Dec. 8, 1964 C. H. WEBER 3,160,362

ADJUSTABLE DRUM FOR AUTOMATIC TAKE-UP REEL

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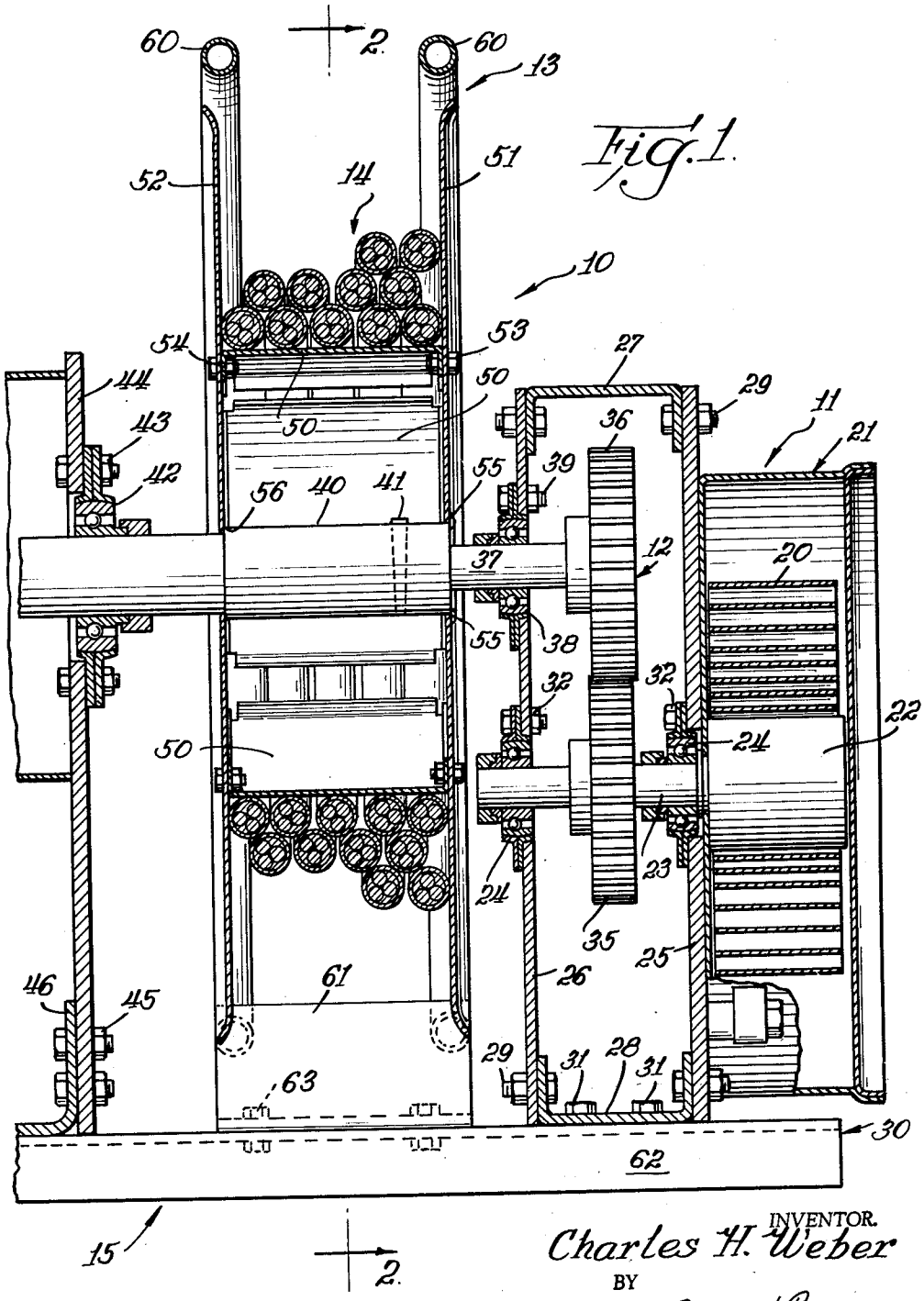


Fig. 1.

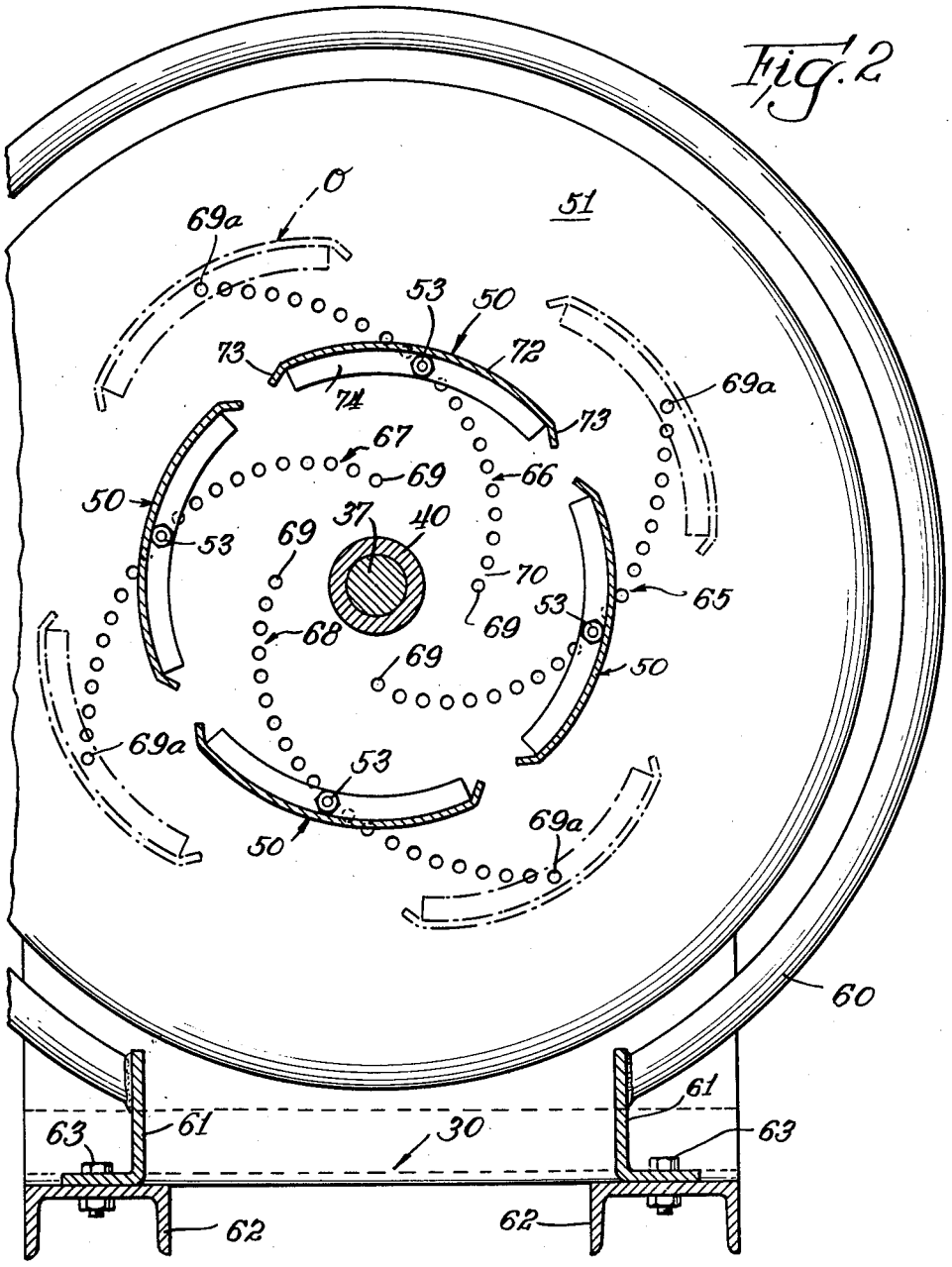
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Fig. 2



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ADJUSTABLE DRUM FOR AUTOMATIC TAKE-UP REEL

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This invention relates generally to take-up reels and, more particularly, to automatic or powered take-up reels and adjustable core means therefor.

Reels for storing cable and having means for automatically tensioning and retrieving the same are well known in the art. In the past, most cable reels have employed fixed drums about which the cable to be stored is wound or wrapped; such drums being of a fixed diameter and generally constructed of sheet metal bent in a cylindrical configuration or, in other instances, a plurality of metal rod members disposed in a cylindrical array. In still other instances, cast metal core drums have been employed with success. In certain areas of development in this art, adjustable drum structures capable of varying diameters have been employed in an attempt to accommodate varying lengths and sizes of cable to be stored on the reel. Generally, such previous adjustable core reels have constituted a minor part of the commercial development in this art, due primarily to the high cost of production and the specialized nature of their structure, usually tailored to meet a specific set of operational conditions, thereby creating a specialty item of manufacture. For some time developers in this field have felt the need for a simple, low-cost and efficient structure for a take-up reel which will accommodate varying core or drum diameters, preferably utilizing standard components capable of being assembled to meet a wide variety of operational conditions.

The present invention answers the above-indicated need in the industry by providing a drum assembly in which standard drum components are capable of being assembled in a variety of positions to present reels having drum core means of various selected diameters, and capable of being repositioned over a wide range of diameters to meet the requirements dictated by special operational circumstance and need of the customer. In brief, the present invention comprises a reel structure in which the drum is formulated by a plurality of core segments, each of an arcuate cross-sectional configuration, pivotally supported on a single axis disposed centrally thereof. The several segments which go to make up the drum or core structure are capable of being mounted at selected positions radially outwardly of the central axis of the reel by means of connector bolts or axis defining means engageable with spaced openings formed in the sides or end plates of the reel, with the openings associated with each drum segment being aligned in a spiral pattern emanating substantially at the central axis of the reel and progressing spirally toward the periphery of the end plates thereof. The openings of each spiral pattern are spaced and separated by intervening metal web portions for strength purposes, with the spiral pattern thereof providing an increased number of adjustment locations for the core or drum segments for a given reel radius. The openings in the opposed reel end members or plates are

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further registeringly aligned to define cooperating pairs of openings at opposite ends of the reel, with each opposed pair thereof defining a single pivotal axis for a drum segment disposed therebetween according to the present invention.

A main object of this invention is to provide a new and improved reel structure distinguished by a diametrically adjustable core assembly.

A further object of this invention is to provide a new and improved reel structure, as aforesaid, in which the adjustable core assembly comprises a plurality of arcuate shaped core segments each disposed on a single pivotal axis at selected positions radially outwardly of the central reel axis.

A still further object of this invention is to provide an improved adjustable core reel structure having a unique core assembly comprising plural arcuate segments mountable between parallel disposed end plate members at various selected positions radially outwardly of the central reel axis and in which the various segment positions are defined by opposing and registeringly aligned openings emanating in a spiral pattern substantially from the central reel axis to adjacent the periphery thereof.

A still further and important object of this invention is to provide a new and improved reel structure for take-up reels and the like in which adjustable core means is provided comprising standard uniform core components disposable over a wide range of selected positions to define thereby various selected core diameters for the reel.

Still another important object of this invention is to provide a new and improved adjustable core reel structure demonstrative of improved economies of production and simplicity of assembly.

The above and further objects, features and advantages of this invention will be recognized by those familiar with the art from the following description of a preferred embodiment thereof in association with the illustration of such embodiment appearing in the accompanying drawings.

In the drawings:

FIGURE 1 is a side elevational view of a typical automatic take-up reel assembly embodying the features of this invention, with certain portions thereof shown in full elevation and the remaining portions thereof in cross-section substantially along the longitudinal center line of the assembly illustrated; and

FIGURE 2 is a cross-sectional view taken substantially at vantage line 2—2 of FIGURE 1 and looking in the direction of the arrows thereon.

Turning now to the features of the preferred embodiment of this invention as illustrated in the drawings, it will be recognized by those familiar with this art that an automatic take-up reel assembly, indicated generally by numeral 10 in FIGURE 1, comprises a spring-powered motor means 11, a reduction gear means 12, a storage drum or reel means 13, which embodies the improved particulars of the present invention and on which a length of electric cable 14 or the like is adapted to be stored, and a supporting structure for such components, designated generally at 15.

The spring motor means 11 is of a conventional and known structure comprising a tension spring means 20, a cover means 21 therefor and a central hub 22 to which the spring means is attached and which in turn is cou-

pled to a power shaft 23 supported between spaced bearing assemblies 24, 24 respectively held and mounted on support plates 25 and 26. Support plates 25 and 26 are interjoined at their upper and lower ends respectively by brace members or brackets 27 and 28 attached to the plates 25 and 26 by bolt members 29 or like fastener elements, and the bracket 28, in particular, being affixed to an underlying bed plate or base 30 of the support structure or assembly 15 by means of plural bolt connectors 31 or other suitable fastening means capable of meeting the intended connective purposes. In the particular embodiment illustrated, each of the bearing assemblies 24, 24 is attached to its respectively adjacent and associated support plates 25 and 26 by bolt members 32, 32.

The power shaft 23 supports intermediate its ends a first drive gear 35 which is keyed to shaft 23 or otherwise affixed thereto for driving relation, and such gear in turn meshingly engages with a secondary gear 36 mounted at one end of a central hub shaft 37; the gear members 35 and 36 comprising the reduction gear assembly 12 referred to hereinabove. In this regard, while the particular embodiment illustrates a one-to-one gear ratio between gear members 35 and 36, other ratios are obviously available to achieve a desired ratio of rotational movement between shafts 33 and 37, all according to known and recognized practice in this art.

Shaft 37 is supported in a bearing assembly 38 adjacent gear 36, such bearing assembly being mounted on the secondary support plate 26 by means of mounting bolt 39 or other suitable connective devices. The shaft 37 is surrounded, axially outwardly of bearing assembly 38, by a tubular sleeve element 40 to which it is pinned or keyed, as by pin means 41, for conjoint rotation with such sleeve member. The sleeve member 40 in turn is supported, along with shaft 37 adjacent the end of the latter opposite that to which gear 36 is affixed, by bearing assembly 42 mounted by bolt means 43 to a third support plate 44 located in parallel spaced relation with respect to the previously described support plates 25 and 26 of the support assembly 15. Plate 43 in turn is attached by bolt means 45 to a right angle bracket 46 for connection with the bed plate 30; the bracket 46 being rigidly associated with the bed plate 30 as by welded connection or the like.

Turning now to the particulars of the improved reel assembly 13 of this invention, it will be recognized that the same is mounted on the central hub or sleeve member 40 between the support plates 26 and 44; the reel assembly being coaxial with the sleeve 40 and shaft 37 so as to be aligned substantially transversely to the bed plate or base 30 in normal operational condition, i.e., vertically with base 30 disposed horizontally.

The reel or drum assembly 13 comprises a plurality of arcuate cross-sectioned core segments or shoes 50; there being four such segments in the particular embodiment illustrated (see FIGURE 2) which define, in their selected assembled positions, a substantially cylindrical core or drum. The several core segments 50 are disposed between a pair of parallel spaced circular end disc or plate members 51 and 52, one at either end of the drum core; such disc or end plate members being respectively affixed to the plural core segments 50 as by bolt connector means 53 and 54. The end plate members each bear a central opening receptive of the hub or sleeve element 40, with the plate member 51 being welded or otherwise affixed to one end of the sleeve member 40 as by spot welds 55, 55, while the plate member 52 is snugged up against one end of a cylindrical shoulder 56 formed intermediate the ends of the sleeve member 40. It will further be appreciated that the disc or plate members 51 and 52 extend radially outwardly of the sleeve member 40 and the core of the reel defined by the several segment members 50 to define a receptacle for storing a length of cable 14 about the core assembly of the reel in a recognizedly familiar fashion. Tubular annular hoop elements 60, 60 are disposed generally about the periphery of the plate members 51, 52 in outwardly spaced relation with respect thereto to provide rub rails and guides protective of the cable 14 as the latter is paid out and taken in by the reel during operation. The hoop elements 60 are held in fixed relation concentrically outwardly of the plate elements 51 and 52, as particularly shown in FIGURE 2 of the drawings, with the ends of such hoop elements being attached to spaced right angle brackets 61 which are bolted or otherwise rigidly attached to rail elements 62 of the base assembly 30 by bolt means 63.

With particular reference now to FIGURE 2 of the drawings, it will be understood from the illustrated showing of end plate 51 therein that the same is provided with four rows of openings designated 65, 66, 67 and 68, each comprising a plurality of individual openings 69 aligned in spaced relationship along a spiral pattern emanating substantially adjacent the central axis of the reel assembly or, that is, adjacent the supporting hub sleeve 40 and progressing in a counterclockwise direction toward the periphery of the disc element 51. It will be appreciated that the several spiral patterns and number of openings in each spiral pattern are uniform and that the particular number of openings and spacing between adjacent openings is not limited to the specific embodiment illustrated in FIGURE 2. The spirally arrayed rows of openings are further separated substantially in the fashion illustrated in FIGURE 2, with the arcuate spacing between corresponding openings of such several rows thereof divergently generating or increasing from a minimum distance adjacent the hub sleeve 40 to a maximum distance as such rows approach the outer periphery of the plate elements, such as plate 51 illustrated in FIGURE 2. Of particular note is the merit achieved by the spiral hole pattern and the spacing between adjacent openings of each spiral row. That is to say, arranging the adjacent openings in a spiral fashion or row affords a marked increase in the number of adjustment locations of the core shoe elements 50 for a given radius of the plate members 51 and 52. Thus, for example, with the same web area or portion 70 between adjacent openings 69 of any one row of openings, a much greater number of adjustment openings is possible due to the spiral opening alignment than if such openings were aligned along a straight radial path or row. Also, it will be appreciated that the spiral hole pattern produces a greater number of adjustment positions and a finer radial adjustment between adjacent openings for a given radial distance from the central axis of the reel assembly than if such openings 69 were arrayed in radial patterns, for example. More importantly, this spiral pattern insures maximum strength for the reel core in resisting radial compressive forces imposed by the cable 14 coiled thereabout. This will be understood from a recognition that at each adjustment position for the core segments, the latter are radially supported against compressive collapse, not by the material of the web area 70 between adjacent openings 69, but by the material of the end plates lying radially between each opening 69 and the central axis of the reel. Thus the end plates give direct radial support to the core segments substantially without weakening of such radial support line by reason of a plurality of adjustment openings being located therealong. This desirable achievement stems directly from the lateral or arcuate spacing of the adjustment openings afforded by the spiral pattern thereof.

Turning now more to the particulars of the core shoe segments 50, it will be seen from FIGURES 1 and 2 that each shoe segment comprises arcuate cross-sectional body portion 72 formed as a cylindrical sector which has its lengthwise or lateral edges turned inwardly to provide lip portions 73, 73. The opposite ends of each body portion 72 are also turned inwardly to provide arcuate shaped mounting flanges or wall portions 74, 74 disposed at right

angles to the lengthwise axis of the body portion 72. Each mounting flange 74 is provided with a central opening substantially mid-way along its arcuate extent for the reception of one of the mounting bolts 53 or 54 (see FIGURE 1) by which the same is attached to the opposing plate or disc members 51, 52 so as to extend transversely between the latter. It will be appreciated, of course, that in mounting the arcuate shaped shoe elements 50 between the plate elements 51 and 52, the mounting bolt means 53 and 54 are disposed through correspondingly opposed openings 69 of the registeringly aligned rows of openings formed in the plate members 51 and 52. Radial adjustment of the reel core, of course, is achieved expeditiously by selecting the desired opposed openings of the several spiral rows of openings for reception of the mounting bolt members 53, 54, with each of the shoe elements 50 being attached to the plate members 51, 52 at corresponding radial positions or sets of opposed openings 69, 69 thereof. As an illustration, the shoe members 50 are therefore disposable between an outermost positional limit (designated O and shown in phantom lines in FIGURE 2) dictated by outermost opening 69*a* of each of the spiral rows of openings and an innermost limit therefor as dictated by the radial innermost openings designated 69 in FIGURE 2. It will also be understood that while the arcuate contour or radius of formation for each of the shoes 50 remains fixed and constant, the plural shoes which go to make up the ultimate core for the reel assembly nevertheless define an outer substantially cylindrical bearing area for the cable 14 due to the fact that each of the shoe members is pivoted on a single longitudinal central axis as defined by the attachment bolt members 53 and 54 by which they are attached to the end plate elements 51, 52. Thus, each of the shoe elements is pivotally attachable to meet and provide bearing support for the cable wrapped thereabout regardless of their radial positions along the spiral rows of adjustment openings.

From the foregoing, it is believed that those familiar with this art will readily recognize and appreciate the novel features and advantages of the present invention which marks it apart from and as a novel advancement over previously known adjustable core reels in this art. Also, it is to be understood that while the features of the present invention have been described and illustrated in relation to a particular embodiment thereof as set forth in the accompanying drawings, nevertheless numerous changes, modifications and substitutions of equivalents may be made therein without departing from the spirit and scope of its inventive features. As a consequence, it is not intended that the present invention be limited to the above-described particulars and specifications, except as may appear in the following appended

I claim:

1. In a rotatable take-up reel, a pair of parallel spaced end plate members, and a diametrically adjustable core mounted between said plate members and presenting a substantially cylindrical surface for supporting cable stored on the reel, said core comprising plural core segments, each having a body portion of arcuate cross-section and presenting a partial cylindrical outer support surface, each said core segment being attached at its opposite ends to both said plate members by pivotal connector means passing through selected pairs of opposed adjustment openings formed through said plate members and defining, with the connector means, spaced, longitudinal pivotal axes for the associated core segment; the said adjustment openings of said plate members being operationally aligned in registering opposed pairs and disposed in separated spiral rows emanating from adjacent the center of said plate members and progressing divergently toward the periphery thereof whereby said core segments are adjustably positionable at plural fixed positions radially of the central rotational axis for the reel and each along spiral lines of position as defined by the spiral row patterns of said openings.

2. The combination as set forth in claim 1 wherein the spiral patterns and locations of said openings in said plate members are such that the various selected adjustment positions for each of said segments affords radial support thereto by and through said end plate members along support lines extending radially of the central axis of the reel and substantially without interruption by said adjustment openings.

3. In a rotatable take-up reel of the class described, a tubular sleeve member and shaft assembly rotatably supported and defining a central rotational axis for the reel, a pair of end plate members mounted in opposing parallel spaced relation on said sleeve and extending radially outwardly thereof, each said end plate member having a plurality of individual core adjustment openings formed therethrough, which openings are aligned in plural separated rows of spiral pattern emanating adjacent said sleeve and generating divergently toward the periphery of the related plate member; the several openings in the said opposing end plate members being registeringly aligned; and plural core segments, each having a body portion of arcuate cross-section, mounted to extend between said plate members, radially outwardly of said sleeve to provide a substantially cylindrical and radially adjustable cable supporting core for the reel concentric of said central axis thereof, each of said segments being detachably connected at its opposite ends to said plate members by connector means engaging and passing through selected correspondingly opposed openings of like opposing rows thereof, with said connector means associated with each of said segments defining a single longitudinal pivotal axis therefor at each of its selected positions of radial adjustment and whereby said segments are pivotally responsive to provide a substantially cylindrical radial support surface self-aligning to turns of cable wrapped thereabout.

4. The combination as set forth in claim 3 wherein said tubular sleeve member is formed with an exterior cylindrical shoulder intermediate its ends against which one of said plate members is removably abutted while the other said plate member is affixed to one end of said sleeve member; interconnection and stabilizing support of said plate members to maintain their parallel spaced relation being effected by means of said core segments mounted therebetween.

5. In an automatic take-up reel of the class described, improved adjustable drum means for storing a length of cable and mounted for rotation about a single central axis comprising, a pair of end plate members mounted in spaced parallel relation to extend radially outwardly of the drum's rotational axis, and a diametrically adjustable core means mounted between and adjustably connected to said end plate members, radially outwardly of said axis; said core means presenting a substantially cylindrical outer support surface for cable stored thereabout and comprising plural like core segments, each formed with a partial cylindrical cable supporting surface and each radially adjustable relative to the drum's said rotational axis by selected positioning thereof at spaced locations along spiral adjustment paths defined by plural spaced openings formed in each of said end plate members and arrayed therein along separated spiral rows, which rows diverge spirally outward, in like pattern directions, from substantially adjacent the center of each plate member and terminate adjacent the outer periphery thereof; the said spiral rows and the said openings thereof formed in said opposing plate members being registeringly aligned to present registeringly opposed pairs of openings for selectively positioning and connecting the said segments to and between the said plate members at various selected fixed radial distances outwardly of the drum's central axis, with the arrangement and alignment of the rows and openings in said plate members being such that sup-

port of said core segments against radial compressive forces applied thereto is afforded by the end plate members along radial lines of support which are substantially uninterrupted by the said adjustment openings formed therein.

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