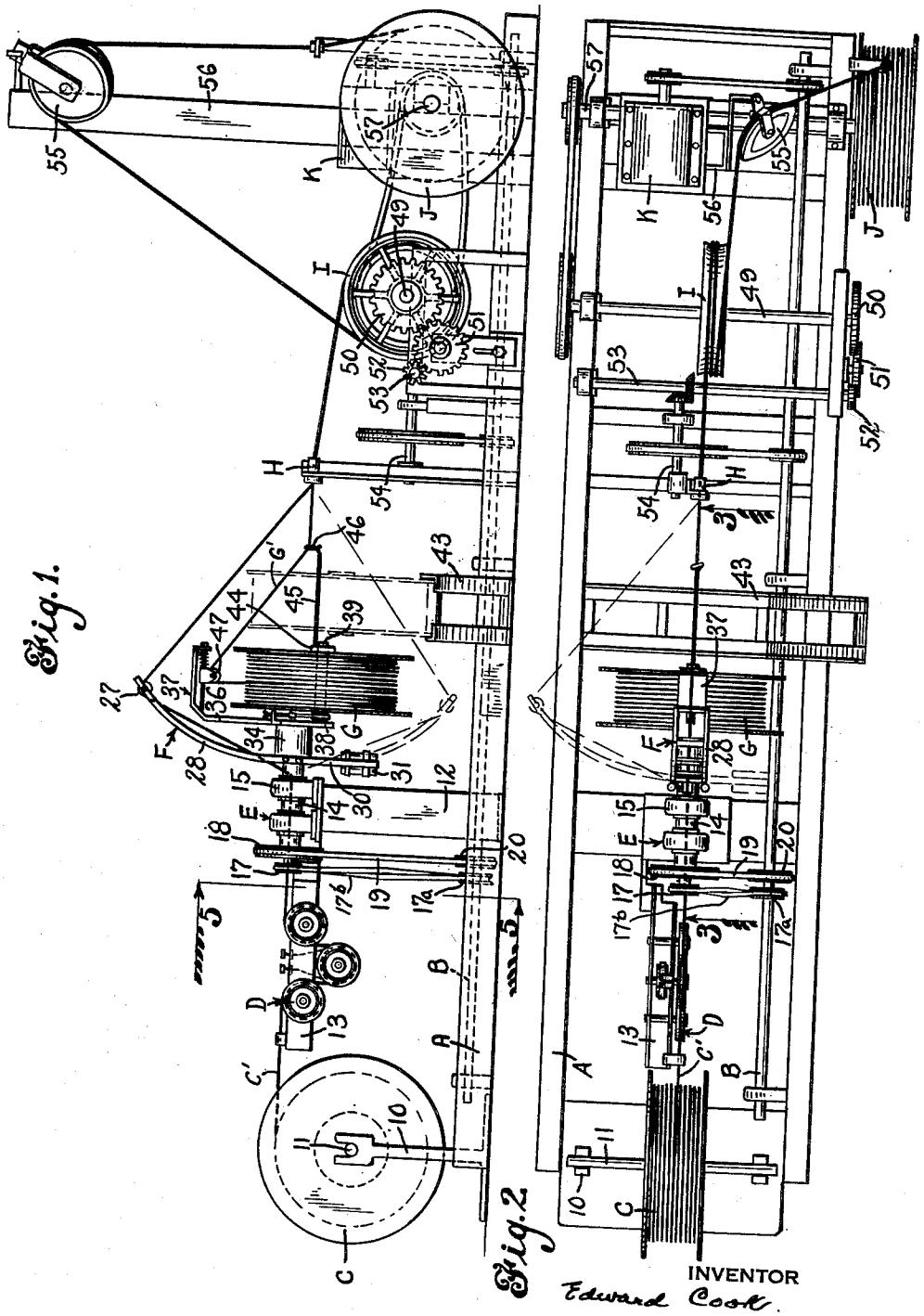


Fig. 1.

Fig. 2.

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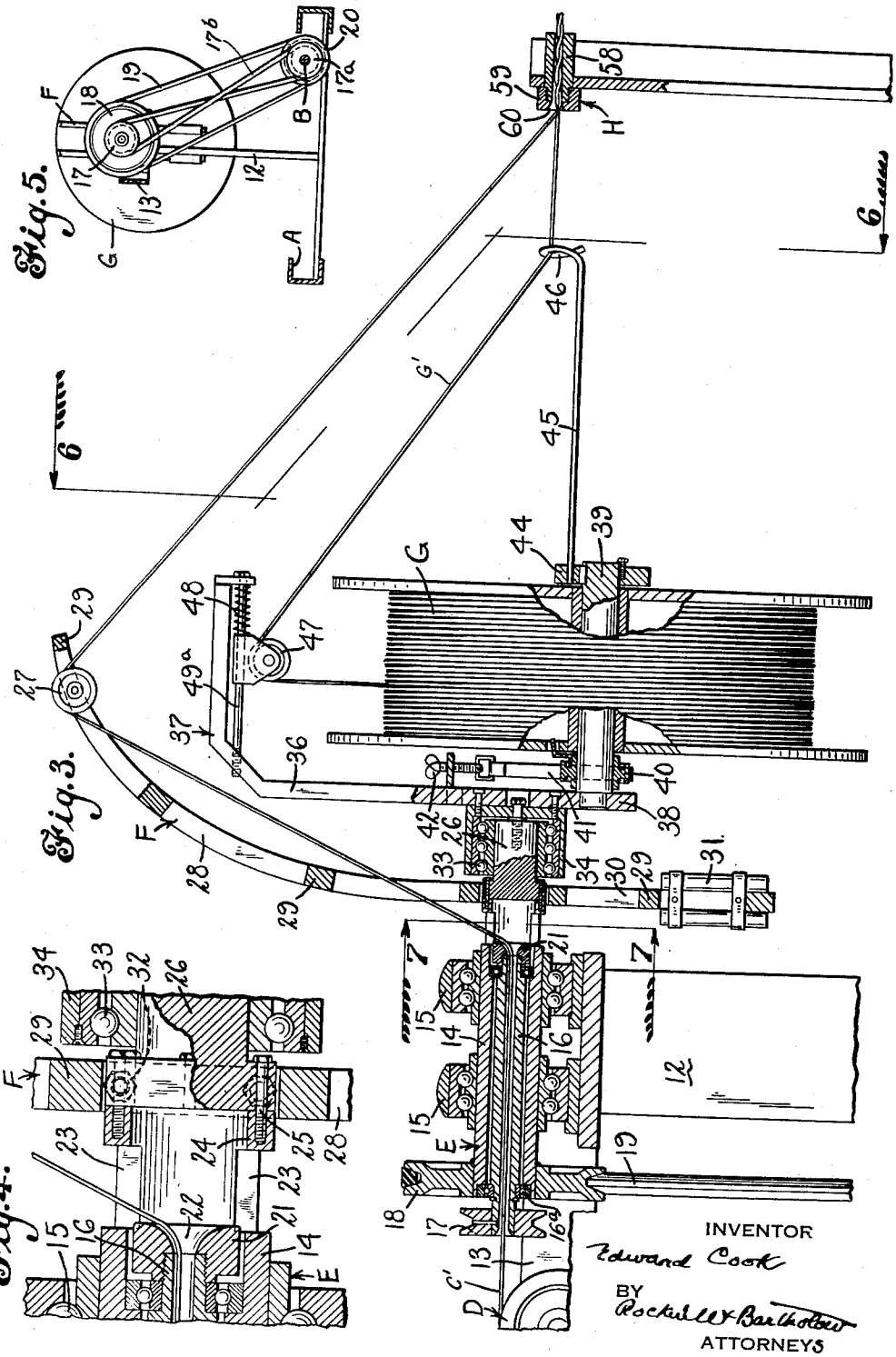
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Fig. 7.

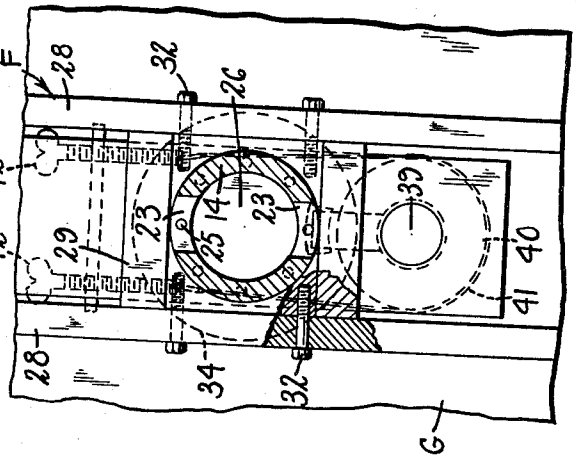


Fig. 8.

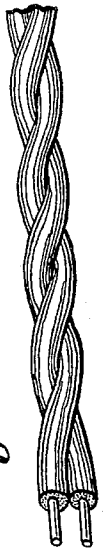
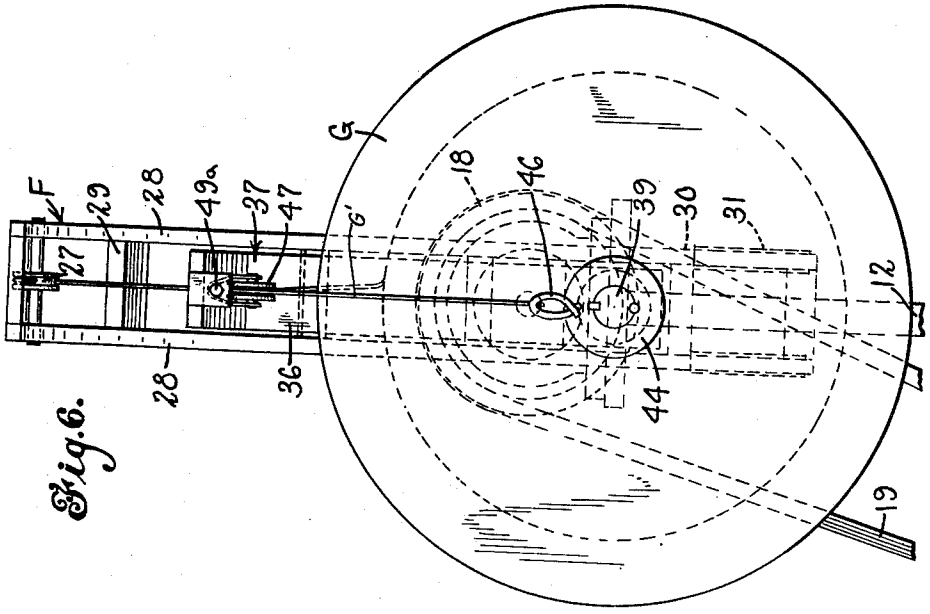


Fig. 6.



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UNITED STATES PATENT OFFICE

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WIRE TWINING MACHINE

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Application March 22, 1951, Serial No. 216,873

11 Claims. (Cl. 57—58.38)

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This invention relates to wire twining machines, and particularly to those of the twister type in which two or more strands or components are intertwisted. The machine is particularly suited to the manufacture of insulated wire such as heater cord, where two strands each consisting of a metal core and a surrounding layer of asbestos fiber are twisted together preliminary to the application of a braided or like covering, but the machine is useful also in the manufacture of other kinds of insulated wire.

One of the objects is to provide an improved machine for intertwisting the strands which are used in the manufacture of the electrical conductor.

Another object is to provide an improved twister arrangement for machines of this general type whereby the character and organization of the machine are simplified and the machine rendered easily and conveniently operable, and the cost of the machine lowered in comparison to machines previously used for this purpose.

Another object is to provide a novel and improved arrangement of the supports carrying the spools on which are reeled the strands to be intertwisted, and a novel arrangement of the means whereby the respective strands are carried to the twisting point and twisted together.

In the accompanying drawings:

Fig. 1 is a side elevation of a wire-twining machine embodying my improvements;

Fig. 2 is a top plan view of the same;

Fig. 3 is a vertical longitudinal section of a portion of the machine, on line 3—3 of Fig. 2;

Fig. 4 is a larger sectional view of certain parts shown in Fig. 3;

Fig. 5 is a section on line 5—5 of Fig. 1;

Fig. 6 is a section on line 6—6 of Fig. 3;

Fig. 7 is a section on line 7—7 of Fig. 3; and

Fig. 8 is a perspective view showing a length of wire having two intertwisted asbestos-covered strands.

The machine shown in the drawings by way of example is one characterized by an elongated frame or bed supported on the floor and carrying upstanding supports for various instrumentalities, as hereinafter mentioned, and also carrying in a position adjacent the floor a longitudinal drive shaft rotated from an electric motor, which drive shaft is used to effect rotation of several rotary devices, as hereinafter described. At the receiving end of the machine is mounted a supply spool for one of the strands, and at the opposite end of the machine a take-up spool or receiving spool on which the strands, after being intertwisted, are wound. Following the first supply spool, which supplies one strand of covered wire, is a device acting as a tension regulator for the wire, and from this device the first strand passes through a tubular shaft structure to the outer end portion of a flier arm rotating about a horizontal axis, and from the end of the flier arm the wire is carried in a generally inward and forward direction to the twisting point. Rearwardly of the twisting point but forwardly of the flier arm there is supported for rotation on a horizontal longitudinal arbor the spool carrying the second strand, from which spool the second strand is taken off and led to the twisting point. The twisting point, that is to say, the point where the two strands are intertwisted, is adjacent or associated with a tubular guide through which the twisted wire is pulled by a take-up member such as a drum which is effective in pulling the wire from both spools, and from which the wire is directed to the receiving spool.

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In the drawings, the bed frame of the machine is indicated at A, the longitudinal drive shaft at B, the first supply spool at C, the tension-regulating device at D, the tubular shaft structure, previously mentioned, at E, the flier arm at F, the second supply spool at G, the wire guide adjacent the twisting point at H, the take-up drum at I, the receiving spool for the finished product at J, and the electric motor for driving the shaft B, at K.

Referring now to the details, the first supply spool C is rotatably supported by a support 10 rising from the machine bed, the support 10 receiving an arbor 11 providing a horizontal rotation axis for the spool. The tubular shaft structure E is carried upon the upper end of an upstanding pedestal or support 12 rising from the bed, and the pedestal 12 also serves to support a bracket 13 extending toward the spool C and carrying the tension-regulating device D, which device in this particular form consists of three serially arranged sheaves or pulley-like members grooved at the periphery about which the strand C' from the spool C is reeved, one of said sheaves having rigid therewith a shaft with which is associated an adjustable brake.

The tubular shaft structure E comprises a tubular member 14 placed horizontally of the machine and mounted in anti-friction bearings 15 that are at the top of the pedestal 12. Rotatably mounted in the tubular member 14 by means of anti-friction bearings 16a, as shown in Fig. 3, is a second tubular member 16 having a bore through which the strand extends. At the rear

of the inner tube 16, and at a point outside of the tube 14, tube 16 has fixed to it a drive pulley 17 the function of which will be described hereinafter. At the rear end of the outer tube 14 is fixed a drive pulley 18 by means of which tube 14 is rotated, drive pulley 18 being connected by a belt 19 to a pulley 20 on the drive shaft.

At the forward end of the inner tube 16 the latter has fixed to it a bushing 21 with a flaring mouth 22 which provides a support for the strand as it is directed outwardly to the outer end portion of the flier arm F. Beyond the bushing 21 in a forward direction the outer tube member 14 is cut away at two points in its circumference, as indicated at 23, and the strand, in passing laterally to the flier arm, extends through one of these portions. Beyond the cut-away portions 23 the member 14 has a forward extremity 24 engaged by bolts 25 that secure member 14 rigidly to a solid shaft member or stub 26 that has a function that will appear hereinafter. The flier arm F has adjacent its outer end or tip a pulley 27 over which the strand is reeved, and the arm F in the form shown is constituted by a frame having longitudinal members 28 and transverse members 29. The flier arm is curved, preferably as shown in Fig. 3, so that its radially outer end is disposed forwardly of that part which is adjacent the tubular member 14.

As will be apparent from Fig. 3, for example, the main part of the flier arm F is located to one side of the tube 14, but there is an extension 30 at the opposite side of the tube which is somewhat shorter than the main part and serves to mount a suitable counterweight 31, which balances the main part of the arm. The extension as well as the main part of the arm is provided with a number of transverse members or bars 29, and the counterweight 31 may be mounted in a convenient manner between the bars 29 that are farthest from the center of rotation. The flier arm is rotatable by the rotation of the tube 14 inasmuch as the arm is fixed to this tube in a suitable manner, the region of connection being between what is the uppermost bar of the extension 30 (Fig. 3) and the lowermost bar of the main part of the arm. It will also be apparent that in this form the strand passing through the member 14 extends between the two lowermost bars of the main part of the arm (Fig. 3) and to the pulley 27, which pulley is mounted in the space between the end bar of the arm and the next adjacent bar.

The part of the stub shaft 26 to which the right-hand end (Fig. 4) of the tube 14 is connected is rectangular in cross-section, and is received within a rectangular recess provided in the flier arm by the side members of the arm and the two adjacent transverse bars. In the form shown here, the connection between the flier arm and the rectangular part of the stub shaft 26 comprises members such as screws 32 (Fig. 7) which extend through the side bars of the arm and into said rectangular part. It will be understood that by this construction the arm is securely locked to the tube 14 so as to be rotated thereby.

The stub shaft 26 extends forwardly from the arm and is surrounded by an anti-friction bearing 33 having an inner race that is fixed to the stub shaft and an outer race that is revoluble about the stub shaft, the outer race being fixedly held in a cup-like member 34 that is fixed in a suitable manner, as by fastening screws, to a leg 36 of a supporting bracket 37 that has the dual function of supporting the second supply spool G for rotation and supporting a pulley about which the strand from the second spool is reeved. The second spool G is supported from the bracket 37 by reason of the fact that the vertical leg 36 of the bracket has an extension 38 beyond the center of rotation of the tube 14, to which extension 38 an arbor 39 is secured. The arbor 39 extends forwardly from the extension 38 and the spool G is rotatably mounted on this arbor. A suitable tensioning device is usually employed in connection with the spool G, and in the form shown this comprises a brake drum 40 rotatable about the arbor but in fixed relationship to the spool, said brake drum being acted upon by a brake band 41 that can be tightened or loosened by manipulation of thumb screws 42. The spool G can be readily placed in position upon the arbor 39 by rolling the spool up onto a ramp 43 associated with the bed of the machine, after which the spool, upon slight lifting thereof, can be shifted rearwardly into position over the arbor. After the spool has been placed in position in this manner, a retaining member 44 is suitably fixed on the free end of the arbor, which retaining memebr is provided with a forwardly extending arm 45 provided with a terminal guide loop 46. The free end of the strand G' on the spool is guided over a pulley 47 associated with the horizontal leg of bracket 37 and is led through the eye 46 and to the guide H and the take-up drum I. The pulley 47 on the bracket 37 is preferably subject to the action of a coil spring 48. The pulley body in which the pulley 47 is mounted is slidable in a forward and rearward direction on a guide rod 49a, and the spring 48 surrounds this rod forwardly of the pulley body. The spring 48 acts to prevent the pulley from being pulled forwardly to too great an extent by the strand, and the spring also has a certain cushioning action, making the take-off from the spool smoother than it would otherwise be.

The take-up drum I has about two turns of the twisted wire in engagement with its outer surface. This drum is mounted on and driven by a cross shaft 49 mounted in bearings in a frame extending upwardly from the bed. On one end of this shaft 49 is a gear 50 engaging an adjustable idler gear 51, which in turn is engaged by a drive pinion 52 on a cross shaft 53. The shaft 53 is driven by bevel gearing, as shown in Fig. 2, from a short longitudinal shaft 54 that is driven by a belt and pulleys from the drive shaft B.

As will be observed from Figs. 1 and 2, the tubular guide H is in approximate alignment with the axis of the hollow shaft structure E and is preferably at a level such that the twisted product is conducted to and passes over the top of the drum I. From the drum I the twisted product is directed upwardly to a pulley 55 mounted on a post 56, and from the pulley 55 it passes downwardly to the receiving spool J, spool J being mounted on one end of a cross shaft 57 and driven by a belt and pulleys from the cross shaft 49.

In the operation of the machine, the take-up drum I exerts draft or pull on both of the strands so as to pull them through the guide H, and the cross shaft 57 drives the receiving spool J so as to reel up the twisted wire. As the strand from the spool G is drawn to and into the guide H, the rotary flier lays the first strand around the second and forms the twist of the strand. The flier rotates about an axis which is somewhat above the axis on which the second spool

rotates. The weight of the second spool is centered at a point somewhat below the rotation axis of the arm, the bracket supporting the second spool being movable in a vertical transverse plane, with the axis of the flier arm as a pivot, but the downwardly extending member on which the second spool is supported cannot be displaced to any appreciable extent in this plane because of the weight of the second spool, which at all times holds the bracket 37 substantially stationary in the position shown in Fig. 3. Thus a very effective and convenient support for the second spool is provided in a manner such that the strand can readily be taken off of this spool, to be twisted with the first strand, the strand being taken off from the rotating second spool at a point which is relatively fixed.

In the operation of the machine, the flier arm is rotated by the tubular shaft member 14 to which it is fixed, while one of the wire components is being pulled forwardly through the shaft member. The rotation of the member 14 has no effect in rotating the inner tubular member 15 inasmuch as the latter member is mounted in member 14 by the anti-friction bearings 16a, as previously described. However, the rotation of the flier arm causes a certain amount of twisting effect to be exerted upon that portion of the wire component passing through the hollow shaft structure. For this reason there may, under some conditions, be a tendency to build up an objectionable amount of twist of the wire component within the member 15. This may be readily overcome, however, by imparting to the member 15 a rotation in a direction which is counter to this twisting effect. If it is desirable or necessary to do this, a crossed endless drive belt 17b may be placed in a position between the pulley 17 and a corresponding pulley 17a on the drive shaft B, as indicated in Figs. 1, 2 and 5. In this manner it is possible to overcome any undesirable twisting effects in the wire component which is being drawn through the hollow shaft structure E.

It is understood that the twist is imparted to the wire by winding one strand on the other while the strands pass through the guide device H, one of the strands passing into the guide device substantially in the axis of the latter, and the other strand being subject to a winding action while directed at an acute angle to the first strand, as shown, for example, in Fig. 3. The guide device H in this form consists of a tubular member 58 to which is screwed at the forward end an annular member 59 having a flaring entrance or mouth 60 into which the two strands are drawn.

It is apparent that, as the arbor for the spool G is offset downwardly with respect to the rotation axis of the flier arm, there will be less clearance between the arm and the spool when the arm is in the lower dotted-line position of Fig. 1 than when it is in the upper position. Nevertheless, there is ample clearance in all positions. It is apparent, of course, that in the upper position of the arm (Fig. 3) it clears the upper part of the bracket and supports the pulley used in taking off the strand from the spool.

In the form shown, the same bracket which supports the take-off pulley 47 is used to bring about a revoluble support of the spool G from the rotary drive shaft of the flier arm, but this, as well as other details shown herein, is subject to modification.

In the form shown, the hollow drive member

for the flier arm is driven from one end, and the other end is a projecting end projecting beyond the bearings to carry the flier arm, and the drive shaft structure for the flier is continued forwardly beyond the base portion of the flier arm, and the support for the second spool G (and its take-off) is hung from this forwardly projecting portion. The provisions for so hanging it include the member in which the projecting end of the shaft is rotatably engaged, said member carrying in an offset position an arbor for the spool, which arbor is parallel to the flier axis.

It is noted that in the form shown, the base portion of the flier arm is rearwardly of the second spool and that from the base position the arm is curved gradually in a vertical longitudinal plane so that the pulley associated with its tip portion is in a vertical transverse plane extending through the body of the spool and approximately opposite the take-off device that is supported by the horizontal leg of the bracket 37. It will also be noted that the strand passing forwardly from the pulley 47 to the guide eye 46 is in approximate parallelism to that portion of the other strand that goes from the pulley 27 to the guide H, when the operation is in the stage of Fig. 3. The curving or dishing of the generally radial twisting arm is so shallow that the arm occupies very little space lengthwise of the machine.

The flier is one of very simple form and the short extension thereof which carries the counterweight provides for nice balancing so that there is no objectionable vibration.

The machine as herein described is of relatively simple and inexpensive structure, and the necessary operations can be carried out very conveniently. The disposition and arrangement of the second spool G are such that the spool can be placed in position and replaced quickly and conveniently.

For changing the pitch of the twist in the wire, it is simply necessary to substitute a gear of the necessary size for the gear 52 on shaft 53, the idler gear 51 being shifted so as to accommodate the substitute gear. The gearing is easily accessible for making such changes, as will be apparent from Figs. 1 and 2.

Owing to the nature of the mechanism, the supporting frame or bed for the machine can be inexpensively constructed of relatively lightweight material.

Various changes may be made in the organization of parts and in the details of construction without departure from the principles of the invention or the scope of the claims.

What I claim is:

1. In a machine such as described, a guide for intertwisted wire strands, means for pulling the strands through the guide, a support for a rotatable supply spool on which one of said strands is reeled and from which the strand is conducted to said guide, a rotary tubular shaft through which said strand passes axially on its way to said guide and extending in a direction transversely of the axis of said spool, a balanced twisting arm through which said shaft extends in fixed relation thereto and over which said strand passes directly to said guide, said tubular shaft having an extension extending forwardly from the attached portion of said twisting arm, and a support for a rotatable second supply spool engaged with said extension and supporting a second supply spool

carrying a strand that is pulled off of said second spool and delivered to said guide.

2. In a machine such as described, a guide for intertwisted wire strands, means for pulling the strands through the guide, a support for a rotatable supply spool on which one of said strands is reeled and from which the strand is conducted to said guide, a rotary tubular shaft through which said strand passes axially on its way to said guide and extending in a direction transversely of the axis of said spool, a balanced twisting arm through which said shaft extends in fixed relation thereto and over which said strand passes directly to said guide, said tubular shaft having an extension extending forwardly from the attached portion of said twisting arm, and a support for a second supply spool engaged with said extension and supporting a second supply spool carrying a strand that is pulled off of said second spool and delivered to said guide, said second support comprising an arbor in downwardly offset relationship to the twisting arm axis on which the second spool is rotatably supported in a substantially stationary position.

3. In a machine such as described, a guide for intertwisted wire strands, means for pulling the strands through the guide, a support for a supply spool on which one of said strands is reeled and from which the strand is conducted to said guide, a rotary tubular shaft through which said strand passes axially on its way to said guide, a twisting arm fixed to said shaft over which said strand passes directly to said guide, said tubular shaft having an extension extending forwardly from the attached portion of said twisting arm, and a support for a second supply spool engaged with said extension and supporting a second supply spool carrying a strand that is pulled off of said second spool and delivered to said guide, said second support comprising an arbor in downwardly offset relationship to the twisting arm axis on which the second spool is rotatably supported in a substantially stationary position, said second spool support also comprising a bracket for said arbor that is hung from said shaft extension said bracket being provided with a take-off for said second spool.

4. In a machine such as described, a guide for intertwisted wire strands, means for pulling the strands through the guide, a support for a rotatable supply spool on which one of said strands is reeled and from which the strand is conducted to said guide, a rotary tubular shaft through which said strand passes axially on its way to said guide and extending in a direction transversely of the axis of said spool, a balanced twisting arm through which said shaft extends in fixed relation thereto and over which said strand passes directly to said guide, said tubular shaft having an extension extending forwardly from the attached portion of said twisting arm, and a support for a second supply spool engaged with said extension and supporting a second supply spool carrying a strand that is pulled off of said second spool and delivered to said guide, said second support comprising an arbor in downwardly offset relationship to the twisting arm axis on which the second spool is rotatably supported in a substantially stationary position, said second spool support also comprising a bracket for said arbor that is hung from said shaft extension, said bracket also supporting a take-off guide element for the strand on the spool.

5. In a machine such as described, a guide for intertwisted wire components, a take-up means

for pulling the components through the guide, a support for a supply spool on which one of the components is reeled and from which the component is conducted to said guide as said spool rotates, a balanced twisting flier arm rotatable about an axis horizontally and longitudinally disposed intermediate the ends of said arm and coinciding with a portion of said component being conducted toward said guide, said arm being a substantially radial arm over which said component is led from the rotation axis substantially to the tip of the arm, from which tip said component is led directly to said guide at an angle thereto, and means providing a substantially stationary support for a second supply spool carrying a second component that is pulled off of said second spool and delivered to said guide, said last-named means including a longitudinal horizontal arbor located radially inwardly from the tip of said arm, said arbor having a carrying bracket and said bracket being hung from a shaft member concentric with the axis of rotation of the arm.

6. In a machine such as described, a guide for intertwisted wire components, a take-up means for pulling the components through the guide, a support for a supply spool on which one of the components is reeled and from which the component is conducted to said guide as said spool rotates, a twisting flier arm rotatable about an axis horizontally and longitudinally disposed and coinciding with a portion of said component being conducted toward said guide, said arm being a substantially radial arm over which said component is led from the rotation axis substantially to the tip of the arm, from which tip said component is led directly to said guide at an angle thereto, and means providing a substantially stationary support for a second supply spool carrying a second component that is pulled off of said second spool and delivered to said guide, said last-named means including a longitudinal horizontal arbor located radially inwardly from the tip of said arm, said arbor having an L-shaped carrying bracket and one leg of said bracket being hung from a shaft member concentric with the axis of rotation of the arm, the other leg of said bracket supporting a take-off pulley over which the wire component on said second spool is led.

7. In a machine such as described, take-up means for pulling intertwisted strands through a suitable guide, a support for a supply spool on which one of the strands is reeled and from which the strand is conducted to said guide, a substantially radially extending rotary flier arm over the end of which said strand passes directly to said guide, a shaft for rotating said arm, a second spool delivering a second strand to said guide, a pivotally mounted L-shaped member having one leg thereof hung from said shaft, and an arbor connected to said leg and rotatably mounting said second spool, the other leg of the L-shaped member mounting a take-off for said second strand, said L-shaped member being maintained in substantially stationary position by the weight of said second spool as the second strand is delivered to said guide.

8. In a machine such as described, a machine bed having a receiving end and a delivery end, a pulling drum adjacent the delivery end, a guide for intertwisted strands located rearwardly of the pulling drum, a rotary shaft directed horizontally and longitudinally of the bed rearwardly of said guide, a flier arm fixed to said shaft and rotatable thereby, a rotary supply spool adjacent

the receiving end of the bed from which a wire component is pulled so as to pass through said shaft axially thereof and outwardly to the tip of said arm, said component being reeved over the tip of said arm and then passed directly to the guide, a bracket for a second rotary spool located between said guide and said arm, a spool-supporting arbor extending forwardly from said bracket adjacent the lower end of the bracket, and a shaft-engaging cup-like member extending rearwardly from the bracket at an elevation above said arbor and serving to hang the spool from said shaft.

9. In a machine such as described, the combination of a shaft, means for rotating said shaft, a flier arm fixed to said shaft, said shaft having an extension beyond the body of said arm, an L-shaped supporting bracket having a depending leg, a spool-supporting arbor extending from said leg in a forward direction, a cup-like member projecting from said leg in a rearward direction, supportedly connected to said extension, and a take-off for the spool carried by the other leg of said bracket.

10. In a machine such as described, the combination of a rotary driven shaft of tubular form, an inner tube revoluble in said shaft, said shaft having a lateral exit slot adjacent one end of said inner tube through which a wire component passing through the inner tube is led in a

lateral direction, a flier arm fixed to said shaft having a pulley over which said wire component is reeved, and means rotating said inner tube when said shaft is driven and in a direction opposite that in which said shaft is driven and inhibiting twistng of said wire component in said shaft.

11. In a machine such as described, a rotary flier arm, a tubular rotary shaft fixed to said arm for driving the same, an inner revoluble tubular member in said shaft through which a strand passes and is then directed through a lateral slot in said shaft and over said flier arm, and means whereby the inner member is driven in a reverse direction to inhibit twisting of said strand in said shaft.

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