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TWISTING MACHINE, ESPECIALLY FOR WIRE ROPE MAKING

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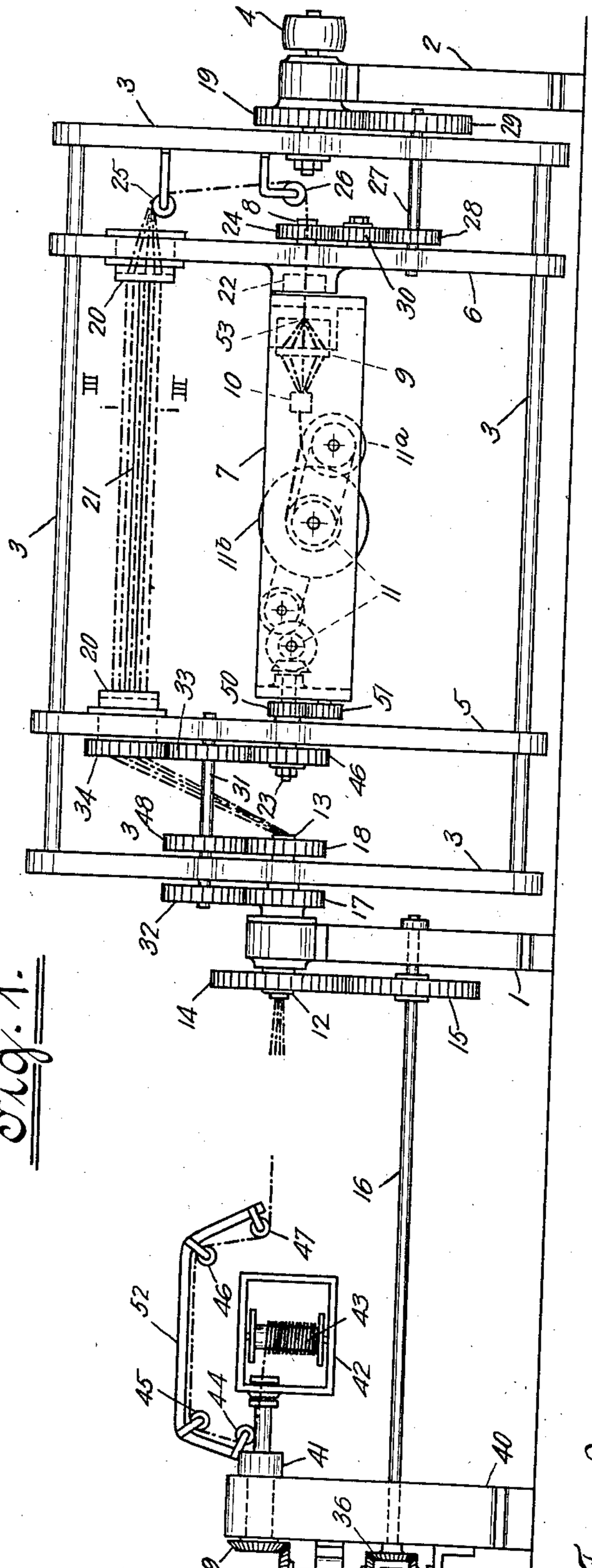

Fig. 1.

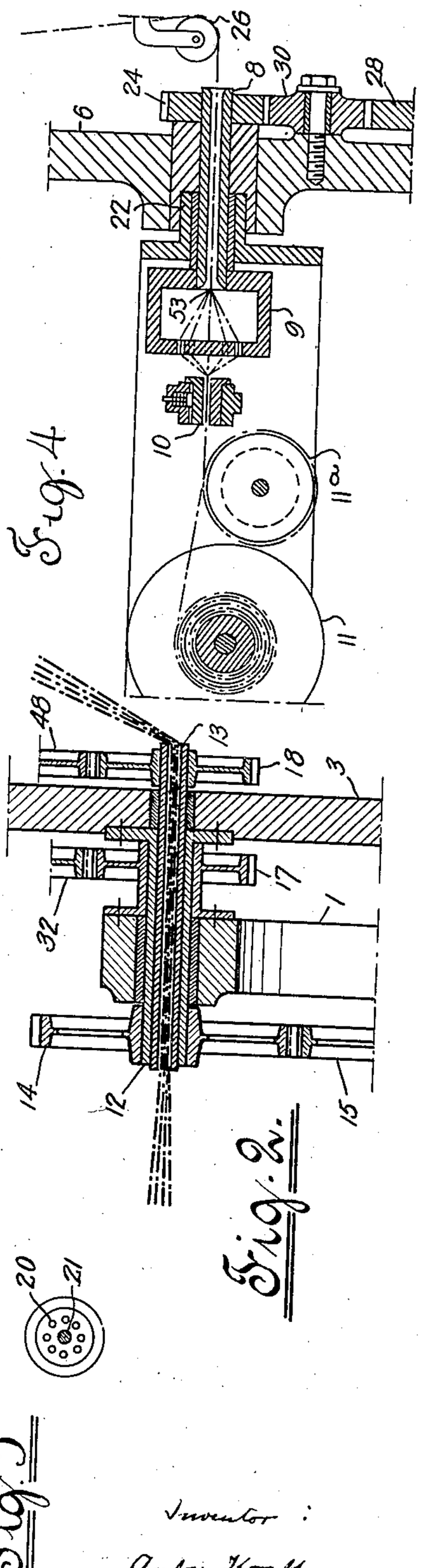

Fig. 4

Fig. 2.

Fig. 3

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TWISTING MACHINE, ESPECIALLY FOR WIRE ROPE MAKING

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This invention relates to a twisting machine in which the individual wires or strands, provided with a back twist, are guided along a flyer, which carries the twisting frame locked in position of rest.

The novelty consists in that two twists in like direction are imparted in the wire bundle at one revolution and on one side of the flyer, which twists are again unwound by a laying plate driven in the opposite direction, the rope being laid at the same time on the farther side of the laying plate on the pressing cheek. Consequently the laid rope is poor in tension in itself. Owing to the fact, that the twistings of the wire bundle during the laying of the rope are continually neutralized, it is possible on the one hand to build the machine lighter, and on the other hand a much higher running speed and consequently a considerably increased efficiency is obtained as compared with the known machines, as, according to the invention, no additional stresses and impeding forces occur in that the twists during the laying of the rope are continuously forced into the material.

A form of construction of such machine is illustrated by way of example in the accompanying drawing in which:

Fig. 1 is a front elevation.

Fig. 2 shows a detail in longitudinal section.

Fig. 3 is a cross section on line III—III of Fig. 1.

Fig. 4 shows in longitudinal section the laying and winding mechanisms for the rope.

A flyer 3 driven by a pulley 4 rotates in brackets 1 and 2. Transverse arms 5, 6 of this flyer carry a twisting frame 7. This frame is loosely suspended and locked in stable equilibrated position in known manner. A laying plate 9 mounted on the hollow shaft 8 and the pressing cheek 10 and the coupled winding device 11 are arranged in known manner in the frame 7. The winding device is provided with an adjustable drawing off pulley 11*a* and winding drum 11*b* for uniformly advancing the rope material.

The stub journal 12 of the flyer 3 journaled in the bracket 1 accommodates a second, likewise hollow shaft 13, through the bore of which the individual wires are fed into the machine. A toothed wheel 14 mounted on the stub journal 12, engages with a toothed wheel 15 and drives a shaft 16 which actuates the individual back twisting body for the individual wires. A toothed wheel 17 is rigidly fixed on the bracket 1, and a toothed wheel 18 is keyed on the hollow shaft 13 (Fig. 2). A toothed wheel 19 is rigidly fixed on the bracket 2.

An axial guide shaft 21 with separating plates 20 is shiftably journalled in the transverse arms 5, 6 of the flyer 3. The separating plates are provided with guide apertures for the individual wires arranged concentrically to the axis and grouped around the shaft 21 (Fig. 3). The hollow shaft 8 extends through a stub journal 22 of the twisting frame 7 journaled in the transverse arm 6. The laying plate 9 is mounted on the inner portion of this shaft and a toothed wheel 24 on its outer end. The bundle of wires is fed through the shaft 8 to the laying plate 9 provided with guide apertures for the individual wires, whence it reaches the press cheek 10, passes over the drawing off disc 11*a* and is wound on the drum 11*b*. Guide pulleys 25, 26 are mounted on the flyer 3 for the bundle of wires. The rope material is guided from the guide shaft 21 converging over the pulley 25 to the pulley 26 and thence in the direction opposite to the drawing in direction to the winding frame 7.

A shaft 27 carrying toothed wheels 28 and 29 is journalled between the transverse arm 6 and the flyer 3. The toothed wheel 29 meshes with the like size stationary wheel 19, rotating around same during the rotation of the flyer, and the wheel 28 transmits the rotary movement of the shaft 27 to the like sized wheel 24 by means of an intermediate wheel 30. The shaft 27 performs two revolutions during one revolution of the flyer 3, with the result that the laying plate 9 rotates twice in the same direction as the flyer 3.

A shaft 31 carrying toothed wheels 32 and 33 is journalled between the transverse arm 5 and the flyer 3. The wheel 32 meshes with and rotates around the stationary wheel 17,

and the wheel 33 transmits the rotary movement of the shaft 31 to a wheel 34 coupled to the guide shaft 21. The wheels 17, 32, 33 and 34 are of uniform size so that during one revolution of the flyer the guide shaft 21 performs one revolution in the opposite direction of rotation. The result is that, when the machine is running, the guide shaft 21 does not change its position relatively to the stationary brackets 1, 2, that is the uppermost wire guide in the plate 20 permanently preserves its position relatively to the foundation of the machine. The rope material fed through the hollow shaft 13 to the shaft 21 is consequently not itself twisted during the rotation of the flyer 3. Owing to the backward turning of the shaft 21 the first twist occurs in the bundle of wires at the pulley 25 and the second at the pulley 26. Owing to the type of line guiding of the wire bundle behind the pulley 26 the twisting of the wire bundle occurring on this pulley is effected in the same direction as that occurring on the pulley 25. If, for example, the flyer 3 rotates in clockwise direction, seen from the bracket 2, the bundle of wires is twisted together with two left twists, whereas if the flyer rotates in the opposite direction the bundle is twisted together with two right twists. As however the laying plate 9 rotates twice as quickly and in the same direction as the flyer, the two twists imparted to the wire bundle in front of the plate are at first untwisted when at the same time the rope is laid on the press cheek 10 at the rear of the laying plate. The two twists in the wire bundle transmitted up to its branch point 53 are therefore continuously neutralized during the laying of the rope, so that the laid rope is itself free from stresses.

As the individual wires of the bundle are also twisted twice during the laying of the rope, whereby torsional stresses would occur, each wire before being pulled into the machine receives a double back twist. For this purpose each wire is conducted over a bow shaped auxiliary flyer 52 rotating around the wire. Only a single auxiliary flyer is illustrated in the drawing. The auxiliary flyers 52 arranged side by side or one behind the others are connected by means of a train of gears 35, 36, 37, 38, 39 to the driving shaft 16 journalled in the brackets 1 and 40. A frame 42 rests in a state of stable equilibrium in the hollow stub journal 41 of the flyer 52 rotating in the bracket 40, the drawing off reel 43 of the individual wire rotating in said frame 42. During the unwinding each individual wire is guided from the centre of the bow over a guide pulley 44, then along the bow over the pulleys 45, 46 and 47, through the hollow shaft 12 into the machine. The pulleys 44, 45, 46 and 47 are arranged on the inner side of the flyer 52. The ratio of transmission of the driving wheels of the individual flyers 52 is such that each flyer carries out one revolution during one revolution of the main flyer 3. Thus, each individual wire receives one back twist by each of the pulleys 44 and 47. These back twists propagate freely in the bundle of wires up to the roping point on the press cheek 10, as the additional back twisting of the individual wires, occurring at the pulley 25 during the twisting of the complete bundle of wires, is again removed at the pulley 26 owing to the opposite pulling in direction of the wire bundle. The two back twists of the individual wires are also neutralized during the laying of the rope by the two oppositely directed turns of the laying plate.

A toothed wheel 48 is keyed on the shaft 31 and meshes with and rotates around the like sized wheel 18 on the hollow shaft 13 (Fig. 2), so that the shaft 13 does not rotate during the revolution of the flyer 3. The wheel 48 is of the same size as the wheels 17, 32, 33 and 34. A driving wheel 49 meshing with the toothed wheel 33 of the shaft 31, is keyed on the stub journal 23 of the roping frame 7 mounted in the transverse arm 5. During the rotation of the flyer 3, the wheel 33 revolves around the like sized wheel 49, whereby the roping frame 7 is locked in position of rest. A toothed wheel 50 is mounted stationary between the roping frame 7 and the transverse arm 5 on this latter. This toothed wheel 50 meshes with the wheel 51 keyed on the driving shaft of the winding device 11 and, through the intermediary of the toothed gearing and driving shafts coupled therewith, drives the drawing off disc 11*a* and from this disc the winding drum 11*b* for the laid rope in known manner.

The operation is as follows:

Each individual wire of the rope to be laid is unwound from its reel 43 and guided along a flyer 52. The wires run together to form a bundle in front of the hollow shaft 13. The wire bundle is guided through the hollow shaft 13 and passes in separate arrangement along the shaft 21. The wire bundle is guided in further converging over the pulleys 25, 26 behind the roller 26 in the opposite direction to that to the feed direction into the machine through the hollow shaft 8 to the laying plate 9 provided with concentric bores each for one wire and finally to the pressing cheek 10 on which the rope is laid. The laid rope is wound over the drawing off pulley 11*a* on the winding drum 11*b*. Each flyer 52 rotates at the same speed and in the same direction as the flyer 3, whereas the laying plate 9 also rotates in this direction but twice as quickly as the flyer 3.

A wire rope is produced by the turning of a wire bundle which for this purpose is clamped on one side by the press cheek 10, whereas on the other side at a certain distance from the clamping point the element effecting the turning, namely the laying plate 9, is

arranged. The laying plate 9 is provided with bores arranged concentrically to the axis of rotation. A single wire extends through each of these uniformly distributed bores so that the wires represent a pyramid-shaped frame work between the rotating laying plate 9 and the press cheek 10 which is in position of rest, the apex of this frame work being the laying point on the press cheek 10.

During the laying of the rope torsional and bending stresses occur in each individual wire of the bundle. The former are removed in known manner in that each wire running off a reel 43 receives two corresponding backward twists on the pulleys 44 and 47 of its flyer 52. These twists extend with the wire into the machine at the farthest up to the roping point. The bending stressing is produced in that the wires must assume a spiral line-shape in the rope. It has been hitherto endeavored to counteract these stresses by previously shaping the wires by means of suitably arranged bending devices without however thereby neutralizing the stresses.

The object of the invention is to remove these bending stresses in the wire bundle and to continually neutralize same with each revolution of the machine during the laying of the rope.

This is effected in that the wire bundle converging at the pulley 25 on its way to the laying plate, namely on the pulleys 25 and 26 likewise receives two backward twists which extend up to the branch point 53 of the wires. As however the laying plate 9 rotates twice during each rotation of the flyer 3 and in the same direction therewith the backward twists of the wire bundle together with the backward twists of the individual wires are continually neutralized during the laying of the rope on the press cheek 10 so that the finished rope is almost free from stresses, whereas hitherto these stresses remained almost unchanged and had to be continually forced into the material.

The two backward twists imparted to the wire bundle at the pulleys 25 and 26 produce two extended winds which are scarcely perceptible as the wires appear to lie parallel side by side right up to their branch point 53. There can be no question of roping in the proper sense of the word. The actual roping of the wire bundle only takes place on the press cheek 10.

I claim:—

1. A rope making machine, in which the individual wires are provided with a back twist, comprising in combination a flyer adapted to impart two like directed twists to the wire bundle on one side of said flyer, a laying plate rotatable in opposite direction to said flyer adapted to untwist and neutralize the twists imparted by said flyer and the back twists in the wires, and to simultaneously lay the rope, and a press cheek on the far side of the laying plate adapt to cooperate with said laying plate to press together the wires of the rope laid by said laying plate.

2. A rope making machine, comprising in combination a main flyer, auxiliary flyers connected to said main flyer adapted to impart two back twists to the individual wires, a hollow shaft of said main flyer adapted to guide the wires arranged side by side coming from said auxiliary flyers, a shaft journaled in said main flyer, separating plates adapted to separate the wires coming from said hollow shaft and to guide the separated wires parallel to said shaft journalled on said main flyer, a roping frame on the opposite end of said main flyer to that of said hollow shaft, and pulleys on said main flyer adapted to guide the separated ropes coming from said separating plates to said roping frame in the opposite direction to the pulling in direction of the wire into said hollow shaft.

3. A machine as specified in claim 2, comprising in combination with the machine drive the main flyer and the shaft journalled in said main flyer, a train of gears adapted to transmit the movement from said machine drive to said shaft and to rotate said shaft so that the twists continually imparted to the wire, when the machine is running, occur only behind said shaft.

In testimony whereof I affix my signature

ANTON KRAFT.