

Feb. 3, 1959

K. P. GORMAN

2,872,123

TOROIDAL CORE ROTATOR ASSEMBLY

Filed Oct. 7, 1957

2 Sheets-Sheet 1

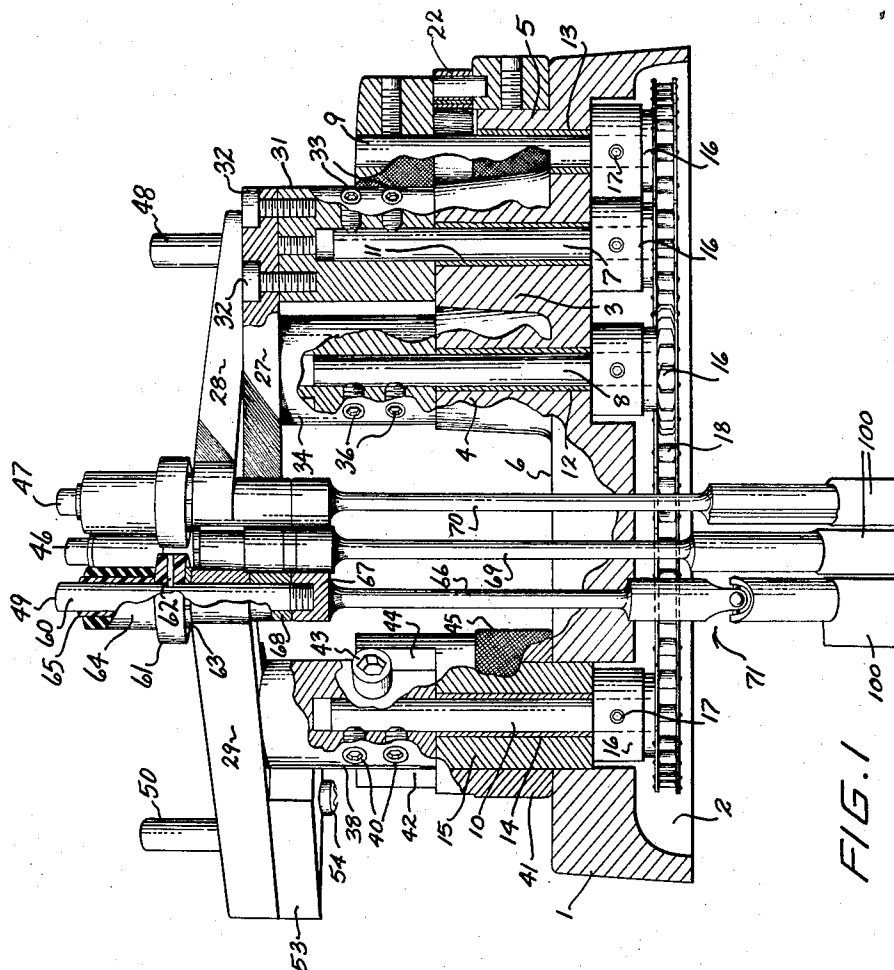


FIG. 1

INVENTOR.
Kenneth P. Gorman
BY Ezekiel Wolf
his Attorney

Feb. 3, 1959

K. P. GORMAN

2,872,123

TOROIDAL CORE ROTATOR ASSEMBLY

Filed Oct. 7, 1957

2 Sheets-Sheet 2

FIG. 2

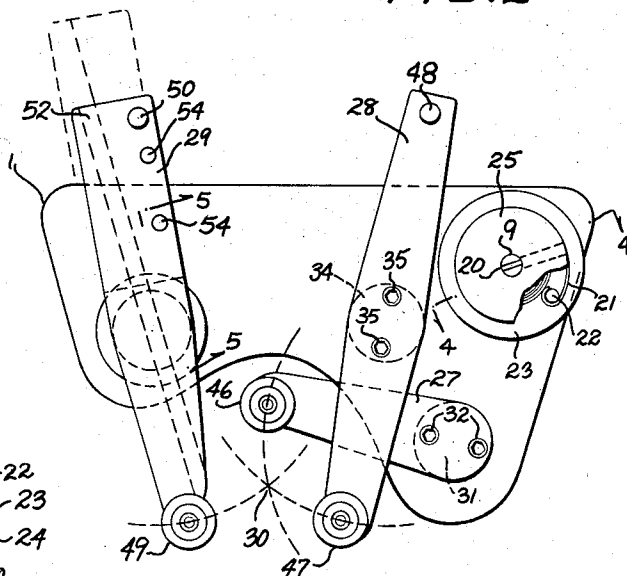


FIG. 4

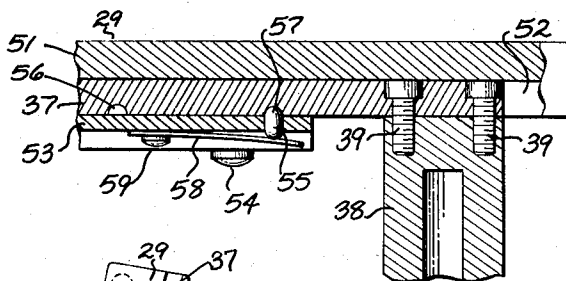
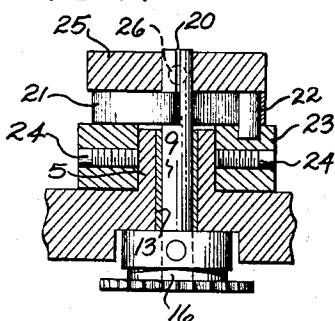


FIG. 5

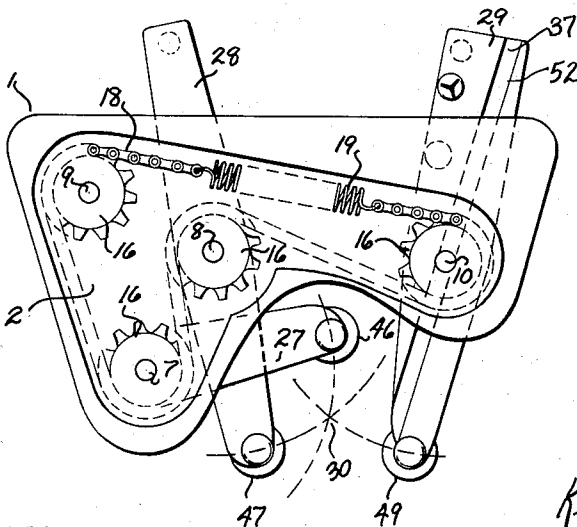


FIG. 3

INVENTOR.
Kenneth P. Gorman
BY
Ezekiel Wolf
his Attorney

1

2,872,123

TOROIDAL CORE ROTATOR ASSEMBLY

Kenneth P. Gorman, Randolph, Mass.

Application October 7, 1957, Serial No. 688,757

12 Claims. (Cl. 242—4)

The present invention relates to a toroidal core rotator assembly, particularly adapted to rotate a toroidal core during the winding of the core.

The winding of toroidal cores and consequently the manufacture of toroidal coils are beset with a great many problems which have materially increased the cost of the individual coil. This is particularly true in the case of the very small coils which are becoming increasingly popular in use. One principal problem is the speed with which these coils may be manufactured. In conventional manufacture, the individual coil is mounted upon a conventional holder. A split ring shuttle is then passed through the core and has thereafter a quantity of wire wound onto the shuttle. After the quantity of wire is wound on the shuttle, the shuttle is rotated and the wire is dropped from the shuttle onto the core as the core itself is rotated in a selective manner. There are, of course, inherent limitations in the speed with which the winding may be accomplished in following the above described procedure. However, in the past a substantial contributing factor in the length of time required for winding was the supporting member upon which the core was mounted.

The present invention provides a structure which is particularly adapted to support a core for rotation at a selected speed and for rotation in selected phases, with the device of the present invention providing precise means for control of the rotation of the core.

The present invention also provides a mechanism which assures uniformity of rotation of the core during the winding procedure as well as uniformity in the radial application of the wire to the core. This is accomplished in part by a mechanism which maintains the rotating core in a fixed axial position regardless of the number of layers of wire which have been wound onto it. This particular mechanism is obtained principally by utilization of three individually and positively driven drive rollers, each tangentially contacting the core. These rollers are adapted to move simultaneously and uniformly away from the axis of the core as the windings build up about the core.

The present invention also provides means whereby one of the drive rollers may be readily removed from the locus of the core for facilitating the removal of the core after winding for the insertion of a new one.

In addition, the present invention provides means by which the drive rollers may be set to contact the toroidal core with a preselected amount of pressure, which pressure will be substantially maintained during the winding process.

These and other features of the present invention will be more clearly understood when considered in connection with the accompanying drawings in which

Figure 1 is a front partially cross section perspective view of the invention;

Figure 2 is a top fragmentary plan view of the invention;

2

Figure 3 is a bottom plan view;

Figure 4 is a cross sectional detail taken substantially along the line 4—4 of Figure 2; and

Figure 5 is a cross sectional fragmentary detail taken substantially along the line 5—5 of Figure 2.

In the arrangement disclosed, there is provided a base 1 preferably formed of a cast metal. This base is formed with a hollow or recessed bottom section 2. A series of bosses 3, 4 and 5 project upwardly from the upper surface 6 of the base 1. Coaxial shaft openings are provided in each one of these bosses containing respectively the shafts 7, 8 and 9. In addition, a fourth shaft 10 extends upwardly through a fourth shaft opening in the base 1. Bearing collars 11, 12 and 13 are interposed respectively between the bosses 3, 4 and 5 and the shafts 7, 8 and 9. Bearing sleeve 14 is mounted between the shaft 10 and the collar 15. The collar 15 in turn is force fitted and rigidly supported on the base 1. Each of these shafts projects downwardly into the bottom section 2 and has mounted thereon equal diameter chain sprockets 16 which may be secured by suitable means as, for example, an Allen head screw passing through the collar of the sprocket and bearing against the shaft, as indicated at 17.

A sprocket chain 18, positioned within the bottom section 2, extends around the outside of the sprockets 16 of shafts 7, 9 and 10 respectively and the inside of the sprocket 16 of shaft 8. The free ends of the chain 18 are connected together by a helical spring 19 which serves to remove or avoid slack in the chain.

The chain and sprocket arrangement thus described is designed to rotate the various shafts 7, 8, 9 and 10 simultaneously and at the same rate. Additionally and as best illustrated in Figure 4, means are provided for adjusting the tension against which the shafts may be rotated. In this arrangement, the shaft 9 is slit longitudinally at its upper end as indicated at 20. A helical spring 21 formed of a flat band of spring steel has its inner end secured in the slot or slit 20 and its outer end secured to the pin 22. The pin 22 is fixed in the collar 23 which in turn is coaxial with and mounted on the boss 5. The collar 23 is secured against axial rotation in any selected position by set screws 24. A cap 25 is mounted on the shaft 9 and secures the spring 21 in position. The cap 25 in turn is secured to shaft 9 by the set screw 26.

Thus, by selectively positioning and securing the collar 23 on the boss 5, the tension of helical spring 21 on the shaft 9 may be increased or decreased. This in turn is transmitted to the sprocket and chain arrangement, thereby making the closing force on arms 27, 28, 29 greater or less as desired.

The shafts 7, 8 and 10 carry respectively the arms 27, 28 and 29 which are adapted to rotate over limited arcs with the shafts. As will be noted from Figure 2 and as will be further explained hereafter, these arms 27, 28 and 29 may be rotated or pivoted toward a common point which is indicated at 30.

Arm 27 is secured to a collar 31 by means of screws 32. This collar in turn is axial with the shaft 7 and is secured to it by preferably a pair of set screws 33.

Arm 28 is secured to a collar 34 by set screws 35 with collar 34 coaxial with shaft 8 and secured thereto by set screws 36 (Figures 1 and 2).

Arm 29, which includes in its construction, more fully described later on (Figure 5), a slide bar 37, is secured to collar 38 by a pair of screws 39. This collar 38 is in turn secured to the shaft 10 with which it is coaxial by preferably a pair of set screws 40. This collar 38 is preferably of the same diameter and longitudinally aligned with the adjacent collar 15. Coaxial with the collars 38 and 15 is an outer collar or sleeve 41. The

3

upper half of this collar 41 is segmented as indicated at 42, leaving a portion of the lower part of collar 38 exposed. Within this segmented section, there is positioned a set screw threaded into the collar 38 as indicated at 43. This set screw 43 is adapted to contact the vertical wall 44 which forms a portion of the segmented section. The collar 41 is secured in any selected position of rotation by suitable means such as a set screw which threads through the base of the collar 41 and secures against the collar 15. Thus, by properly rotating the collar 41 and securing it in a selected position, the amount of rotation of the arm 29 and consequently the arms 28 and 27, which are operatively connected thereto by the chain and sprocket arrangement, may be limited. In this manner, the arms 27, 28 and 29 may be permitted to selectively close under the tension of spring 21 to a selected distance from the common point 30. This arrangement, of course, greatly facilitates the insertion or removal of cores of specified diameters. The collar 41 may be provided with a knurled lower surface as indicated at 45 in order to facilitate the selected positioning of this collar.

The arms 27, 28 and 29 are each individually shaped for particular purposes. Arm 27 extends radially from the shaft 7 and terminates in the roller 46.

Arm 28 extends diametrically across shaft 8 and terminates at one end at roller 47. The other end of arm 28 is provided with a finger-grip or pin 48 with the grip 48 extending upwardly and preferably normal to the surface of arm 28.

Arm 29 also extends diametrically across the shaft 10 and terminates at one end at roller 49 with the other end provided with a finger-grip or pin 50 similar in arrangement to grip 48. Top plate 51 of the arm 29 is formed with a slot or groove 52 which extends diametrically across its bottom surface. The slide bar 37 is longitudinally positioned within this slot 52 and is secured therein by means of a cross member 53 positioned at one end of the arm 29 opposite the roller 49. This cross member 53 is secured in position by screws 54 extending into the plate 51.

The plate 51 which carries roller 49 may be secured in one of two positions indicated at Figure 2 in solid outline on one hand and dotted outline on the other hand. These selected positions are determined by the spring tensioned ballbearing or pin member 55 shown in Figure 5, which is adapted to sit in one of two recesses 56 and 57, formed in the bottom of slide bar 37 in longitudinal alignment with the ballbearing 55. This ballbearing 55 which projects through an opening in the plate 53 is tensioned upwardly by means of a leaf spring 58 against one end of which it bears. The other end of this leaf spring 58 is secured to the cross member 53 by the screw 59.

As indicated above, the slot along which the plate 51 is guided extends transversely and lengthwise of the plate. This particular arrangement has been found to be quite useful in preventing the accidental dislodgement of a toroidal core from between rollers 46 and 47 when the arm 29 is being moved.

The rollers 46, 47 and 49 are each similar in construction. In this arrangement (see Figure 1), there is provided a vertical shaft 60 which as indicated extends through the ends of the arm with which it is associated. Coaxially mounted on this shaft 60 just above the arm is a nylon annular member 61 which may be secured to the shaft 60 by means of a pin such as illustrated at 62. If desired, the member 61 may be spaced from the arm by a washer 63. Positioned above the member 61 and having a diameter somewhat smaller than it, is a rubber roll 64 coaxial with and mounted on the sleeve 65, in turn mounted on shaft 49. The shaft 49 is free to rotate and carries with it the member 61 and roll 64. This shaft 60 is in turn secured at its bottom to flexible shaft 66 with which it is longitudinally aligned.

4

Shaft 66 may be provided with an internally threaded head as indicated at 67 into which the threaded lower end of shaft 60 may be secured. A spacing member 68 may be interposed between the lower surface of the arm 29 and the head 67. The shaft 66 as well as shafts 69 and 70, connected respectively to rollers 46 and 47, are flexible to permit adaptation to drive means 100 of different types. The lower end of shaft 66, however, should be provided with a pivotal joint as indicated at 71 so as to permit the longitudinal sliding of the arm 29 without the requirement of disconnecting the shaft 66 from the drive means. The drive means referred to are secured at the lower end of the shafts 66, 69 and 70 and should be of such a type as to provide uniform simultaneous rotational drive to each one of these shafts. Moreover these lower ends of the shafts 66, 69 and 70 should be splined to permit vertical movement when the device is in operation and the arms 27, 28 and 29 are moved over their arcuate paths. The shafts 66, 69 and 70 may be formed of some material which is torsionally stiff but longitudinally flexible as, for example, speedometer cable.

Having now described my invention, I claim:

1. A device for rotatably supporting a toroidal core for winding comprising three rotatable rollers adapted to tangentially contact said core, drive means for positively rotating each roller, arms, each rotatably supporting one of said rollers with the axis of each roller normal to its supporting arm, three shafts each supporting at one end a separate one of said arms with each shaft fixed and normal to its arm, and means synchronously engaging said shafts at their other ends for uniform rotation thereof.

2. A device as set forth in claim 1 wherein said synchronous means comprises sprockets of uniform diameter secured to the lower end of each shaft and operatively interengaged by a chain.

3. A device for rotatably supporting a toroidal core for winding comprising three rotatable rollers adapted to tangentially contact and support said core, drive means for said rollers comprising flexible shafts longitudinally aligned and secured one each with each of said rollers, arms, each rotatably supporting one of said rollers with the axis of each roller normal to its supporting arm, three shafts each supporting and fixed normal to one each of said arms, means synchronously engaging each shaft for uniform and limited rotation thereof comprising sprockets of uniform diameter secured to each shaft, a chain operatively interengaging said sprockets and means biasing said shafts in a selected rotational position comprising a second shaft and second sprocket mounted thereon with said second sprocket operatively interengaging said chain, a helical spring coaxial with and fixed to said second shaft at one end and to a rotatably adjustable member at the other end whereby said helical spring may be tightened or loosened about said second shaft, means for limiting the rotation of said shafts comprising a collar having a segmented section coaxial with one of said first mentioned shafts and adapted to be fixed in a selected rotational position and a projection extending outwardly from said one shaft within said segmented section, and means adapted to permit longitudinal movement of one of said arms whereby the roller on said one arm is adapted to be moved individually with respect to the other rollers.

4. A device for rotatably supporting a toroidal core for winding comprising a plurality of rotatable rollers adapted to tangentially contact, rotate and support a toroidal core, drive means for said rollers, arms, each rotatably supporting one of said rollers with the axis of each roller normal to its supporting arm, a shaft fixed to each arm and each extending normal thereto, and means for synchronously and uniformly rotating said shafts, comprising means for rotationally biasing said shafts in a selected rotational position and means for simultaneously rotating said shafts against said rotational bias.

5

5. A device for rotatably supporting a toroidal core for winding comprising a plurality of rotatable rollers adapted to tangentially contact, rotate and support a toroidal core, drive means for said rollers, arms, each rotatably supporting one of said rollers with the axis of each roller normal to its supporting arm, a shaft fixed to each arm and each extending normal thereto, and means for synchronously and uniformly rotating said shafts, wherein said synchronous means comprises sprockets of uniform diameter secured to each shaft, a chain operatively interengaging said sprockets, and means biasing said shaft in a selected rotational position comprising a second rotatable shaft and second sprocket mounted thereon with said sprocket operatively interengaging said chain, a helical spring coaxial with and fixed to said second shaft at one end and to a rotatably adjustable member at the other end whereby said helical spring may be tightened or loosened about said second shaft.

6. A device for rotatably supporting a toroidal core for winding comprising a plurality of rotatable rollers adapted to tangentially contact, rotate and support a toroidal core, drive means for said rollers, arms, each rotatably supporting one of said rollers with the axis of each roller normal to its supporting arm, a shaft fixed to each arm and each extending normal thereto, means for synchronously and uniformly rotating said shafts, comprising means for rotationally biasing said shafts in a selected rotational position, means for simultaneously rotating said shafts against said rotational bias and means for limiting the rotation of said shafts comprising a collar having a segment section coaxial with one of said shafts and adapted to be fixed in a selected rotational position, and a projection extending outwardly from said one shaft within said segmented section.

7. A device for rotatably supporting a toroidal core for winding comprising a plurality of rotatable rollers adapted to tangentially contact, rotate and support a toroidal core, drive means for said rollers, arms, each rotatably supporting one of said rollers with the axis of each roller normal to its supporting arm, a shaft fixed to each arm and each extending normal thereto, means for synchronously and uniformly rotating said shafts, and means adapted to permit longitudinal movement of one arm whereby the roller on said one arm is adapted to be moved individually with respect to the other rollers.

8. A device for rotatably supporting a toroidal core for winding comprising a plurality of rotatable rollers adapted to tangentially contact, rotate and support a toroidal core, drive means for said rollers, arms, each rotatably supporting one of said rollers with the axis of each roller normal to its supporting arm, a shaft fixed to each arm and each extending normal thereto, means for synchronously and uniformly rotating said shafts, and means adapted to per-

6

mit longitudinal movement of one arm comprising means forming a longitudinally extending slot in said arm, a slide bar positioned in said slot and secured to the one shaft for said one arm, and means securing said arm to said slide bar for longitudinal movement whereby the one roller on said one arm is adapted to be moved individually with respect to the other rollers.

9. A device as set forth in claim 8 wherein said slide bar is secured radially to said shaft, and said one roller is laterally spaced with respect to the longitudinal axis of said slot whereby said one roller will move obliquely with respect to said one shaft on movement of said one arm.

10. A device for rotatably supporting a toroidal core for winding comprising a plurality of rotatable rollers adapted to tangentially contact, rotate and support a toroidal core, drive means for said rollers, arms, each rotatably supporting one of said rollers with the axis of each roller normal to its supporting arm, a shaft fixed to each arm and each extending normal thereto, means for synchronously and uniformly rotating said shafts, and having means adapted to permit one roller to be moved obliquely with respect to the radius between said roller and the rotatable shaft supporting it whereby said one roller is adapted to be moved individually with respect to the other rollers.

11. A device for rotatably supporting a toroidal core for winding comprising a plurality of rotatable rollers adapted to tangentially contact, rotate and support a toroidal core, arms, each rotatably supporting one of said rollers with the axis of each roller normal to its supporting arm, a shaft fixed to each arm and extending normal thereto, a base in which the lower ends of said shafts are journaled, means located in said base for synchronously and uniformly rotating said shafts, and positive drive means including a flexible shaft coaxial with and secured one each to each of said rollers.

12. A device as set forth in claim 11 wherein said base is formed with a portion recessed from the vertical extension of the location of said core.

References Cited in the file of this patent

UNITED STATES PATENTS

45	1,841,609	Labine	Jan. 19, 1932
	2,467,643	Wirth	Apr. 19, 1949
	2,721,708	Rogers	Oct. 25, 1955
	2,727,698	Stevens	Dec. 20, 1955

FOREIGN PATENTS

50	908,281	Germany	Apr. 5, 1954
	1,107,336	France	Aug. 3, 1955