Nov. 13, 1956 G. R. LEE 2,770,425

SPOOL AND MANDREL ASSEMBLY

Filed Sept. 28, 1954 2 Sheets-Sheet 1

Fig. 1.

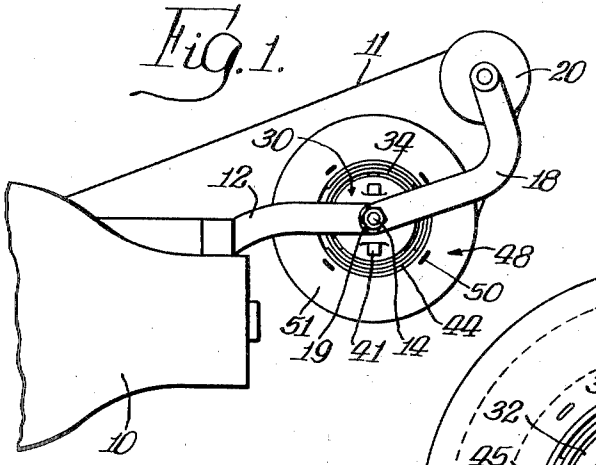


Fig. 2.

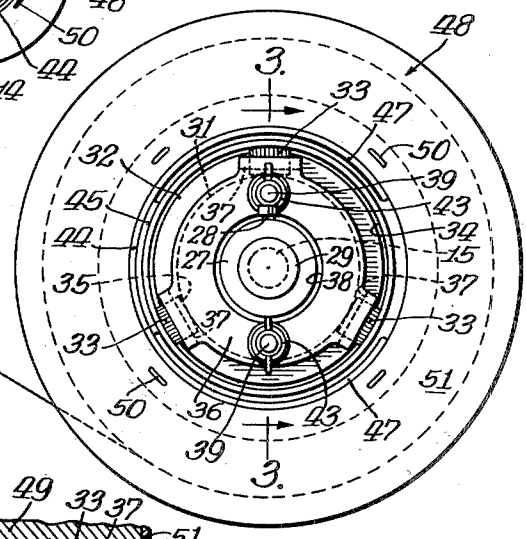
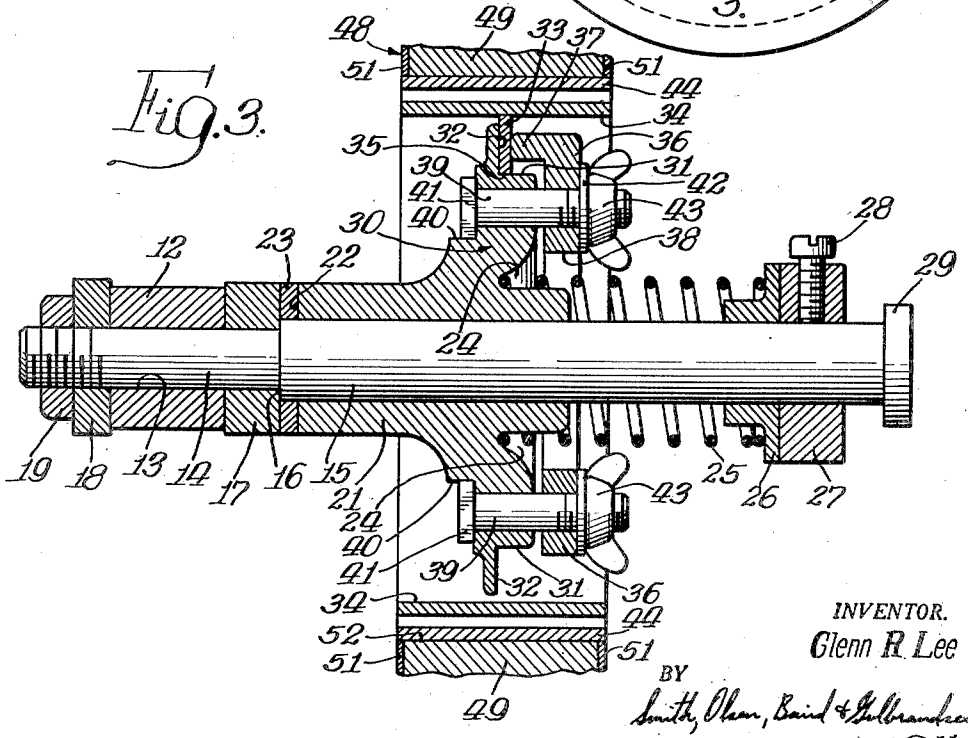


Fig. 3.



INVENTOR.
Glenn R. Lee

BY
Smith, Olsen, Baird & Galbraith
Atty's.

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Fig. 4.

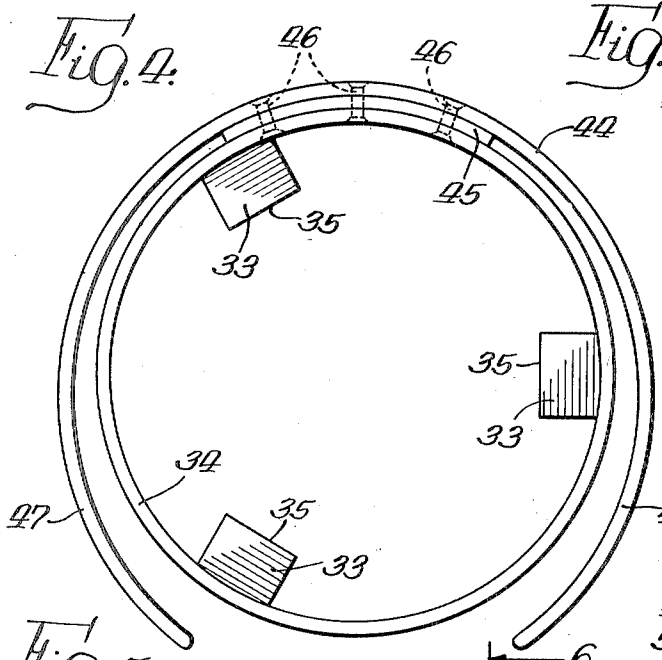


Fig. 6.

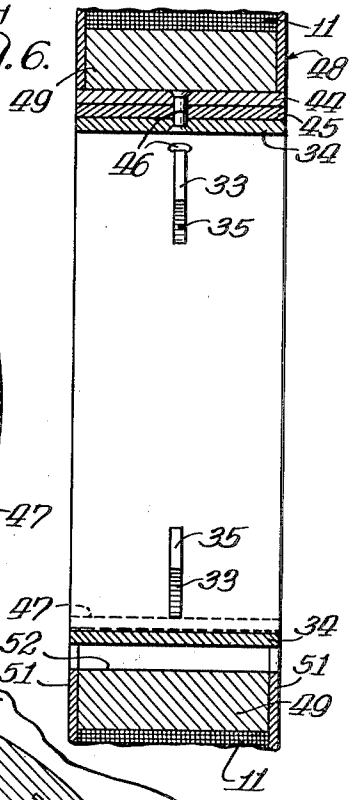
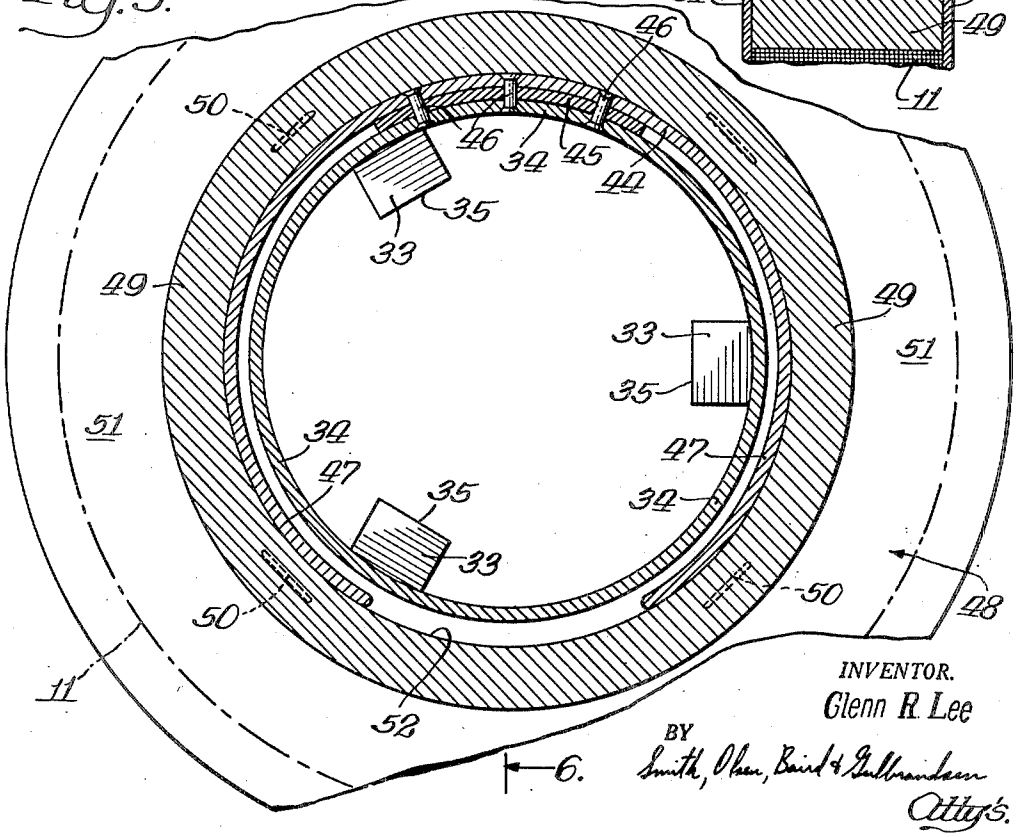


Fig. 5.



INVENTOR.
Glenn R. Lee

BY
Smith, Olsen, Baird & Gulbrandsen
Attys.

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SPOOL AND MANDREL ASSEMBLY

Glenn Richard Lee, Kokomo, Ind., assignor to Continental Steel Corporation, Kokomo, Ind., a corporation of Indiana

Application September 28, 1954, Serial No. 458,772

7 Claims. (Cl. 242—46.2)

This invention pertains to the winding and reeling arts and more particularly to a highly improved spool and mandrel assembly of a type suitable for receiving wire and other linear materials subsequently to be unwound from the spool.

One of the principal objects of the invention is to provide a simple and relatively inexpensive spool and mandrel assembly which will support the contents of the spool for rotation during winding and unwinding and wherein the spool, despite its very inexpensive construction, will always be supported, and will rotate, concentrically about the axis of the shaft upon which the spool and mandrel assembly is mounted. A further object of the invention is to provide a spool and mandrel assembly having, in addition to the foregoing qualities, provision whereby the spool is firmly held upon the mandrel in the concentric position just mentioned but may be easily removed therefrom and a like spool replaced on the mandrel in a minimum of time simply by sliding the spools off of, and on to, the mandrel assembly in an endwise direction. Yet another object of the invention is to provide a spool and mandrel assembly wherein the spool is fabricated substantially of paper or the like and may therefore, as a matter of economy, be destroyed when empty, but yet may be quickly and easily applied to or removed from the mandrel without the necessity of loosening, removing or disassembling any part of the mandrel.

These and other objects and advantages of the present invention will be apparent from the following description of a preferred embodiment thereof, taken with the accompanying drawings wherein:

Fig. 1 is an elevational view showing the rear side of one form of the spool and mandrel assembly of the present invention and illustrating a way in which the assembly may be mounted upon a wire stitching machine or other machine adapted to withdraw and consume the contents of the spool;

Fig. 2 is a front view of the spool and mandrel assembly on an enlarged scale;

Fig. 3 is a still further enlarged cross-sectional view of the spool and mandrel assembly taken substantially along the line 3—3 in Fig. 2, parts of the spool per se being cut away for convenience in illustration;

Fig. 4 is a detailed elevational view of a part of the mandrel assembly including a ring which, in the assembled condition of the mandrel, encompasses and is secured upon the rotatable hub, and including a spring member that is secured upon the ring in a position encompassing a substantial portion of the same, the spring member being shown in its unflexed position prior to receiving the spool thereon;

Fig. 5 is a vertical cross-section taken at right angles to the axis of the assembly with the hub omitted, showing the manner in which a spool is received upon the spring member encompassing the ring, the core of the spool flexing the spring member inwardly to a shape and position concentric with respect to the ring; and

Fig. 6 is a vertical cross-section taken along the line 6—6 in Fig. 5.

Referring now to the drawings, the spool and mandrel assembly of the present invention is shown in Fig. 1 in a form in which it may be mounted in any suitable location upon a machine that receives and consumes the wire or similar material that may be wound upon the spool. The machine, for example, may be a wire stitching machine **10** adapted to consume stitching wire **11** wound upon the spool. In the embodiment shown in Fig. 1 an arm **12** is fixedly mounted upon the stitching machine **10** and has an opening **13** in its extremity which receives and fixedly supports a reduced-end portion **14** of a horizontally disposed shaft **15**. The shaft has a shoulder **16** formed thereon between its reduced-end portion **14** and the remaining portion of the shaft, with a collar **17** disposed about the reduced portion and abutting the shoulder **16** for spacing the shoulder from one side of the arm **12** adjacent the opening **13**. A rotatably adjustable bracket **18** is carried by the reduced-end portion **14** of the shaft on the other side of the arm **12** and is secured upon the shaft in any desired angular position by a nut **19** threaded upon the end of the shaft. The bracket **18** may extend radially outwardly and then upwardly, as illustrated in Fig. 1, and may carry upon its extremity a rotatable guide roller **20** about which the wire **11** may be fed from the spool to the machine **10**.

A hub **21** is rotatably mounted upon the main body portion of the shaft **15**, with the inner end **22** of the hub spaced from the collar **17** by a washer **23**, the opposite end of the hub being recessed as at **24** to receive the inner end of a helical compression spring **25**. The outer end of the helical spring bears against a bearing member **26** that is rotatably mounted upon the shaft **15** and which, in turn, bears against one side of a collar **27** that is adjustably fixed upon the shaft by means of a set-screw **28**. The helical spring **25** and its coacting parts constitute an adjustable brake for supplying tension to the wire **11** or other material fed from a spool that is removably mounted upon the hub by means about to be described. It will be observed, particularly in Fig. 3, that loosening of the set-screw **28** permits adjustment of the collar **27** and the bearing member **26** longitudinally with respect to the shaft **15**, thereby causing an increase or a decrease in the compression of the spring **25**. An increase in this compression urges the end **22** of the hub against the washer **23** with greater force to increase the friction therebetween, and also causes the innermost convolution of the spring to tend to expand slightly and to bear with greater force against the hub within the recess **24** therein. This increase in friction or drag on the hub **21** increases the force required to rotate the hub on the shaft **15** and consequently causes an increase in the tension of the wire **11** fed from the spool on the hub. A decrease in the compression of the spring **25** causes the opposite result, permitting the hub to rotate with less friction and thereby causing less tension to exist in the wire **11** being withdrawn from the spool. The compression of the spring **25**, and the consequent tensioning of the wire **11**, may be adjusted at will by selectively locating the collar **27** longitudinally on the shaft **15**. In order to avoid inadvertent release of all compression in the spring, which would permit the hub to spin freely, the outer end of the shaft may have a shoulder **29** formed thereon which limits the extent to which the collar **27** may be moved in the direction releasing the compression of the spring.

The hub **21** has a radially extending, circular, disk-like portion formed thereon, designated generally by the numeral **30** in the drawings. An annular surface **31** and a radially extending face **32** are formed on the disk-like portion at its outer periphery for removably receiving a plurality of identical lugs **33** extending radially inwardly from a hollow cylindrical ring **34** encompassing the hub, the lugs at their outer ends being welded or otherwise

secured to the inner surface of the ring. The lugs, which may be three or more in number, are of equal length and are preferably located equi-angularly about the inner circumference of the ring 34, as best seen in Figs. 4 and 5. The inner ends 35 of the lugs loosely engage the annular surface 31 on the hub and thereby at all times hold the ring 34 in a position concentric with respect to the hub. One side of each of the lugs lies flush against the face 32 of the hub and the lugs are clamped in this position by a removable clamp plate 36 which, in the form illustrated, has three inturned toes 37 engaging the opposite sides of the lugs. The clamp plate has a central aperture 38 therein somewhat larger than the diameter of the compression spring 25 and of the shaft 15, both of which extend outwardly therethrough. This permits easy movement of the clamp plate toward and away from the face 32 of the hub without the necessity of disassembling the hub or its brake assembly. The clamp plate 36 may be removably secured to the hub in any suitable manner. In the form shown, the clamp plate is provided with a pair of openings that loosely receive the threaded ends of a pair of bolts 39 that extend through the disk-like portion 30 of the hub. The rear side of the hub may be milled out or otherwise recessed, as at 40 (Fig. 3), to receive the heads 41 of the bolts to prevent the bolts from turning. The threaded ends of the bolts extend through the openings in the clamp plate and receive washers 42 and wing-nuts 43 thereon, the latter of which, when turned down tightly, carry the inturned toes 37 of the clamp plate firmly against the lugs 33 of the ring 34 and clamp the lugs tightly against the radially extending face 32 of the hub. It will be seen that when the lugs are so clamped the ring 34 and the hub will rotate as a unit concentrically about the shaft 15, the clamping of the lugs preventing longitudinal movement of the ring with respect to the hub and the engagement of the inner ends 35 of the lugs against the annular surface 31 of the hub constantly maintaining the ring in a coaxial position with respect to the hub.

A single piece split-ring or arcuate leaf-type spring member 44 is secured at its approximate center upon the outside of the ring 34 with an arcuate spacing member 45 therebetween, all three parts being fastened together as by rivets 46, or the like, preferably having counter-sunk formations at their opposite ends. The spring member 44 in its unflexed or unstressed condition (illustrated in Fig. 4) has a fairly uniform radius which is substantially greater than the radius of the ring 34. The spring member in this free condition is located eccentrically of the ring, with its radial center off-set with respect to the radial center of the ring and offset with respect to the radial center of the hub 21 that removably receives the ring, as explained above. It will be seen, furthermore, that the free end portions 47 of the spring together circumferentially encompass substantially more than 180 degrees of the periphery of the ring. The spring member 44 however may be compressed or flexed inwardly to a position substantially concentric with the ring 34 and this is accomplished when a spool 48 constructed in accordance with the present invention is slipped over the spring member, as perhaps best seen in Figs. 2, 3 and 5. The spool is preferably of very inexpensive construction having a hollow cylindrical core 49 of paper or fiber, upon the opposite ends of which there are secured (as by gluing or by staples 50, or by both) a pair of radially extending side flanges 51 which likewise, in the preferred form, are fabricated of paper or fiber or the like. The opening 52 in the center of the core 49 of the spool bears a relation with respect to the dimensions of the ring 34, the spring member 44 and the spacer plate 45, its radius being substantially equal to the radius of the outer periphery of the ring plus the combined thicknesses of the spring member 44 and the spacer plate 45, as seen in Fig. 5. This dimensional relationship results in an inward flexure of the spring member 44 to a position concentric with the ring 34 when the core of the spool is received upon and embraces the spring member, the spring member thereupon supporting and retaining the spool on the assembly in a relatively fixed position also concentric with respect to the hub 21 and the ring 34, the hub and ring 34 and the spring member constituting a rotatable mandrel for the spool.

The spool and mandrel assembly described above has a great variety of suitable uses particularly in connection with industries wherein substantial quantities of spooled wire or other spooled linear materials are consumed. Heretofore, and especially with regard to the supplying of wire, it has been common practice for the manufacturers of wire to wind and deliver their products to industrial consumers on relatively expensive metal spools which, for reasons of economy, must be returned to the manufacturer to be refilled. The use of such spools was heretofore thought to be necessary especially where the wire was consumed in connection with machines that require a smooth unreeling of the wire and a smooth concentric running of the spool during the unwinding process. The present invention, however, has eliminated the need for such expensive spools and has provided a simple, inexpensive, easily disposable spool which, in combination with the mandrel assembly described above, is quickly interchangeable with like spools and runs smoothly and concentrically during both unwinding and winding of materials thereon. Because of their light weight as compared to spools of metal and the like, the present spools when filled may be shipped at less expense, and when received they individually may be quickly placed upon the present mandrel assembly. This is accomplished simply by initially compressing the spring member 44 radially inwardly with the hands and by then slipping the spool in an endwise direction over the spring member which, with the ring 34 and its related parts, may remain undisturbed in assembled relation on the hub 21 as shown in Figs. 2 and 3. Similarly, when an empty spool is to be removed from the mandrel assembly, it is quickly slipped in the opposite endwise direction off of the spring member 44, whereupon it may be destroyed. It will be noted that when the spool has been slipped onto the spring member 44, the compressive forces in the spring firmly hold the spool upon the spring member. Because of the central mounting of the spring member and because of the friction between said member and the inner surface of the core 49, any tendency of the spool to slip rotatively with respect to the spring causes one or the other of the end portions 47 of the spring to tend to be carried outwardly to increase the force upon the core, thereby immediately halting the slippage.

Removal of the ring and leaf-spring assembly from the hub 21 is likewise easily and quickly accomplished merely by unscrewing the wing-nuts 42 to release the clamp plate 36, turning the clamp plate so that its toe portions 37 are out of alignment with the lugs 33 on the ring 34, and then removing the ring and spring assembly in an endwise direction to the right as viewed in Fig. 3. The installation of the same or a different ring and spring assembly is made merely by reversing the order of the procedure just stated, proper placement of the assembly upon the hub always being assured by reason of the fact that the inner ends of the lugs 33 on the ring 34 automatically locate the ring concentrically with respect to the hub when they are passed into engagement with the annular surface 31 on the hub.

The foregoing description of one embodiment of the present invention has been made for clearness of understanding only and no unnecessary limitations are intended thereby, for it will be quite apparent to those skilled in the art that various changes and modifications may be made in the structure within the spirit and scope of the appended claims.

I claim:

1. A spool and mandrel assembly comprising, an annu-

lar ring mounted for rotation about its axis, a single piece substantially uniformly arcuate leaf-type spring member anchored to the exterior of said ring and circumferentially encompassing more than 180 degrees of the periphery of the ring, said arcuate spring member in its unflexed condition being disposed eccentrically with respect to said ring, and a spool having a circular opening in the core thereof removably received upon and supported solely by said spring member, the wall of said opening forcefully embracing the outer surface of said spring member and flexing said member inwardly to a position substantially concentric with said ring, the ring, spring member and spool thereby being rotatable as a unit substantially concentrically about said axis of said ring, the resilience of said spring member retaining said spool thereon.

2. A spool and mandrel assembly comprising, an annular ring mounted for rotation about its axis, a single-piece substantially uniform arcuate leaf-type spring member anchored to said ring at a location midway between the opposite end portions of said spring with said end portions of said spring circumferentially encompassing a substantial portion of the exterior periphery of the ring, said arcuate spring member in its unflexed condition having a radius substantially greater than the radius of said ring and having a radial center offset with respect to the radial center of the ring, and a spool having a circular opening in the core thereof removably received upon and supported solely by said spring member, the wall of said opening forcefully embracing the outer surface of said spring member and flexing said member inwardly to an arcuate shape having a radial center substantially coincident with said radial center of said ring, the ring, spring member and spool thereby being rotatable concentrically as a unit about said axis of said ring, the resilience of said spring member retaining said spool in position thereon.

3. A spool and mandrel assembly therefor comprising, an annular ring mounted for rotation about its axis, a single piece substantially uniformly arcuate leaf-type spring member disposed outside said ring and circumferentially encompassing a substantial portion of the exterior periphery thereof, said spring member and said ring being secured together at a single location with an arcuate spacing block disposed therebetween, said spring member in its unflexed condition occupying an eccentric position with respect to said ring, and a spool having a circular axial opening in the core thereof having a radius substantially equal to the sum of the radius of the outer peripheral surface of said ring and thicknesses of said spacing block and said spring member, said spool being removably received upon and supported solely by said spring member with the wall of said opening forcefully embracing said spring member and flexing the same inwardly to a position substantially concentric with said ring, the ring, spring member and spool thereby being rotatable as a unit substantially concentrically about said axis of said ring, the resilience of said spring member retaining said spool thereon.

4. The combination of a readily disposable spool for stitching wire and the like and a mandrel assembly therefor comprising, an annular ring mounted for rotation about its axis, a single piece substantially uniformly arcuate spring member of the leaf-type anchored to the exterior of said ring and circumferentially encompassing more than 180 degrees of the periphery of said ring, said arcuate spring member in its unflexed condition being disposed eccentrically with respect to said ring, and a spool having a fibrous core with radially extending fibrous flanges at its opposite ends, said core having an axially arranged opening extending therethrough containing said ring and spring member, the walls of said opening forcefully embracing the outer surface of said spring member in intimate contact therewith and flexing the same inwardly to a position substantially concentric with said ring, the ring, spring member and spool thereby being

rotatable as a unit substantially concentrically about said axis of said ring, the resilience of said spring retaining said spool thereon.

5. A spool and mandrel assembly comprising, a rotatable hub, a ring encircling said hub, means for removably clamping said ring to said hub in position coaxial therewith, a substantially uniformly curved leaf-type spring member anchored to the outside of said ring at a location substantially midway between the opposite end portions of said spring member with said end portions circumferentially encompassing a substantial portion of the exterior periphery of said ring, said arcuate spring member in its unflexed condition having an average radius substantially greater than the radius of said ring and being disposed eccentrically with respect to the ring, and a spool having a circular opening in the core thereof removably received upon said spring member, the wall of said opening forcefully embracing the outer surface of said spring member in intimate contact therewith and flexing the same inwardly to an arcuate shape having a radial center substantially coincident with said radial center of said ring, the hub, ring, spring member and spool thereby being rotatable concentrically as a unit about the axis of said hub.

6. A spool and mandrel assembly therefor comprising, a rotatable hub having an annular surface thereon, a ring encircling said hub, a plurality of inwardly extending lugs on said ring, the inner ends of said lugs being in engagement with said annular surface for locating and maintaining said ring in a coaxial position with respect to said hub, means for removably clamping said lugs to said hub, a longitudinally uniformly arcuate spring member anchored to the exterior of said ring and circumferentially encompassing more than 180 degrees of the periphery of said ring, said arcuate spring member in its unflexed condition being disposed eccentrically with respect to said ring, and a spool having a circular opening in the core thereof removably received upon said spring member, the wall of said opening forcefully embracing the outer surface of said spring member and flexing the same inwardly to a position substantially concentric with said ring, the hub, ring, spring member and spool thereby being rotatable as a unit substantially concentrically about said axis of said hub.

7. A spool and mandrel assembly comprising, a rotatable hub having an annular surface thereon with a shoulder extending radially outwardly therefrom, a ring encircling said hub, a plurality of inwardly extending lugs on said ring, the inner ends of said lugs loosely engaging said annular surface for indexing and maintaining said ring in a coaxial position with respect to the hub, means for clamping said lugs against said shoulder for preventing longitudinal movement of said ring with respect to the axis of the hub and for preventing relative rotational movement between said hub and said ring, an arcuate spring member anchored to the exterior of said ring and circumferentially encompassing more than 180 degrees of the periphery of said ring, said arcuate spring member in its unflexed condition being disposed eccentrically with respect to said ring, and a spool having a circular opening in the core thereof removably received upon said spring member, the wall of said opening forcefully embracing the outer surface of said spring member and flexing the same inwardly to a position substantially concentric with said ring, the hub, ring, spring member and spool thereby being rotatable as a unit substantially concentrically about said axis of said hub.

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