Aug. 15, 1939. G. WOLF 2,169,828

PROCESS AND MACHINE FOR WINDING CABLES

Filed Jan. 22, 1938

Fig. 1

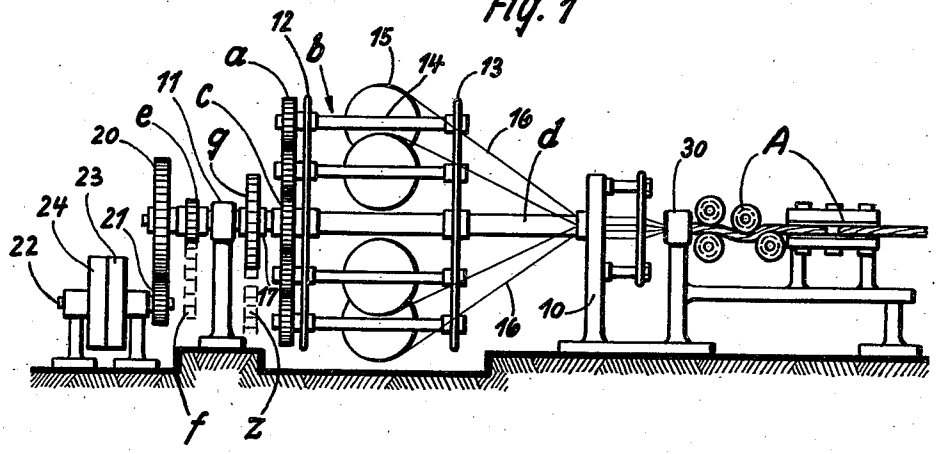


Fig. 2

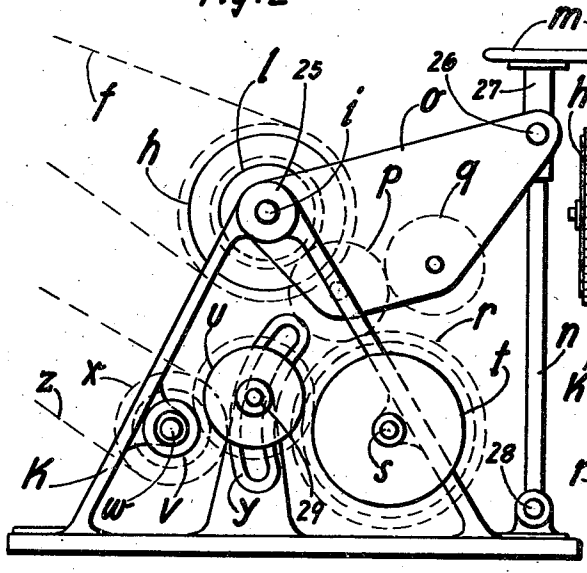
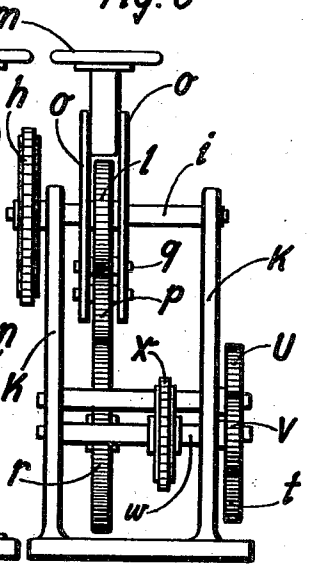


Fig. 3



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PROCESS AND MACHINE FOR WINDING CABLES

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4 Claims. (Cl. 57—65)

The invention relates to the manufacture of wire cables consisting of a number of strands each composed of a plurality of wires. In the production of such cables on the customary cable winding machines the twisting tension of the cable strands, as well as of the individual wires of the strands, increases in winding regular lay cable, but decreases in winding Lang lay cable. For this reason the resulting cables have a tendency to twist too strongly, or to untwist.

The manufacture of a cable without any twisting strain at all has heretofore only been successfully done by the use of a preforming process, which produces a deformation of the steel material. The problem to be solved by the present invention is to produce a cable completely without twisting strain, particularly a regular lay cable of this kind.

It is already known to use a variable individual rotation of the feed spools, in order to produce an increased tension in Lang lay cable, so as to make a sufficiently firm structure of the finished cable. It is further known to draw the finished cable, or the individual strands, through a bending device, in order to remove twisting strains, the device for this purpose consisting of sets of rollers arranged one behind another in different planes.

The essential feature of the invention is that the cable strands are wound with the individual wires relatively loosened, by suitable control of the rate of back rotation of the feed spools; following which the cable is drawn through a bending device of the kind described above.

By this procedure in accordance with the invention it is achieved that the outer wires of the strands, which have a greater path to cover, first arrive at the winding head without any great strains and then the loosened cable structure, has imparted to it by the winding a firm and definite structure, in which all individual wires lie with substantially equal tension throughout their length.

The back rotation of the feed spools is accordingly always so determined and set that a sufficient loosening of the individual wires of the strands take place before the winding of the strands. The non-uniform thickness of the cable elements which results from this loosening is removed by drawing the cable through a bending device, preferably like the one above-described, having a plurality of sets of rollers arranged one behind another in different planes. A cable completely relieved of twisting strain is produced without any deforming or strain of the material.

A machine for carrying out the invention is shown in the accompanying drawing, wherein

Fig. 1 is a side elevation of a cable winding machine, with its reversing and speed controlling gearing omitted for greater clearness;

Fig. 2 is rear elevation of the speed and direction control gear; and

Fig. 3 is a side elevation of the mechanism shown in Fig. 2.

A tubular shaft *d* is rotatably supported in bearing posts **10** and **11** and has fixed upon it a spool cage *b* comprising disks **12** and **13** fixed to the shaft *d* and spool shafts **14** rotatably mounted in the disks. Each shaft **14** bears a feed spool **15** upon which is wound a strand **16** composed of a plurality of wires twisted together, the connection of each spool with its shaft (not shown in detail) being such as to permit the spools to unwind about axes transverse to their shafts **14**. A gear **20** keyed to shaft *d* meshes with a gear **21** mounted upon a countershaft **22** having the customary tight and loose pulleys **23** and **24** respectively for a belt drive (not shown). Through this gearing the primary drive is imparted to the cage *b* which revolves the spools **15** bodily about the axis of the shaft *d* to wind the strands **16** together.

Each shaft **14** has fixed to it a planet gear *a*, the set of gears *a* meshing with a sun gear *c* mounted upon a tubular shaft **17** revoluble upon the shaft *d*. Shaft **17** has fixed to it a sprocket wheel *g* connected by a chain *z* with a sprocket wheel *x* of the reverse and speed control gearing. The shaft *d* has keyed upon it a sprocket wheel *e* over which is trained a chain *f* running to a sprocket wheel *h* of the reverse and speed change gearing. The sprocket wheels *h* and *x* are interconnected by a mechanism now to be described so that the drive of shaft *d* can be imparted to the sun gear *c* to turn the latter in either direction, and at any determined speed, to rotate the feed spools **15** about the individual axes of the shafts **14**, which I call the twist axes. The sprocket wheel *h* is fixed upon a shaft *i* rotatably supported in bearings **25** in the frame *k* of the reverse and speed change mechanism. Also fixed to the shaft *i* is a gear *l* which meshes with a pinion *p* rotatably mounted upon a swinging arm *o*. The arm *o* is composed of two parallel plates loosely pivoted on shaft *i* and connected at their outer ends with pins **26** of a nut **27** threaded on a screw spindle *n*, the lower end of which is pivotally mounted at **28** on the frame *k*. The nut **27** can be adjusted on the screw spindle *n* by means of a handwheel *m*. In the position shown in Fig.

2 the pinion *p* meshes directly with a large gear *r* fixed upon a shaft *s*. By adjusting the arm *o* downward on the spindle *n* a second pinion *q* meshing with the pinion *p* can be brought into engagement with the gear *r* as pinion *p* moves out of engagement therewith. Thus the gear *r* can be rotated in either direction. Fixed to the shaft *s* is a second gear *t*, the number of teeth of which corresponds to the desired rate of rotation of the individual shafts **14** of the feed spools. The gear *t* meshes with an intermediate gear *u* mounted upon a shaft **29** which can be adjusted up and down within an arcuate slot *y* of the frame *k*, in conformance with the size of the gear *u* in use, to bring the gear *u* into mesh with a gear *v* fixed upon the shaft *w* of sprocket wheel *x*. The rate of rotation imparted to the gear *x*, and thence to the sun wheel *c*, is determined by the sizes of the gears *t* and *u*.

The wound cable passes from the winding mechanism through an eye **30** to a bending device A, which is preferably of the kind shown in my Patent No. 1,862,345, though a suitably smaller degree of bending is sufficient in the present case. The bending in a plurality of planes radial to the axis of the cable equalizes the non-uniform thicknesses of the cable material and causes simultaneously a release of harmful twisting strains in the cable. By a correct adaptation of the speed and direction of rotation of the planet wheels *a* to the properties and conditions of the cable material and cable elements, as well as suitable choice of the degree of twisting strain during the laying of the cable, a smaller degree of bending in the rollers A results, affording the highest possible protection of the structure of the cable material and thereby a longer life of the finished cable than heretofore.

I claim:

1. Process for producing wire cable with low twisting tension, which comprises winding together a plurality of wires to make a plurality of compact twisted strands, winding together said strands while twisting them individually about their own axes in the direction opposite to the direction in which the wires composing them were wound together, sufficiently to loosen the individual strands before they are wound together into a cable, and then bending the cable in a plurality of different planes.

2. Process for producing wire cable with low twisting tension, which comprises revolving around a common axis a plurality of spools of strands each composed of wires twisted compactly together, thereby winding said strands together, while rotating said spools around individual axes transverse to their unwinding axes in a direction and at a rate so proportioned to the rate of revolution of the spools around said common axis as to bring said strands into winding position with their individual wires relatively loosened, and then bending the cable in a plurality of different planes.

3. In a machine for winding wire cable, a revoluble cage, a plurality of strand feed spools each mounted on said cage to rotate about an unwinding axis and also about a twist axis transverse to said unwinding axis, driving means for revolving said cage, and means actuated by said driving means for rotating said spools about said twist axes at a rate bearing a definite ratio to the rate of revolution of said cage, said last means including means for reversing the direction of rotation of said spools about said twist axes, comprising a driving gear, a driven gear, a pair of reversing pinions permanently meshing with each other and one permanently meshing with one of said gears, an arm mounted to swing about the axis of said last mentioned gear, adjustable means for holding said arm in certain angular positions, said pinions being supported upon said arm so as to be brought alternatively into mesh with that one of said gears not permanently in mesh with one of said pinions.

4. Process for producing wire cable with low twisting tension, which comprises revolving around a common axis a plurality of spools of strands each composed of wires twisted compactly together, thereby winding said strands together, while rotating said spools around individual axes transverse to their unwinding axes in a direction and at a rate so proportioned to the rate of revolution of the spools around said common axis as to bring said strands into winding position with their individual wires relatively loosened.

GUSTAV WOLF.