July 20, 1926. 1,593,012

H. E. BRYANT

WINDING MACHINE

Filed Sept. 29, 1925 2 Sheets-Sheet 1

Fig. 1.

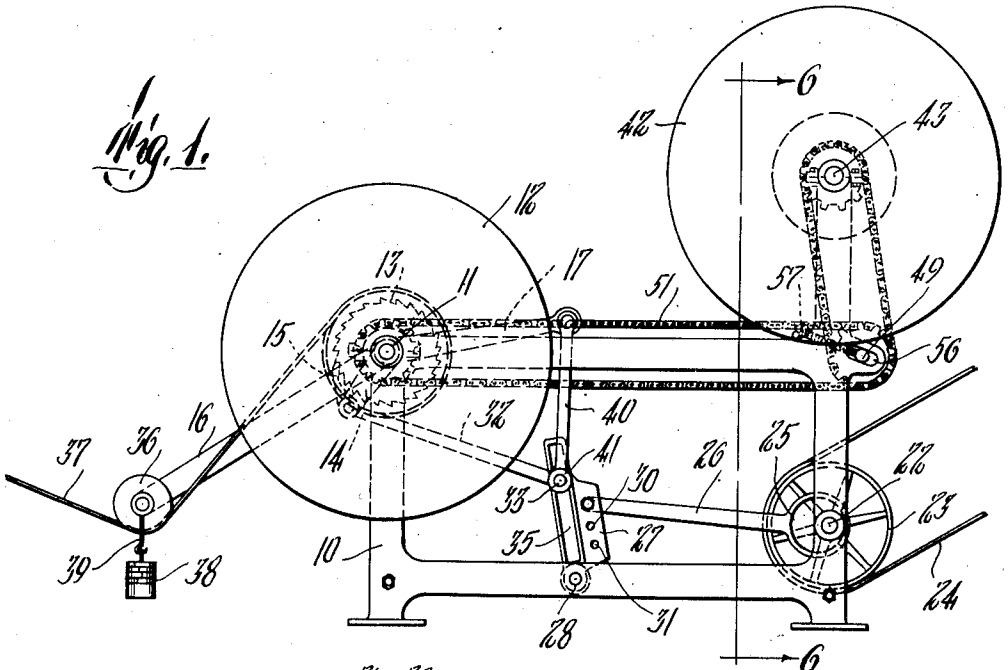


Fig. 2.

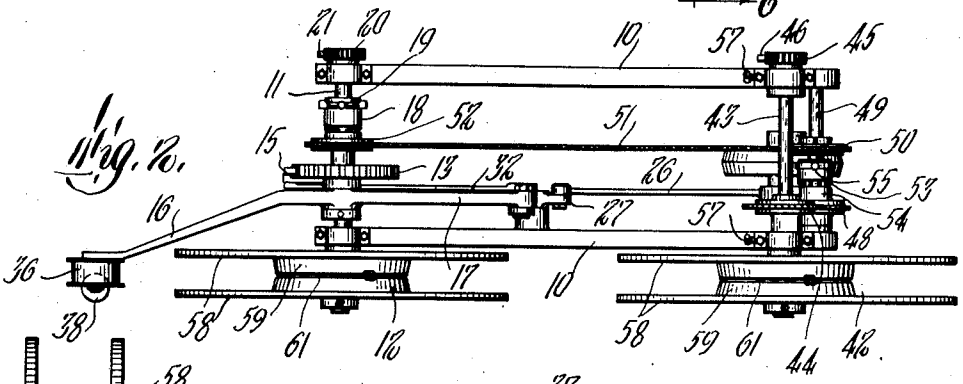


Fig. 3.

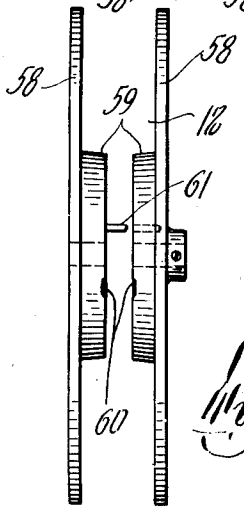
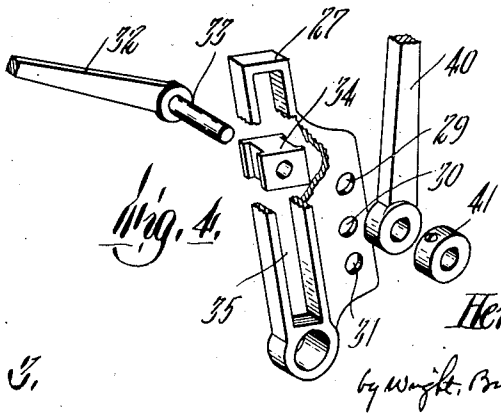


Fig. 4.



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Fig. 5.

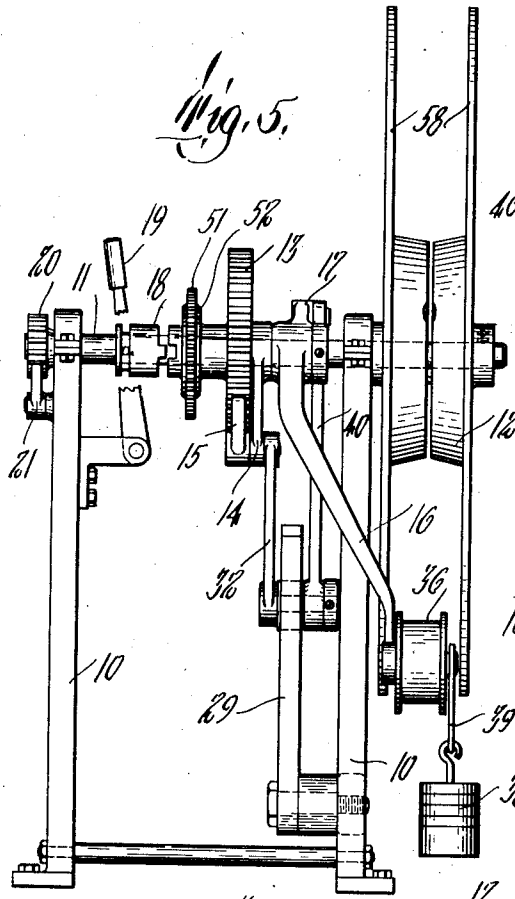


Fig. 6.

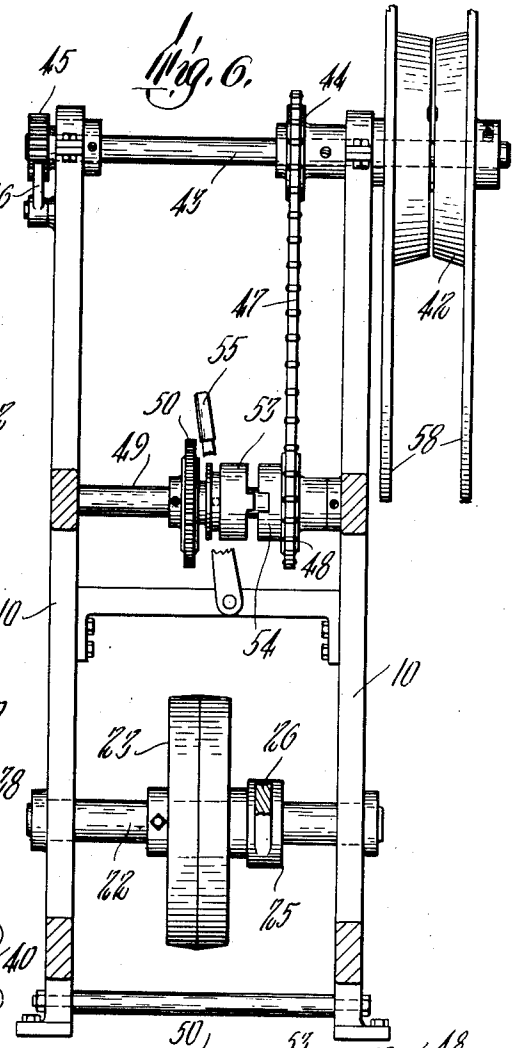


Fig. 7.

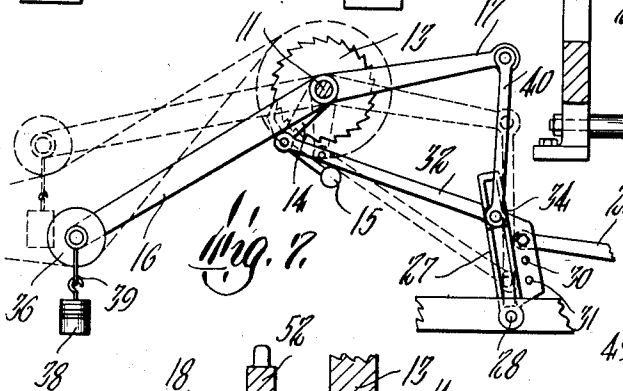


Fig. 8.

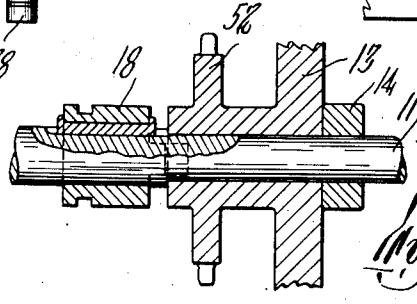
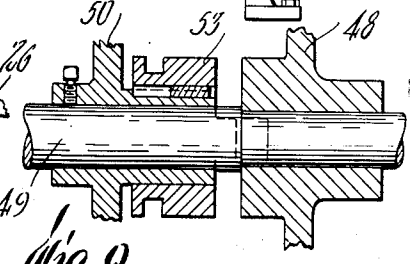


Fig. 9.



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Patented July 20, 1926. 1,593,012

UNITED STATES PATENT OFFICE.

HENRY E. BRYANT, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO TUBULAR WOVEN FABRIC COMPANY, OF PAWTUCKET, RHODE ISLAND, A CORPORATION OF RHODE ISLAND.

WINDING MACHINE.

Application filed September 29, 1925. Serial No. 59,270.

The subject matter of this invention is a machine or apparatus for winding flexible elongated material upon spools, reels, or the like. The primary object of the invention is to regulate the speed of rotation, or take up, of the spool on which the material is wound in proportion to the speed or rate at which the material is delivered from a machine in which such material is made or finished, or is released from other sources of supply. Other objects are concerned with means for driving a plurality of spools in order that the winding action may be carried on continuously while filled spools are removed and empty spools substituted; and also with a construction of spool adapted to permit ready removal, in the form of a coil, of the material wound upon the spool.

The winding machine chosen for illustration herein has been designed for the particular use of winding, into the form of coils, armored electrical cable and flexible metallic conduit adapted to contain electrical conductors; receiving and winding up such cable or conduit as it is delivered from the machine which makes it. However, the invention is not limited to that special use, but is applicable to receiving and winding wire delivered from a wire drawing machine, or strip metal from a rolling mill, fabric from a loom, or rope, thread, flexible tubing, or any other elongated and slender flexible material from any source, which needs to be brought into coiled form or wound on a spool. Hence in the following description and claims, I will explain and treat the invention with reference to its characteristics as a winding machine for any purpose or use which it is capable of serving, and without limitation as to the specific material handled or the source of such material.

In the drawings,—

Fig. 1 shows a side elevation of a winding machine embodying the present invention;

Fig. 2 is a plan view of the machine;

Fig. 3 is a side view of one of the spools with which this machine is equipped, the separable parts of such spool being shown as separated from one another;

Fig. 4 is a perspective view showing in dismembered condition the parts which control the rate of drive of the take-up spool;

Fig. 5 is an end view of the machine, as seen from the left of Fig. 1, but drawn to a larger scale than Fig. 1;

Fig. 6 is a sectional elevation, also on an enlarged scale, as seen from line 6—6 of Fig. 1, looking in the direction of the arrows;

Fig. 7 is a fragmentary view showing the means for controlling the rate of motion of the take-up spool by the tension of the material being wound, and showing by full and dotted lines, respectively, different positions of such controlling means;

Figs. 8 and 9 are sectional views of the clutching means by which the two spools with which this machine is equipped may be selectively driven.

Like reference characters designate the same parts wherever they occur in all the figures.

The working parts of the machine are mounted on a frame 10 of any suitable character and construction. The operative and adequate construction shown in the drawings comprises two side frames with transverse braces and tie members, affording a staple base and separated bearings for the various shafts.

A shaft 11 is rotatably mounted on the frame, and has a protruding end on which a take-up spool 12 is detachably mounted and fastened. Loosely mounted on the same shaft are a ratchet wheel 13, a pawl carrier 14 carrying a pawl 15 for driving said ratchet, and a two-armed lever 16—17, the purpose of which will be later explained. There is splined upon the shaft a clutch member 18 having jaws or teeth adapted to be slipped into and out of complemental sockets in the hub of the ratchet wheel for the purpose of detachably coupling the ratchet with the shaft and, through the latter, with the spool. A clutch shipper 19 is supported on the frame adjacent to the clutch and cooperates with the latter in a well known manner for bringing it into and out of coupled relation with the ratchet wheel hub. A holding ratchet 20 is also mounted on the shaft 11, and a holding pawl 21 is mounted on the frame and coacts with the holding ratchet to prevent unwinding movement of the spool.

A driving shaft 22 is mounted on the frame and is driven by a belt pulley 23 and belt 24, or other suitable means. The shaft 22 carries an eccentric or crank 25 coupled

by a connecting rod 26 with a rocker 27 pivoted at 28 on the frame. The connecting rod may be coupled at any one of a number of different points on the rocker, at different distances from the pivot 28. Such coupling points are designated at 29, 30 and 31. According as the connecting rod is attached at one or another of these points, the rocker is oscillated through a larger or smaller angle.

The pawl carrier 14 is oscillated by the rocker 27 through the medium of a link 32, which is pivoted at one end to the pawl carrier, and at the other end carries a pivot rod 33 contained in a slide block 34 which occupies an elongated, substantially radial, guideway or slot 35 in the rocker. One end of this slot preferably extends as near as possible to the pivotal axis of the rocker. and nearer thereto than the nearest coupling position, 31, of the connecting rod; while the slot preferably extends farther away from the pivot than the outermost coupling point 29. According as the pivot 33 is positioned more remote from or nearer to the axis of the rocker, the pawl carrier is moved through a greater or less angle and the spool correspondingly rotated by longer or shorter steps.

The position of the pivot 33 in the rocker is automatically controlled by the tension of the material being wound, acting through the lever 16—17, previously mentioned. The arm 16 of said lever carries a guide 36. which is preferably a roll located in the same plane with the spool, and the elongated flexible material to be wound passes under the guide roll 36 in its course from the source of supply to the spool. Such material is designated by the numeral 37, and will generally be referred to hereinafter as the strand; the term "strand" meaning and including any of the materials or articles previously mentioned, or other similar material which the machine is capable of handling.

It may be assumed that this elongated material or strand is delivered from the source of supply at a limited rate of speed, and that the winding machine is required to take up the material at an average rate equal to the rate of delivery, in order that a sufficient tension may be maintained during winding, but that too great a tension may not be applied, with danger of breaking, stretching or otherwise injuring the strand. To this end, the lever arm 16 is made sufficiently heavy to apply tension to the strand 37 and to descend when the strand slackens; but its weight is not great enough to stretch the strand unduly or to prevent the strand from raising it when the slack in the strand is taken up. Preferably the weight of this part is made adjustable to the strength and character of the strand by providing detachable weights 38 hung from the lever by a suspender 39.

The arm 17 of the lever is coupled by a link 40 with the pivot 33 of the pawl driving link 32. A satisfactory mode of thus coupling said link and pivot together is to make the pivot of sufficient length to protrude through an eye in the end of the link and to secure a collar or nut 41 on such protruding end. It will be apparent that if the strand 37 slackens, the weighted arm descends and the other arm rises, thus raising the pivot 33 and increasing the stroke of the driving pawl; while if the strand tightens, due to its speed of delivery being less than the take-up rate of the spool, the weighted arm 16 is lifted and the pivot 33 is lowered and brought toward the pivot of the rocker, thereby shortening the swing of the pawl carrier and the steps of rotation of the spool.

The spacing of the ratchet teeth and the dimensions, proportions and positions of the transmission mechanism between the pawl carrier and the driving shaft 22 are appropriately designed for the work which the particular machine made according to this invention is intended to perform, and made of such values and with such effect that the limits of peripheral speed of the spool will be within the limits of delivery of the strand; and preferably also of such values that no motion at all will be given to the spool when the strand is drawn straight, or approximately so, between the delivery point and the spool. The latter effect is accomplished by making the spacing of the ratchet teeth greater than the movement imparted to the pawl when the pivot 33 lies in its position of nearest approach to the rocker pivot. This condition occurs when delivery of the strand is stopped, the take-up spool being thereby automatically stopped also.

The regulating means just described automatically takes care of the increasing travel of the surface on which the strand is wound, due to accumulation of windings on the spool, as will be readily apparent. A sufficiently exact correspondence of the average peripheral speed of the spool with the rate of delivery of the strand is obtainable, even without making the ratchet teeth of fine pitch, because when the condition is reached that a single step of the spool moves its receiving surface a distance substantially greater than the length of the strand delivered in the time between two oscillations of the pawl, the tightening of the strand caused thereby simply suspends the movement of the spool until enough slack has accumulated in the strand to permit the spool to be turned another step.

The spool is mounted on the shaft in the manner previously described in order to per-

mit of its removal when filled and the substitution then of an empty spool. A second spool 42 is mounted in a similar manner to the mounting of spool 12 upon the end of of a shaft 43. On the shaft 43 are also mounted a sprocket wheel 44 and a holding ratchet wheel 45 co-acting with a holding pawl 46. The sprocket 44 is connected by a chain 47 with a sprocket 48 rotating on an intermediate shaft 49; and a second sprocket 50 on the same shaft is connected by a chain 51 with a sprocket 52 connected rigidly with the ratchet 13. The sprockets 48 and 50 may be permanently connected to one another, but preferably they are separate and adapted to be coupled and uncoupled by a clutch 53 splined upon one of them, and having jaws or teeth adapted to enter sockets 54 in the other. A shipper 55 is shown as a suitable operative means for coupling and uncoupling said clutch. By means of these connections, either spool may be driven independently of the other, and the one which is being driven employed to wind the strand while the other is taken off.

In order to compensate for wear and stretch of the sprocket chains and to take up their slack, the shaft 49 is preferably mounted in bearing boxes which occupy inclined guideways 56 on the frame and are adjusted therein by screws 57.

The spools which I have shown in these drawings are designed to release the strand as a coil after being wound up, and to this end, each spool is made of two parts, each consisting of a flange 58 and a hub 59, and each part having a central hole to receive the shaft. The hubs also have notches 60 so arranged as collectively to form a recess within which the end of the strand may be inserted to hold it before commencing to wind, when the stand is of sufficient stiff construction to be so held; and one of the spool members is provided with a dowel 61, adapted to enter a recess in the other, for so positioning the parts, when assembled, that the notches will register.

In thus above particularly describing one embodiment of my invention, I have not intended to limit the protection which I seek to that specific machine, or in any other manner than commensurate with the novelty of the invention. Various inversions, reversals and modifications in the structure and arrangement of the machine and its parts may be made, and equivalent structures and parts substituted, without departure from the invention.

What I claim and desire to secure by Letters Patent is:

1. A winding machine comprising a winding member, a weighted guide engaging the strand to be wound in its course to the winding member with tendency to deflect said strand from a straight line, and being movable by increase in tension of the strand, a positive driving mechanism for rotating said winding member including shiftable connections for varying the speed of the winding member between a predetermined maximum and a minimum when no motion at all is given to the winding member, and means controlled by movement of said guide for shifting said connections.

2. A winding machine comprising a take-up member, positive driving mechanism for said member including a shiftable connection for changing the extent of movement imparted by said driving mechanism to the take-up member, and means controlled by the slack and tension of, in its course to the take-up member, material being wound for shifting said connection.

3. A winding machine comprising a winding member, a movable guide arranged to be engaged by the material being wound in its course to the winding member, said guide being movable and tending to bend said material from a straight line, positively acting variable speed mechanism for said winding member, and means for changing the speed ratio of said driving mechanism in consequence of movements of said guide.

4. A winding machine comprising a rotatable take-up spool, driving mechanism for rotating said spool step by step including means for varying the length of the steps imparted to the spool, a guide arranged to be engaged by the material being wound in its course to the spool, said guide being movable in response to variations in the slack and tension of said material and being constantly under force tending to deflect such material from a straight line, and means by which the movement of said guide alters the relation of said speed changing mechanism.

5. A winding machine comprising a take-up member, a ratchet and pawl drive for said take-up member, means for imparting movement to the pawl of said drive including a rocker and a connector shiftable into positions variously distant from the axis of said rocker, and means for so shifting said connection including a guide arranged to be engaged by the material being wound and to be displaced with variations in the slack of the material.

6. A winding machine comprising a spool, a pawl and ratchet mechanism for driving said spool, an oscillative rocker having a guideway, different points in which are differently distant from the axis of the rocker, a transmission member between said rocker and pawl engageable with said rocker in said guideway and being movable therein, a guide engageable with the material being wound and under force tending to deflect such material from a straight line in its course to the winding member, said guide

being displaceable by slackening or tightening of the material, and connections between said guide and said coupling for shifting the latter.

7. A winding machine comprising a spool, a pawl and ratchet mechanism for driving said spool, a lever having a guide arranged to engage the material being wound and being movable back and forth in consequence of variations in the slack of such material, a rocker having a guideway which is non-concentric with the pivot of the rocker, means for oscillating said rocker, a link coupled with said pawl and engageable with said rocker movably in the guideway thereof, and a connection between said lever and link for shifting the latter in said guideway.

8. A winding machine comprising a supporting structure, a plurality of shafts, spools removably mounted upon said shafts, a common driving mechanism for said shafts including a speed changing mechanism, a movable guide engageable with the material being wound in the course of the latter to either spool, and means by which movement of said guide effects a change in said speed changing mechanism.

9. A winding machine including a winding member, variable speed driving mechanism for said member, means controlled by the material being wound for regulating said driving mechanism, a second take-up member, and means for imparting movement to said second member from said driving mechanism.

10. Variable speed driving mechanism comprising a ratchet wheel, a pawl carrier oscillatable about the axis of said wheel, a pawl complemental with said ratchet carried by said pawl carrier, a rocker having a substantially radial guideway, a link connected with said pawl carrier and having a slidable connection with said rocker in said guideway, a lever mounted to rock, and a link coupled with said lever and with the first named link, said lever being arranged and operable to shift the connection of the first named link in the rocker guideway.

In testimony whereof I have affixed my signature.

HENRY E. BRYANT.