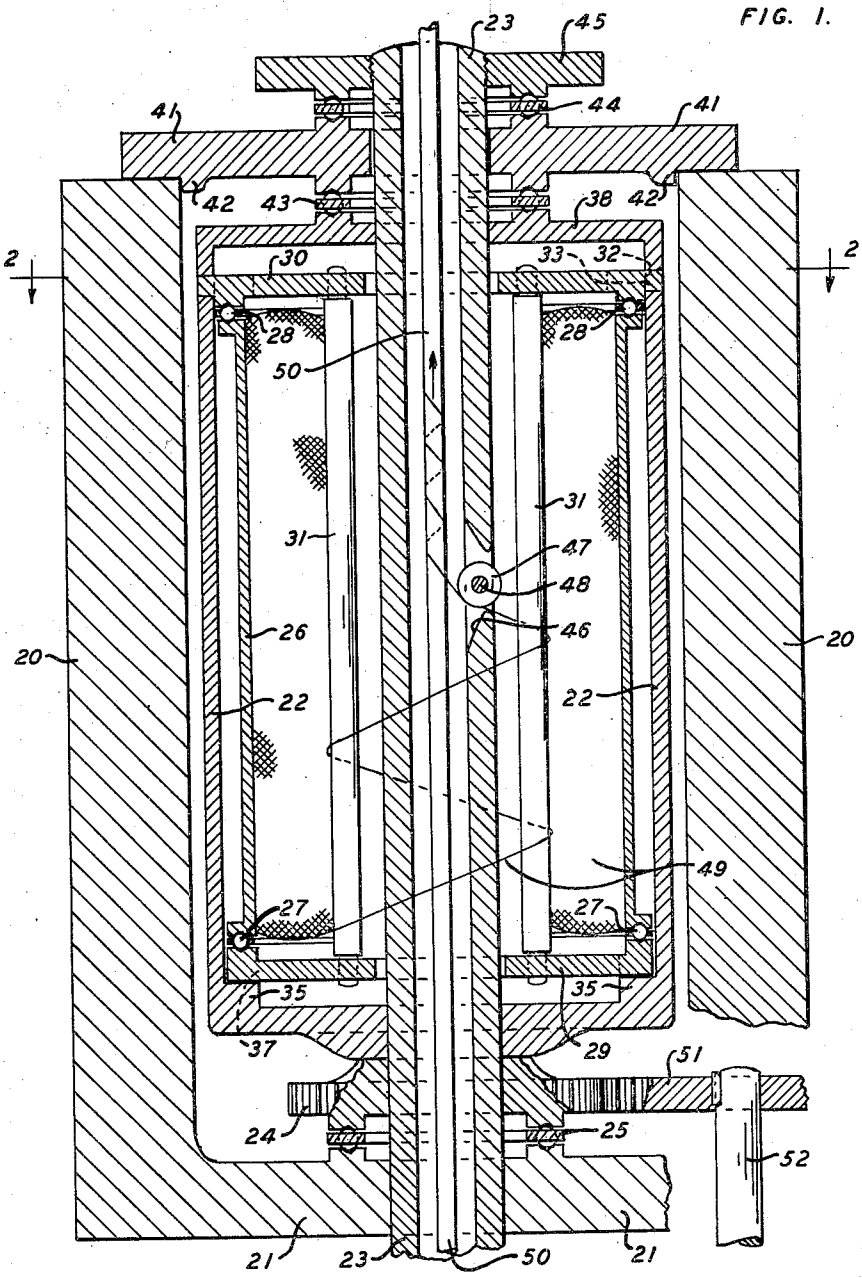
Aug. 11, 1936. Y. A. BOUGET 2,050,243

STRAND HANDLING APPARATUS

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FIG. 1.



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FIG. 2.

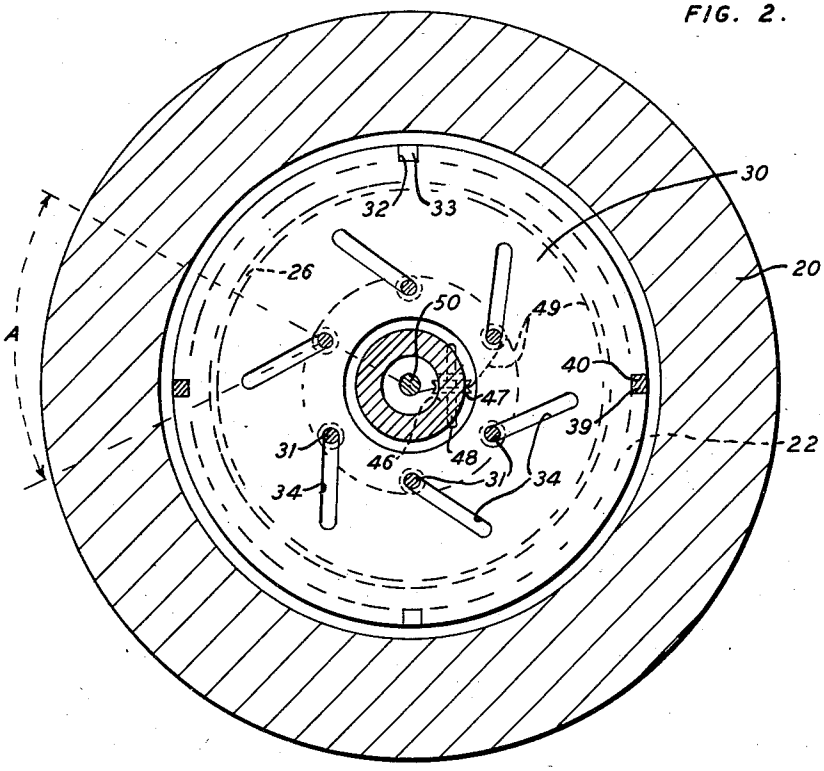
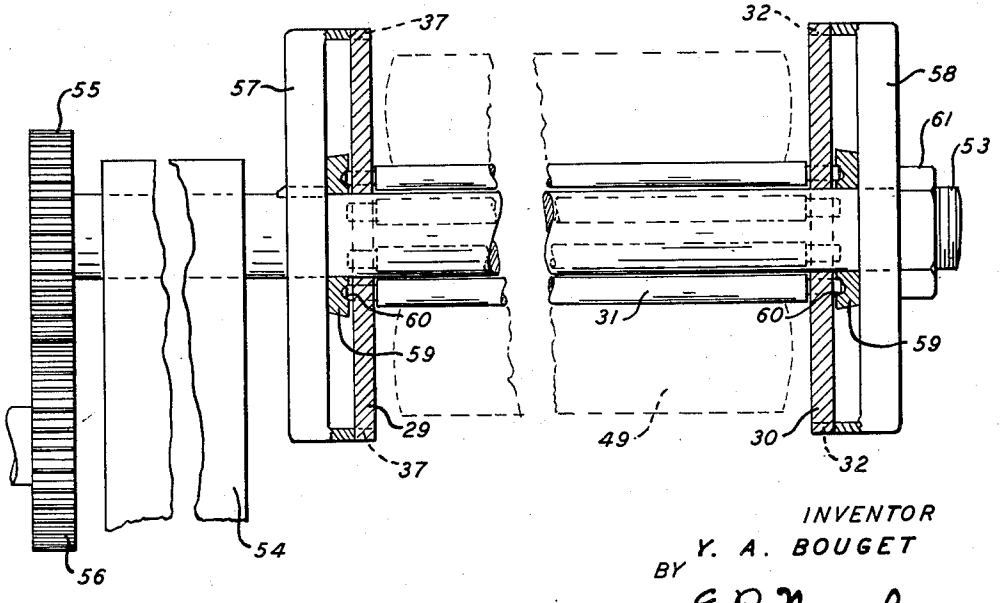


FIG. 3.



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STRAND HANDLING APPARATUS

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Application February 9, 1934, Serial No. 710,426

13 Claims. (Cl. 117—42)

This invention relates to strand handling apparatus and more particularly to a serving head for winding a strand on a core.

An object of the present invention is to provide a serving head for winding machines, of simple and rugged construction and having a symmetrical and balanced arrangement of few and light weight parts which enables a great speed of operation.

With this and other objects in view the invention contemplates a serving head comprising a supply spool of peculiar construction which permits the strand to be served on a core advancing longitudinally through the hollow axis of the revolving spool, the strand to be served being drawn from the inside of the supply wound on the spool. The barrel of the spool consists of a plurality of long slender rollers whose ends are confined with freedom to rotate in slantingly radial guide slots in the heads of the spool, so that as the supply of strand diminishes from within outwardly the rollers are forced out by centrifugal force and so tend to keep the strand under continuous and constant tension.

Other objects and characteristic features of the invention will appear from the following detailed description of one embodiment thereof taken in connection with the accompanying drawings in which the same reference numerals are applied to identical parts in the several figures and in which

Fig. 1 is a somewhat diagrammatic broken view in vertical central section of a winding machine having a serving head embodying the invention;

Fig. 2 is a sectional view on the line 2—2 of Fig. 1, and

Fig. 3 is a view similar to Fig. 1 of apparatus for refilling an empty spool.

In the embodiment of the invention herein disclosed, a winding machine has a main frame 20 of a generally U-shaped or cylindrical form having a support bracket or horizontal member 21 perforated as shown in Fig. 1. A spool housing 22 generally cylindrical in form, open at the top and having a centrally perforated floor is located within the frame, and a winding member or tube 23 is positioned coaxially within the housing 22 and frame 20 passing through the perforations in the floor of the frame and in the bracket 21.

A driving gear 24 is rigidly mounted on the tube 23 and is supported on the bracket on an interposed anti-friction bearing 25 thus supporting the tube. The housing 22 rests on and is rigidly secured to the gear 24. The gear 24 meshes with a gear 51 rigidly mounted on a shaft 52 driven by a source of power not shown.

Within the housing 22 is a supply spool comprising a lower head 29, an upper head 30 and interposed rod like members 31 here shown as six in number which preferably but not necessarily act as rollers. The upper head 30 is a substantially circular disc of diameter equal to the external diameter of the housing 22 upon the top rim of which the disc rests. The head is provided with one or more peripheral notches 32 corresponding to an equal number of lugs 33 extending up from the top rim of the housing. These lugs and notches coact to position the disc definitely on the housing and to compel the disc and housing to rotate together. The disc 30 is also provided with a number of slots 34 each situated at the same angle A to the radius through its inner end.

The lower head 29 is likewise a circular disc dimensioned to fit easily within the housing 22 and rests on a peripheral shoulder or ledge 35 around the floor of the housing. The ledge is formed with upstanding lugs 36 and the head with corresponding coacting notches 37 to position the head within the housing and to compel them to rotate together. The head is further formed with slots identical in form, number and relative position to the slots 34 of the upper head. The lugs 36 and 33 are so disposed that when the heads are in place as in Fig. 1, each slot 34 in the head 30 is directly over and aligned with a corresponding slot in the head 29. In each such pair of corresponding slots are confined the reduced ends of one member 31 snugly enough to prevent excessive play but with freedom to slide and preferably also to rotate in the slots. The members or rollers are longitudinally confined between the heads by the peripheral shoulders formed by reducing the ends of the rollers, which also serve to maintain the heads spaced apart when the spool is removed from the housing.

A removable strand supporting casing 26 having the form of an open ended cylinder is positioned to float between anti-friction bearings 27 and 28 interposed between the casing 26 and the spool heads 29 and 30. A supply of serving strand 49 is wound in a toroidal mass on the group of rollers 31 as a core and is externally supported against centrifugal expansion by the casing 26. The upper and lower ends of the mass of strand do not extend to the spool heads 29 and 30.

A centrally perforated housing cover **38** having a down-turned peripheral rim of the same diameter as the housing and the head **30** rests on the head and is keyed thereto by lugs **39** formed on the rim and coacting with corresponding notches **40** in the periphery of the head. A perforated supporting member **41** rests on and if desired may be attached by means not shown to the frame **20**, and may also be provided with positioning shoulders **42** coacting with the frame to keep the member **41** in position. An antifriction bearing **43** is interposed between the upper surface of the cover **38** and the lower surface of the member **41**. A flat disc-like locking member **45** is threadedly mounted on the externally threaded upper end of the tube **23** and an antifriction bearing **44** is interposed between the lower face of the locking member and the upper face of the supporting member **41**.

About midway of the spool the tube **23** is provided with an appropriately shaped radial slot **46** in which a grooved guide sheave **47** is rotatably mounted on a tangentially directed pin **48** to guide the strand **49** drawn from the interior of the supply thereof wound on the rollers **31** to a core **50** advancing upwardly through the tube.

Assuming now that the arrangement is that of Fig. 1, and that the spool is filled with strand **49** to be wound on the core **50**. The core is advanced upwardly through the tube **23** from a supply which is not shown by means which is not shown as such supply and advancing means are well known and their construction and nature are not relevant here. At the same time power is applied to the shaft **28** to rotate the tube counter-clockwise as seen from above. The guide sheave **47** being carried around the core by the rotation of the tube wraps or winds the strand **49** on the advancing core at an angle depending on the longitudinal velocity of the core as related to the rotational speed of the tube.

Thus the sheave draws the strand from the inner surface of the supply thereof on the spool, the strand passing around and in contact with the group of rollers **31** one or more times and finally over the roller nearest the guide sheave **47** to the sheave. This drawing off of the strand exerts a tangential pull on the inner cylindrical surface of the mass of strand on the spool which sets the casing **26** and its contents in rotation the casing being rotatably free between the bearings **27** and **28**. The direction of this rotation of the mass will depend on the direction in which the strand is wound on the spool as compared with the direction of rotation of the tube carrying the sheave and on the relation between the longitudinal speed at which the strand is being taken off the spool and the speed of the guide sheave in its revolution around the core.

Generally it is preferable to have the strand unwind from the mass in the direction in which the sheave revolves as then the unwinding effect is opposed to the direct drag of the sheave on the mass and the resulting velocity of the mass is less than if the strand be wound on the spool in the contrary direction.

Since the ends of the rollers **31** are free in the slots **34**, as the interior substantially cylindrical surface of the mass of strand supply expands with the removal of strand therefrom, the rollers under the centrifugal force developed by the rotation of the spool will move out in the slots keeping continually in contact with the retreating face of the wound strand and so affording continuous support thereto. The mass of strand slides over the rollers **31** as the strand is drawn to the sheave thus rotating each of the rollers on its axis. The rotation of the rollers is resisted more or less by the friction of the body of the roller on the mass of wound strand and also by the friction of the roller ends in the slots **34**. The amount of this latter friction varies with the angle A and may be modified by altering this angle to meet the requirements of an individual case. This determinably variable resistance of the roller to rotating imposes a corresponding determinably variable normally constant longitudinal tension on the strand **49** as it is wound on the core, a condition essential to satisfactory serving.

When the spool is empty, the apparatus is stopped and the core cut and drawn out of the top of the tube. Elements **45**, **44**, **41**, **43** and **38** are then successively removed, leaving the spool free for removal also. The spool may then be lifted out as by means of a pair of stiff, hook ended wires or rods passed down through the slots in both spool heads and hooked under the lower head. One of the spool heads is then removed, the casing **26** is removed, and the head put back. The empty spool is then positioned on the apparatus shown in Fig. 3 to be refilled.

This apparatus comprises a shaft **53** journalled in a support **54** and driven from a source of power not shown by gears **55** and **56**. A driving dog **57** having two arms preferably is rigidly mounted on the shaft and so proportioned that the ends of its arms will enter the notches **37** of the spool head **29** to drive the head. A second two armed driving dog **58** is removably keyed on the shaft **53** in position to coact with the notches **32** in the spool head **30** and to maintain the notches **32** in accurate alignment with the notches **37**. One of a pair of identically similar grooved collars **59** is positioned on the shaft **53** between the head **29** and the dog **57**, the other collar being similarly located between the head **30** and the dog **58**. In the face of each collar toward the corresponding spool head is a concentric groove **60** to receive the ends of the rollers **31**. The radially interior side of each of the grooves is conical and is so proportioned as to force the rollers **31** a short distance outwardly in the slots **34**, while the radially outer sides of the grooves keep the rollers stationary in this location so that the group of rollers is thus slightly expanded and rigidly held. A locking nut **61** threaded on the shaft **53** locks the entire assembly thus described together.

The spool is then driven by rotating the shaft **53** and a supply of strand **49** is wound thereon as indicated in dotted lines in Fig. 3, care being taken to so distribute the strand in the winding that the mass formed does not touch the spool heads **29** and **30**. The winding is continued until the outer diameter of the mass **49** is equal to the inner diameter of the casing **26**. The winding is then stopped, the nut **61**, dog **58**, collar **59** and head **32** removed. The casing **26** is then slipped into place over the mass **49** and the head **32** replaced.

The filled spool may now be removed with its contents and replaced in the housing **22** for further serving of the core **50**. The rollers **31** having been held slightly out from the inner ends of the slots **34** during the filling by the collars **59**, are now free to move to the inner ends of the slots leaving the mass of strand free to slide over them.

Since all the parts of the serving head are ra-

dially symmetrical or symmetrically balanced, except the sheave **47** which is insignificant in mass, and since all the parts have relatively small radii of gyration in operation, the apparatus can be run at unusually high speeds without developing troublesome or dangerous centrifugal stresses.

The embodiment of the invention herein disclosed is merely illustrative and may be modified in many ways and departed from without departing from the spirit and scope of the invention as pointed out in and limited solely by the appended claims. In particular it may be noted that there may be provided a permanent barrel inside of and concentric to the members **31**, permanently or detachably secured to one of the heads, and detachably secured to the other head if desired. Such element has been omitted in the disclosure herein in order to display the characteristic features of the invention in as simple and clear a manner as possible. Such barrel would be provided with an aperture for radial alignment with the guide sheave **47**.

What is claimed is:

1. In a strand handling apparatus, a spool comprising a pair of heads, a barrel consisting of a plurality of members interposed between the heads and supported therein with freedom to move toward the circumference thereof, and a casing interposed between the heads and supported thereby with freedom to rotate relatively thereto.

2. In a strand handling apparatus, a spool comprising a pair of heads, a barrel consisting of a plurality of rollers interposed between the heads and supported therein with freedom to move toward the circumference thereof, and a casing interposed between the heads and supported thereby with freedom to rotate relatively thereto.

3. In a strand handling apparatus, a serving head having a rotatable housing, means to drive the housing, and a spool removably mounted in the housing and comprising a pair of heads and a barrel consisting of a plurality of members interposed between the heads and supported therein with freedom to move toward the circumferences thereof.

4. In a strand handling apparatus, a serving head having a rotatable housing, means to drive the housing, and a spool removably mounted in the housing and comprising a pair of heads, a barrel consisting of a plurality of members interposed between the heads and supported therein with freedom to move toward the circumference thereof, and a casing interposed between the heads and supported thereby with freedom to rotate relatively thereto.

5. In a strand handling apparatus, a serving head having a rotatable housing, means to drive the housing, and a spool removably mounted in the housing and comprising a pair of heads and a barrel consisting of a plurality of rollers interposed between the heads and supported therein with freedom to move toward the circumferences thereof.

6. In a strand handling apparatus, a serving head having a rotatable housing, means to drive the housing, and a spool removably mounted in the housing and comprising a pair of heads, a barrel consisting of a plurality of rollers interposed between the heads and supported therein with freedom to move toward the circumference thereof, and a casing interposed between the heads and supported thereby with freedom to rotate relatively thereto.

7. In a strand handling apparatus, a serving head having a rotatable tube, a guide sheave mounted in the tube, a rotatable housing, means to drive the tube and the housing, and a spool removably mounted in the housing and comprising a pair of heads and a barrel consisting of a plurality of rollers interposed between the heads and supported therein with freedom to move toward the circumferences thereof.

8. In a strand handling apparatus, a serving head having a rotatable tube, a guide sheave mounted in the tube, a rotatable housing, means to drive the tube and the housing, and a spool removably mounted in the housing and comprising a pair of heads, a barrel consisting of a plurality of rollers interposed between the heads and supported therein with freedom to move toward the circumference thereof, and a casing interposed between the heads and supported thereby with freedom to rotate relatively thereto.

9. In a strand handling apparatus, a serving head having a rotatable housing, means to drive the housing, a spool removably mounted in the housing and comprising a pair of heads and a barrel consisting of a plurality of members interposed between the heads and supported therein with freedom to move toward the circumferences thereof, and means in the housing to maintain the spool heads in relative position.

10. In a strand handling apparatus, a rotating supply spool to contain a supply of strand wound thereon, means to withdraw a strand from the interior of the supply, and centrifugal means within the supply to impose tension upon the strand being withdrawn.

11. In a strand handling apparatus, a rotating supply spool to contain a supply of strand wound thereon, means to withdraw a strand from the interior of the supply, and centrifugal means within the supply to impose tension upon the strand being withdrawn comprising a plurality of members supported within the spool to revolve therewith and with freedom to move toward the circumference thereof.

12. In a strand handling apparatus, a rotating supply spool to contain a supply of strand wound thereon, means to withdraw a strand from the interior of the supply, and centrifugal means within the supply to impose tension upon the strand being withdrawn comprising a plurality of members supported within the spool with freedom to move toward the circumference thereof.

13. In a strand handling apparatus, a rotatable shaft, a spool mounted thereon comprising a pair of heads and a plurality of members mounted in the heads with freedom to move toward the circumference thereof, means on the shaft to engage the heads to drive the same and to maintain them in alignment against relative rotation, and means on the shaft to releasably lock the members against radial movement.

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