

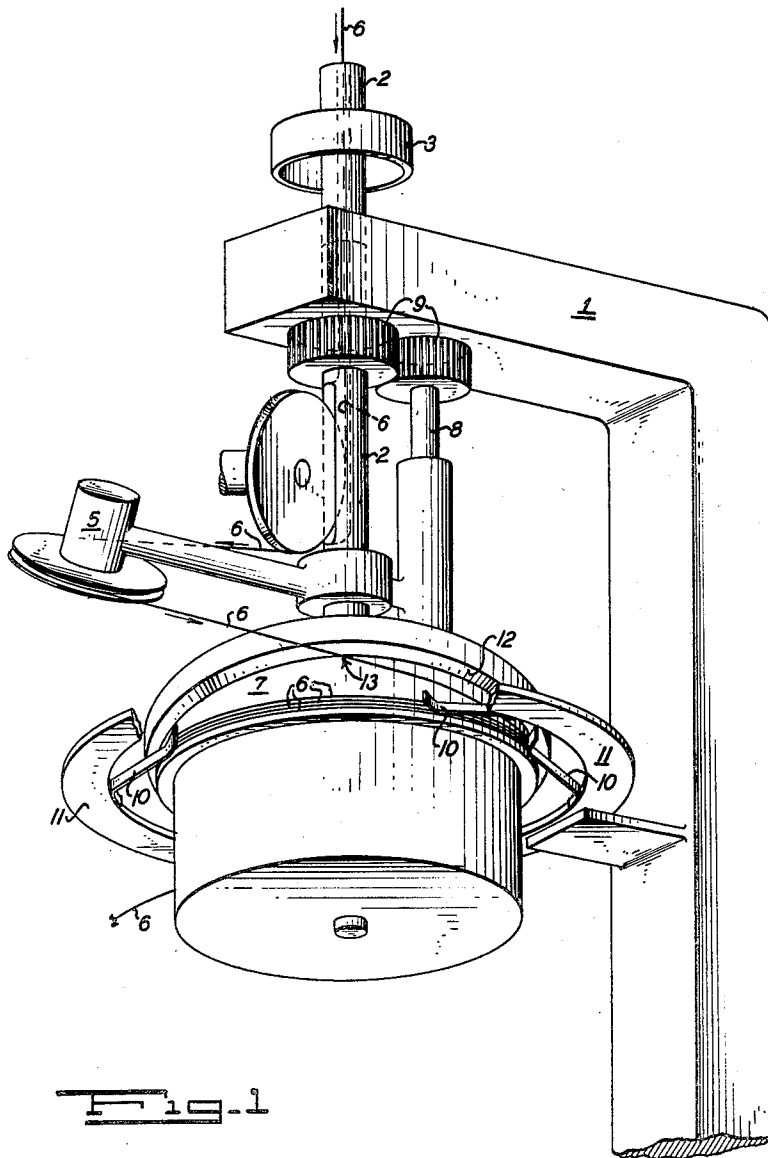
June 11, 1963

J. GODDERIDGE
ARRANGEMENTS FOR WINDING WIRE AT HIGH SPEED
INTO CIRCULAR TURNS

3,093,339

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4 Sheets-Sheet 1



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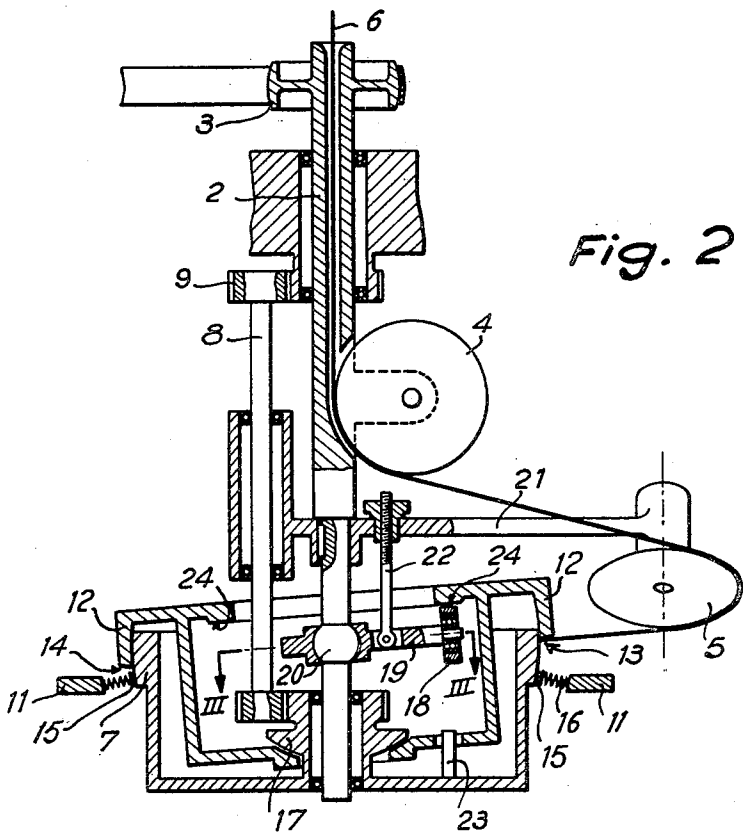


Fig. 2

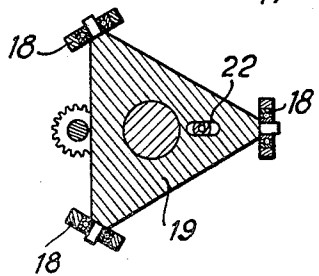


Fig. 3

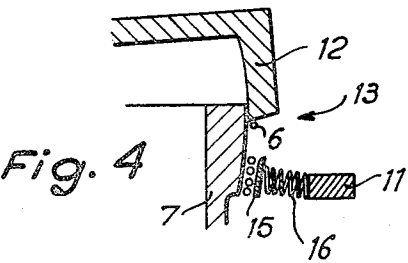


Fig. 4

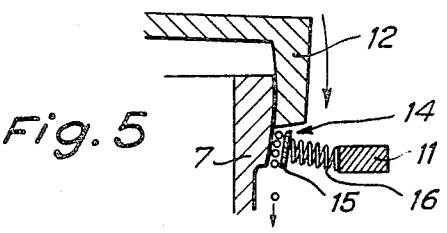


Fig. 5

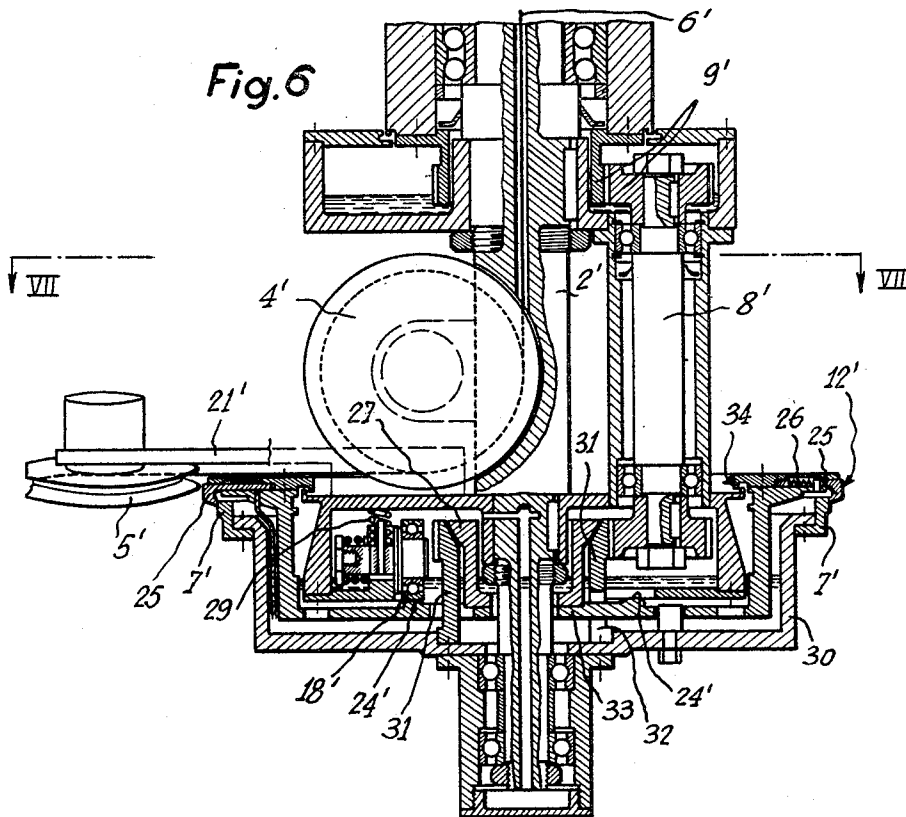
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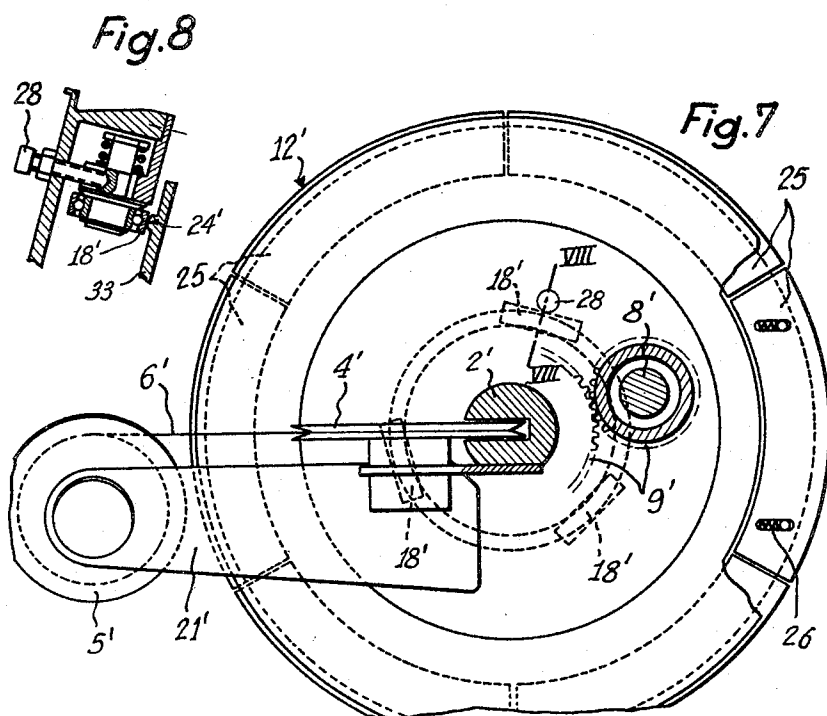
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3,093,339 ARRANGEMENTS FOR WINDING WIRE AT HIGH SPEED INTO CIRCULAR TURNS

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7 Claims. (Cl. 242—82)

The present invention relates to arrangements for winding wire at high speed, into circular turns and has for an object improvements therein.

Particularly, the invention relates to such arrangements in which the wire is wound by a rotating head in order to form several turns round a conical fixedly mounted capstan.

All the turns of wire which are maintained against the capstan by springs or similar flexible elements must be pressed towards the bottom of the capstan by a distance which is equal to the diameter of the wire at each revolution of the rotating head, in such a manner that the lower turn, which is progressively freed as a new turn is being wound at the top of the capstan, drops freely on to a support disposed below the capstan.

In known arrangements of the kind referred to above, this downward thrust on the turns of wire is exerted by a member comprising a roller or a rigid part, mounted on the rotating head in order to turn with it round and very near the capstan.

However, this type of pressure member has drawbacks when it is required to wind wire having a small diameter into circular turns at high speeds.

Indeed, if the clearance between the pressure member and the capstan is very small, the pressure member may rub on the capstan and thus cause a great wear of the latter, particularly when the rotating head carrying the pressure member is rotated at high speeds. On the other hand, when the clearance between the pressure member and the capstan is large, small-diameter wire may become wedged between them and break. In any case, the rotating pressure member rubs on the wire and this causes the wire to wear.

A particular object of the invention is to provide a winding arrangement of the above-mentioned type that does not suffer from the drawbacks referred to.

According to the invention, it becomes possible to avoid any clearance between the pressure members and the capstan these pressure members being actuated only with an alternating longitudinally sliding movement of small amplitude relative to the capstan. The capstan is no longer subjected to wear due to friction of the pressure members of the rotating type and the wire is no longer in danger of becoming wedged between the pressure members and the capstan. Moreover, wear of the wire is also avoided since the latter is no longer subjected to friction forces which are tangentially exerted as in hitherto known devices having a rotating pressure member.

In order that the invention may be more clearly understood, reference will now be made to the accompanying drawings which show some embodiments thereof by way of example and in which:

FIGURE 1 shows a perspective view of an arrangement for winding wire according to the invention,

FIGURE 2 is a longitudinal sectional view of a modification of the arrangement of FIGURE 1,

FIGURE 3 is a partial plan view along the line III—III of FIGURE 2,

FIGURES 4 and 5 are partial sectional views to a larger scale, showing in detail the relative positions of the pressure members and of the capstan, respectively at the point where the wire is applied to the capstan, and at the diametrically opposite point,

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FIGURE 6 shows in a longitudinal section a modification of the arrangements of FIGURES 1 to 5,

FIGURE 7 is a sectional view along the line VII—VII of FIGURE 6,

FIGURE 8 is a partial sectional view along the line VIII—VIII of FIGURE 7.

Referring now to FIGURE 1, there is shown an arrangement comprising a support 1 for supporting a hollow shaft 2 driven by a pulley 3. The shaft 2 is provided with two guide pulleys 4 and 5 which guide the wire 6, which is fed from above through the hollow shaft 2 towards and round a capstan 7, which is rotated by an auxiliary shaft 8 driven from the shaft 2 by differential pinions 9.

The turns thus formed on the capstan 7 by the rotating head constituted by the shaft 2 and pulleys 4 and 5, are maintained on the capstan by flat springs 10, mounted around the capstan on an annular member 11. A ring 12 is located above the turns, the plane of said ring being inclined relatively to the axis of the capstan 7, in such a manner that its uppermost part is located at the point 13 where the wire 6 is applied to the capstan 7.

When the rotating head turns, the inclination of the ring 12 is angularly altered in order to remain always the same relatively to the point where the wire 6 is applied to the capstan 7. The ring 12, whose lower edge constitutes the above-mentioned pressure members, thus presses by this movement the whole stack of turns in a downward direction until it has reached its lowermost position at the point 14 opposite to the arrival of the wire. The lower turn is consequently freed and comes out from below the springs 10.

Since there is no rotation of the ring 12 relative to the capstan 7, but only a movement having a very small longitudinal oscillation whose amplitude is at least substantially equal to the diameter of the wire 6, the play between the capstan 7 and the ring 12 may be very small and substantially zero; the risk of the wire being wedged is thus avoided and the wire itself is also protected, because there is no relative movement of the capstan relatively thereto.

Reference will now be made to FIGURE 2 which is a sectional view of a modification of the device of FIGURE 1, this modification consisting in that the flat springs 10 are here replaced by retaining plates 15 pushed back against the capstan 7 by spiral springs 16.

The movement of the ring 12 which corresponds in shape to the capstan 7 whose upper part is partially spherical, is guided by a cup joint 17 and three rollers 18 fixed on a triangular planar member 19, which may be seen in FIGURE 3, mounted on a ball joint 20 having the same centre as the cup joint 17 which is situated in a median plane of the spherical part of the capstan.

The planar member 19 is inclined relatively to the arm 21 which supports the pulley 5, by means of an adjustable screw 22.

A finger 23 prevents the ring 12 from rotating relatively to the capstan 7.

When the shaft 2 turns, the rollers 18 roll on a path 24 provided on the internal face of the ring 12 and impose on it an inclination which is always equal to that of the planar member 19 carrying the rollers 18; the inclination of the ring is thus modified cyclically relatively to the capstan 7 as a function of the rotation of the shaft 2.

FIGURE 4 shows partially in section the upper position of the ring 12 on the capstan 7 at the point 13 where the wire 6 is applied to the capstan. Four turns are located under the plate 15. In the lower position 14, shown in FIGURE 5, the new turn takes the place of the upper turn of the stack and all the others are pushed down-

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wardly by a distance equal to the diameter of the wire. The last one therefore comes out of the spring, so that it is no longer held, and falls freely.

Reference will now be made to FIGURES 6 to 8 which show a modification of the arrangements described above. In these figures, the elements corresponding to those of FIGURES 1 to 5 have been given the same reference numerals, but primed.

According to this modification, the ring 12' is divided into six radially sliding segments 25 which are each applied individually against the capstan 7' by springs 26 which completely suppress any clearance. The capstan 7' is removable. The two ball and cup joints mentioned above are replaced by a single ball joint 27 which is downwardly oriented.

The rollers 18' are thus situated above the path or track 24'.

The position of one of the rollers is determined by means of an adjusting screw 28, as is shown in FIGURE 8. The other two rollers are pressed against the path 24' by springs 29 and automatically take up the position which corresponds to the inclination given by the first roller.

The part 30 which carries the capstan 7' is sealed at the bottom and partially filled with oil. The part 31 integral with the part 30 and which carries the ball joint 27 is provided with ports 32 through which pass arms of a member 33, which carries the roller path 24' and the radially sliding segments 25. Oil-tightness at the top is ensured by labyrinths 34. All the internal moving parts work in the oil.

What is claimed is:

1. Apparatus for winding wire comprising a capstan means operatively associated with said capstan for winding turns of said wire around said capstan in a predetermined zone thereof and means surrounding said capstan in tight fitting uniform engagement in a zone outside that in which the wires are wound, the latter said means cyclically oscillating with respect to said capstan while maintaining the tight fitting engagement therewith to cyclically urge the last wound turn of said wire against the other turns of wire on said capstan to successively remove a turn of wire as another turn is wound on the capstan.

2. Apparatus for winding wire comprising a capstan, means operatively associated with said capstan for winding turns of said wire around said capstan in a predetermined zone thereof, a ring surrounding said capstan without clearance in a zone outside that in which the wires are wound, and means supporting said capstan and ring to provide cyclical rocking movement of said ring in synchronization with the winding of the wire on the capstan and with said ring and capstan being without clearance so that the ring cyclically urges the last wound turn of wire against the other turns of wire on the capstan to successively remove a turn of wire as another turn is wound on the capstan.

3. Apparatus for winding wire comprising a capstan, means operatively associated with said capstan for winding turns of said wire around said capstan in a predetermined zone thereof, a ring contactingly surrounding said capstan in a zone outside that in which the wires are wound to define a peripheral contact surface therewith, and means supporting said capstan and ring to rockingly move the ring and capstan relative to one another to

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cause relative sliding therebetween to cause the ring to contact turns of wire on the capstan while maintaining a peripheral contact surface therebetween, said ring and capstan being synchronized for movement such that the means for winding the wire causes the wire to contact the capstan at a substantially constant level thereon while the capstan and ring rock relative to one another such that the last wound turn of wire is urged against the other turns of wire on said capstan by said ring to remove a turn of wire as each turn of wire is wound on the capstan.

4. Apparatus for winding wire comprising a capstan, a head adapted for relative rotation with respect to said capstan for winding turns of wire around said capstan in a predetermined zone thereof a pressure ring encircling the capstan in a zone adjacent that in which the wires are wound, said capstan and pressure ring having spherically shaped surfaces in contact with one another and means for rocking the ring and capstan relative to one another about a point corresponding to the center of the spherical surfaces such that the spherical surfaces always remain in contact with one another, the latter said means being effective to cause relative movement between the ring and the capstan over a distance corresponding to the diameter of the wire and in synchronizing manner with the head such that the wire initially contacts the capstan at a constant level thereon and thereafter is urged against other wires wound on the capstan in cyclical fashion by the pressure ring to cause movement of all the other wires on the capstan whereby a space is provided between the ring and the wires for the winding of another turn of wire on the capstan.

5. Apparatus as claimed in claim 4 wherein the means for relatively rocking the ring and capstan comprises a cup joint supporting the ring for universal movement about a location corresponding to the center of the spherical surfaces.

6. Apparatus as claimed in claim 5 wherein the means for relatively rocking the ring and capstan further comprises a planar member adjustably supported in inclined fashion with respect to the capstan and adapted for rotation about an axis, said planar member supporting the ring and causing rocking of the same as said planar member rotates about said axis.

7. Apparatus as claimed in claim 4 comprising a sealed member adapted for containing oil and detachably supporting the capstan, a member within the sealed member and supporting said ring, said ring including several radially sliding segments, resilient means urging said segments against the capstan, a plurality of rollers in said sealed member and operatively coupled to said member supporting the ring to cause the segments to lie in a plane inclined with respect to said capstan, means for adjusting one of said rollers for adjusting the inclination of said plane, and a spring urging each of the rollers against the member supporting the ring.

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