Aug. 2, 1949. F. A. FRENCH 2,477,690

APPARATUS FOR FORMING TWISTED WIRE STRUCTURES

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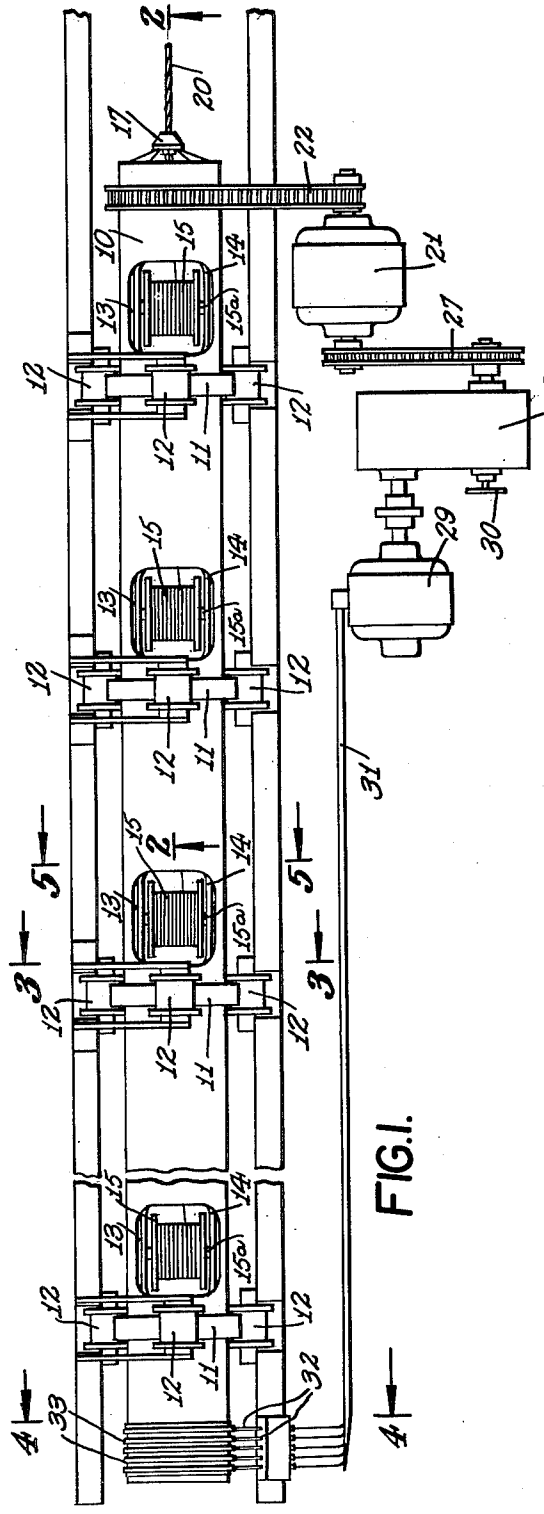


FIG. 1.

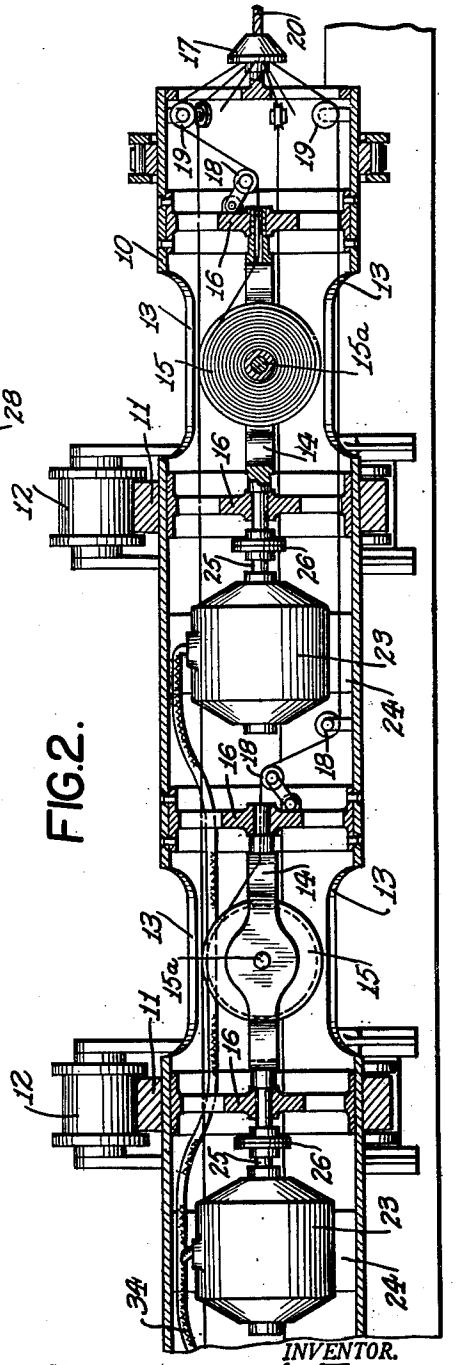


FIG. 2.

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FIG.3.

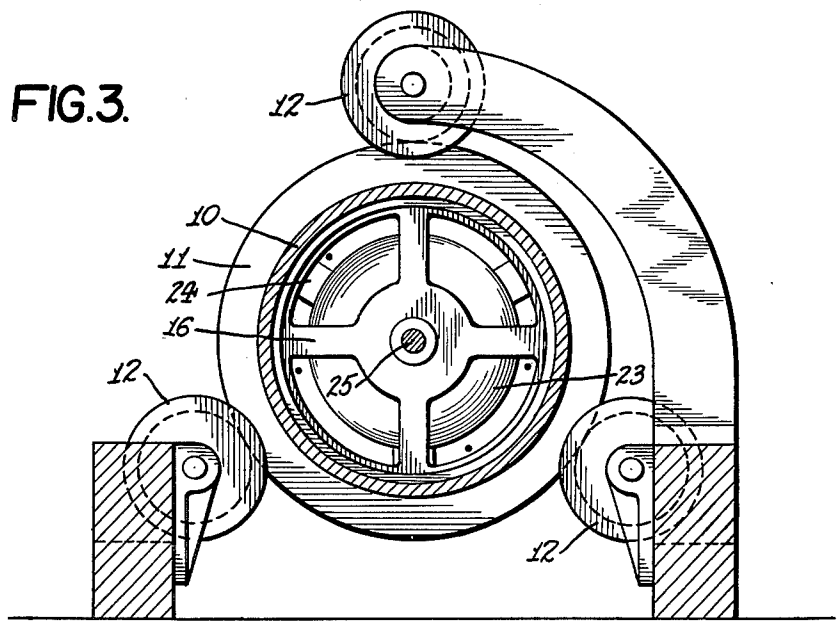
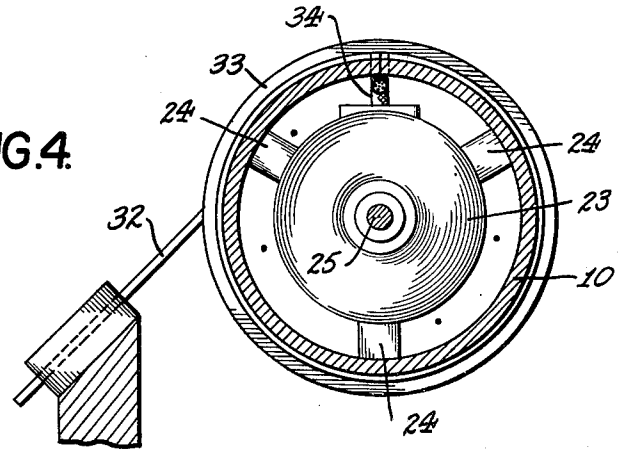


FIG.4.



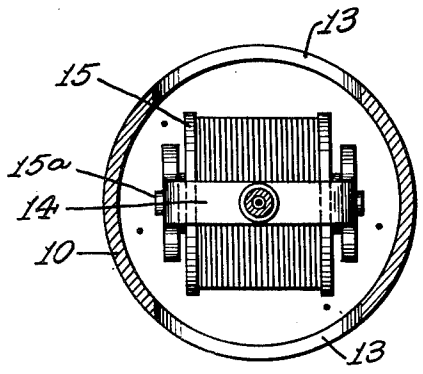


FIG.5.

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APPARATUS FOR FORMING TWISTED WIRE STRUCTURES

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8 Claims. (Cl. 57—59)

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This invention relates to apparatus for forming an elongated twisted structure, such as wire strand or cable, from a plurality of individual wires, strands, filaments or the like. More particularly, the invention is concerned with apparatus for imparting a controlled and uniform amount of twist, in either direction, to the individual wires or filaments before they are twisted together or laid into the form of the finished structure.

In the manufacture of wire strand, wire cable or the like, it is frequently important to impart a certain amount of twist to the individual wires or strands as they are fed to a closing or forming die of a stranding or cabling machine. The machine described herein is capable of adjustment either to apply no twist to the individual wires or strands or to apply a controlled amount of twist to the individual wires or strands in either direction from neutral and at any desired ratio with the main machine rotor. In this manner the qualities such as the crankiness of the finished product can be controlled and, in general, an improved final product obtained. Complicated machines have been tried for this purpose, but generally speaking have not been particularly successful due to their complexity and the slow speeds at which they have to be operated. Furthermore, the more complicated the construction of such machine is, the more maintenance is required and the more frequently break downs occur which interrupt the production schedule.

One object of my invention is to provide electrical means for controlling in a simple and positive manner the amount and direction of twist imparted to individual wires or filaments in such a machine.

Another object of my invention is to provide such a device in which the control means is connected to the main drive of the machine so that a constant ratio of wire twist to machine rotation is always obtained regardless of varying speeds of operation of the machine.

A further object of the invention is the provision of apparatus in which the desired ratio of twist of the individual wires to the twist of the finished product can be selected or adjusted in a simple but effective manner while the machine is either standing still or operating.

Other objects will be apparent and will be explained in connection with the following description of a preferred embodiment of my invention illustrated in the drawings, in which

Fig. 1 is a plan view of a wire stranding machine embodying my invention.

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Fig. 2 is a vertical sectional view of the machine taken about on the line 2—2 of Fig. 1.

Figs. 3, 4 and 5 are transverse sectional views through the machine taken respectively on the lines 3—3, 4—4 and 5—5 of Fig. 1.

The machine illustrated in the drawings as one embodiment of my invention is a horizontal stranding machine having the usual rotor 10 which is provided with a number of circular bands or tracks 11 that in turn are supported and guided for rotation by the rollers 12. Rotor 10 may be provided with openings 13 at intervals in its shell for access to cradles 14 which carry spools or reels 15 of the wire. The cradles 14 are preferably mounted in suitable bearings 16 concentric with the axis of rotation of the rotor 10 so that the cradles 14 are free to rotate in either direction with respect to the rotor 10.

The reels or spools 15, of course, are mounted on shafts or axles 15a extending transversely of the rotor 10 so that the wire can be fed from each of the spools to a stationary closing or forming die 17 located near one end of the rotor 10. Each individual wire from one of the spools may be fed to the die 17 by passing it through a hollow portion of one of the axles of the cradles 14 and thence over the guide pulleys 18 to a series of guide pulleys 19 located near one end of the rotor adjacent the die 17. The wire strand 20 issuing from the die 17 is pulled out of the die by means of any suitable pull-out mechanism (not shown), as will be understood by those skilled in the art. The rotor 10 may be driven by any suitable means such as an electric motor 21 and the chain 22.

My invention is concerned with the means for imparting to the cradles 14 and the spools or reels 15 carried thereby a controlled amount of rotation relative to the rotation of the rotor 10, whereby the desired amount and direction of twist can be imparted to one or more of the individual wires. For this purpose, I provide a series of synchros or self-synchronous motors 23, one for each of the cradles 14. The stationary part or stators of these synchros may be connected directly to the rotor 10 by the brackets 24, so that these stators rotate with the rotor 10. The rotary portions of the synchros carried on the shafts 25 are connected directly by suitable couplings 26 or other means to the axles of the cradles 14, so that these axles are rotated directly by rotation of the rotor portions of the synchros.

The motor 21, which drives the rotor 10, is connected by the chain 27 to a suitable variable speed drive mechanism 28, which in turn drives

a synchronous generator or master synchro 29. The variable speed drive mechanism 28 may be of any suitable type so that by adjustment of the control 30, the rate and direction of rotation of the generator with respect to the rate of rotation of the motor 21 can be varied at will. If desired, the variable speed drive 28 may be replaced with a simple change gear drive which would provide means for presetting the rate and direction of twist with respect to rotation of the machine rotor. However, in this case, adjustment while the machine is running would not be possible.

The generator 29 is connected electrically to the individual synchros 23 by means of an electrical cable 31 and suitable brushes 32 which bear on corresponding slip rings 33 mounted on the rotor 10. The slip rings 33 in turn may be connected to each of the synchros 23 by means of the cable 34. A five wire cable system for connecting the generator 29 to the synchros 23 is illustrated in the drawings because these synchros ordinarily are provided with a three-phase stator connected to the stator of the generator 29 and with a single phase winding in the rotor which is likewise connected to the rotor of the generator or master synchro 29.

It will thus be apparent that the direction and speed of rotation of the rotor of the generator or master synchro 29 will determine the direction and speed of rotation of the cradles 14 carrying the wire spools 15. Thus, not only can the cradles 14 all be rotated simultaneously in the same direction at the same speed, but they can also be rotated at a speed which is directly proportional to the speed of the motor 21 and the rotor 10, the particular proportion depending upon the setting of the variable speed drive 28.

As distinguished from the use of planetary gearing and other complicated mechanisms, the relative rate of rotation of the cradles 14 can be readily adjusted quickly and easily by the operator while the stranding machine is in operation.

A particular feature of my machine is the fact that all gears and mechanical drive parts for obtaining and controlling twist ratios are outside of and entirely separate from the machine rotor.

Apart from the flexibility and ease of adjustment of my apparatus, one of its principal advantages is the higher speed at which it can be operated due to the concentric placement of the component parts. A low flywheel effect is inherent in this arrangement. Since the speed of operation of such a machine is directly related to the cost of production, it will be apparent that my machine is capable not only of producing a more uniform product but also of producing it at a lower cost. In addition, of course, the apparatus is smoother in operation, quieter, and is not as complicated, all of which improve the working conditions of the operator and means that less maintenance work is involved in keeping the machine operating in the proper manner.

Certain variations and modifications of the embodiment of my invention illustrated in the drawings will be apparent to those skilled in the art. For example, individual synchros 23 have been described as connected to each of the reel or spool cradles, whereas it might be that certain of the wires would require no twist. In such a case, certain synchros 23 could be omitted

and the cradles associated with them could be counterweighted to remain in a neutral position. It might also be desirable to use more than one master synchro generator and drive, with separate circuits to the individual synchros or groups of synchros, for obtaining different ratios or directions of rotation on certain cradles, instead of having all of the cradles rotate in a like manner. For most practical purposes, however, the form of machine illustrated in the drawings is entirely satisfactory.

The terms and expressions which I have employed are used as terms of description and not of limitation, and I have no intention, in the use of such terms and expressions, of excluding any equivalents of the features shown and described or portions thereof, but recognize that various modifications are possible within the scope of the invention claimed.

I claim:

1. In apparatus of the character described, a rotary member for feeding a plurality of wires or the like to a die, a spool therefor mounted in said member so that it can be revolved about the axis of rotation of said member, means for rotating said member, and electrical means connected to said rotating means by a variable speed drive for revolving said spool at a controlled ratio to the speed of rotation of said member, said electrical means including a generator driven by said rotating means and electrically connected to a motor that revolves said spool about said axis.

2. In apparatus of the character described, a rotary member for feeding a plurality of wires or the like to a die, a spool therefor mounted in said member for revolution about an axis extending longitudinally of the wire fed from the spool, synchronous motor means for controlling the revolving of said spool about said axis, means for rotating said member, an electrical generator driven by said rotating means and connected electrically to said motor means for revolving said spool at a speed proportional to the speed of rotation of said member.

3. In apparatus of the character described, a rotary member for feeding a plurality of wires or the like to a die, a spool therefor mounted in said member for revolving about an axis extending longitudinally of the member, synchronous motor means for controlling the rotation of said spool about said axis, means for rotating said member, an electrical generator driven through a variable speed drive mechanism by said rotating means, said generator being connected electrically to said synchronous motor means to revolve said spool in accordance with the speed of rotation of the generator.

4. A stranding machine for imparting a predetermined amount of twist to one or more individual wires which comprises a rotor carrying a plurality of spools of wire with at least one of said spools supported for revolution about an axis extending longitudinally of the wire fed therefrom, means for driving the rotor, synchronous motor means for controlling the revolving of said spool about said axis, and electrical generating means driven by said driving means and connected to drive said motor means.

5. A stranding machine for imparting a predetermined amount of twist to one or more individual wires which comprises a rotor carrying a plurality of spools of wire with at least one of said spools supported for revolution about an axis extending longitudinally of the rotor, means

for driving the rotor, synchronous motor means for revolving said spool about said axis, a synchronous generator driven through a variable speed drive by said driving means, and means connecting said generator electrically to said motor means.

6. A stranding machine for imparting a predetermined amount of twist to one or more individual wires which comprises a rotor carrying a plurality of spools of wire supported by spool carriers for rotation about axes extending longitudinally of said rotor, means for rotating said rotor, self-synchronous motors mounted in said rotor for rotating said spool carriers about said axes, a synchronous generator for controlling rotation of said motors, and variable drive means connecting said rotating means to said generator.

7. In a stranding machine having a rotor carrying spools of wire, a closing die, and means for driving the rotor, mechanism for imparting a uniform and controlled amount of twist to the individual wires fed from said spools to said die, said mechanism comprising cradles carrying said spools and arranged to rotate about axes substantially coincident with the axis of said rotor,

self-synchronous motors having stationary parts connected to said rotor and rotary parts connected to said cradles, a generator for supplying current to said motors, and adjustable drive means connecting said rotor driving means to said generator.

8. In a wire stranding machine having a rotary cage, a closing die, a plurality of wire spools supplying individual wires to said die, and means for driving said rotary cage, the combination of synchronous motors for revolving said spools about an axis longitudinal of said cage, and a synchronous electrical generator separate from said cage for controlling the rate of rotation of said motors.

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