Feb. 15, 1949. R. W. STANLEY 2,461,576

REINFORCED THREAD-ADVANCING REEL

Filed July 21, 1945 3 Sheets-Sheet 1

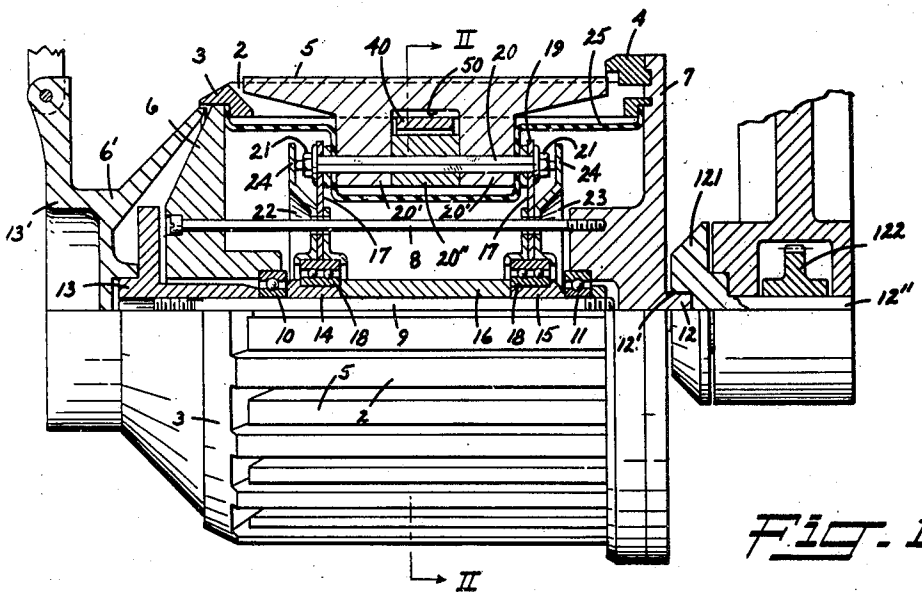


Fig. 1

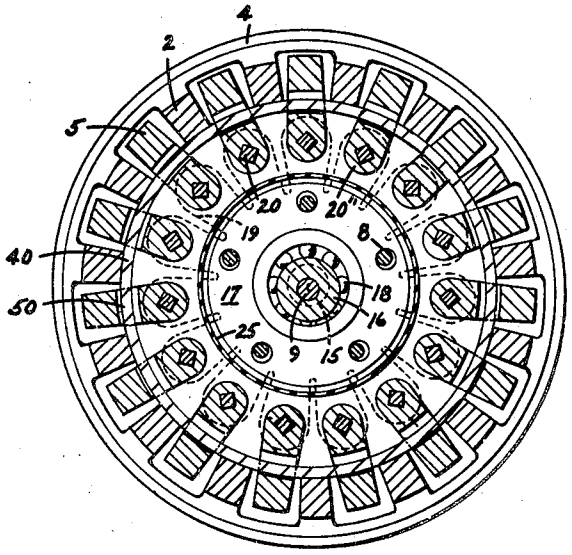


Fig. 2

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REINFORCED THREAD-ADVANCING REEL

Filed July 21, 1945 3 Sheets-Sheet 2

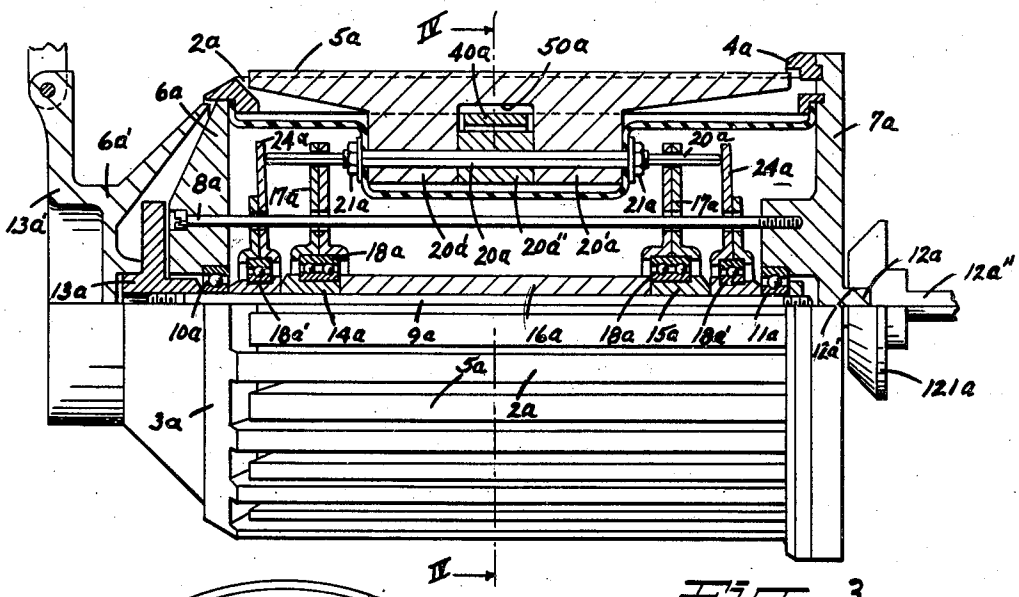


Fig. 3

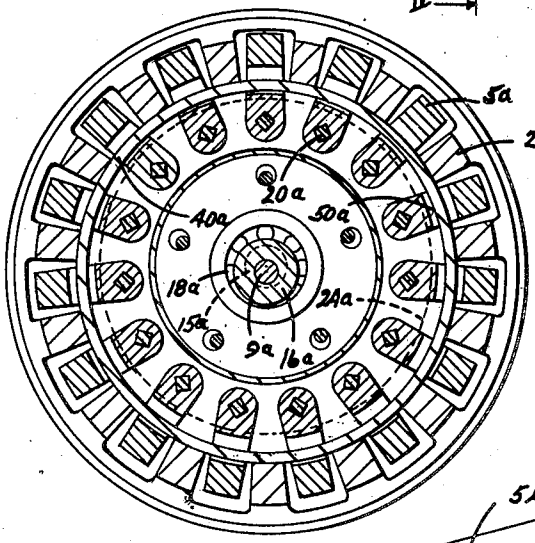
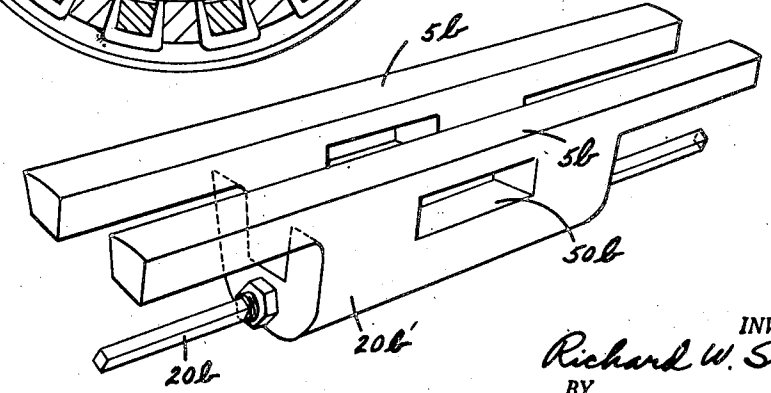


Fig. 4

Fig. 7



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REINFORCED THREAD-ADVANCING REEL

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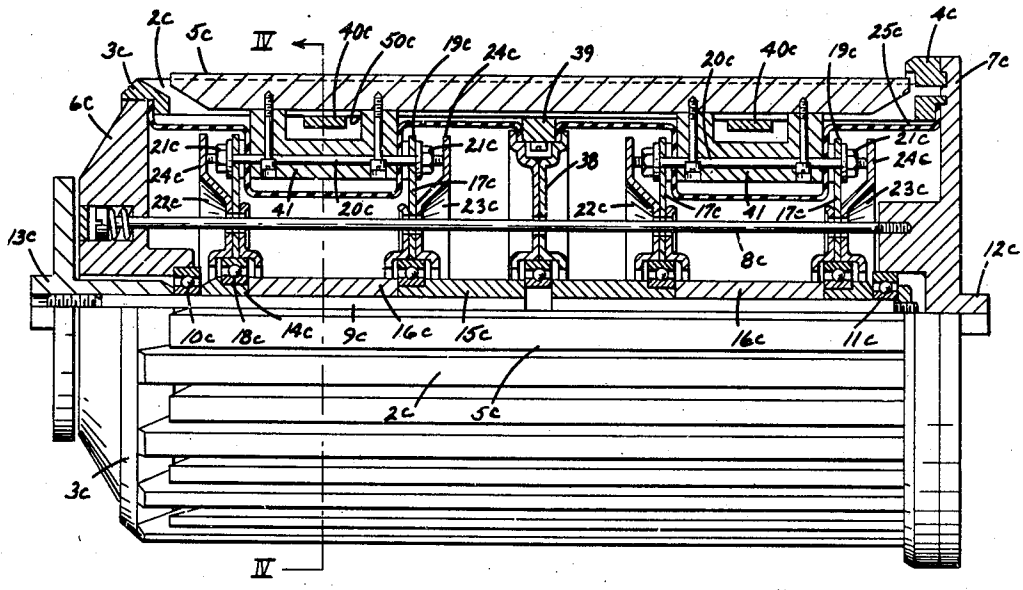


Fig. 5

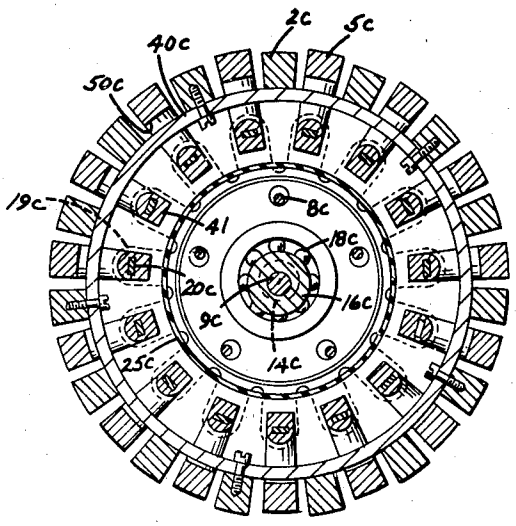


Fig. 6

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UNITED STATES PATENT OFFICE

2,461,576

REINFORCED THREAD-ADVANCING REEL

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Application July 21, 1945, Serial No. 606,384

9 Claims. (Cl. 28—71.6)

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This invention relates to thread-advancing reels which may be used for the production of a yarn store which is continuously advanced axially of the periphery of the reel, during which time it may be subjected to fluid treatment in the manner and for the purposes conventional in the art. This application is in part a continuation of copending application Serial No. 508,174, filed October 29, 1943, now Patent 2,403,031.

It is a particular object of this invention to provide an improved thread-advancing reel. It is a further object of this invention to devise a reel which is adaptable to either a cantilever or double-end supported structure. It is a further object of the invention to provide a reel of this type based upon a structural principle which, when embodied in a reel of considerable axial length, results in substantially uniform efficiency in thread-advancing action throughout the length of the reel, and, at the same time, is adapted to operation at high speeds of rotation of the reel.

A further object of the invention is to provide an improved construction including reinforcement for preventing bending of the bars under the pressure exerted by the strand or thread carried thereabout, especially when the strand is of large size and/or exerts a strong shrinkage tension or when the reel is of long length axially.

Further objects and advantages of the invention will be apparent from the drawings and description thereof hereinafter.

In the drawings illustrative of the invention—

Figure 1 is an elevation with the upper half in mid-section taken axially through one embodiment of the reel of this invention;

Figure 2 is an section taken on line II—II of Figure 1;

Figure 3 is an elevation with the upper half in mid-section taken axially through another embodiment of the invention;

Figure 4 is a section taken on line IV—IV of Figure 3;

Figure 5 is an elevation with the upper half in mid-section taken axially through another embodiment of the invention;

Figure 6 is a section taken on line VI—VI of Figure 5; and

Figure 7 is a perspective view of a modified actuatable bar unit.

In general, the present invention is concerned with the reinforcement of the longitudinal reel bars of thread-storing, thread-advancing reels comprising two sets of interdigitating bars. Merely making such bars of massive construction

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is not satisfactory, since this adds excessively to the weight of the reel and reduces the available space within the reel housing for the working parts. The added weight increases not only the initial cost of the reel but also the cost of operation and maintenance. The reduction in space within the reel increases the cost of assembly, cramps the working parts, and in many specific instances increases the strains exerted upon the working parts and thereby in turn requires them to be made of larger size. When the threads carried by the reel are subjected to corrosive liquids, it is desirable to use special materials for the bars, such as porcelain and Durez, which do not have high resistance to bending stresses as compared to ordinary or stainless steel, and consequently proper reinforcement becomes essential if the reel is to be made of considerable axial length, or is to handle heavy tows (of 50,000 to 250,000 denier or higher) or yarns having strong shrinkage tendencies, especially when the threads contain or are being treated with corrosive liquids.

In Figures 1 and 2, the invention is shown embodied in a thread-storing, thread-advancing reel comprising a concentric set of spaced, longitudinally extending bars 2 and an eccentric set of spaced, longitudinally extending bars 5 interdigitating with and alternating between the bars of the first set. The bars in the non-concentric set are supported by a non-rigid and resiliently flexible mounting which allows axial displacement of the bars either individually or as associated groups with respect to the remaining bars in the set. This flexible mounting is preferably of such a character that displacement of the bars from a given position of rest, which may advantageously be the mean axial position of these bars during operation of the reel, is opposed resiliently by the mounting, but, during actual operation of the reel, such resilient mounting acts not only to restore the bars to their "rest" or mean position when permitted to do so, but also tends to carry the bars beyond their "rest" or mean position by virtue of their kinetic energy stored therein at the time of passage through the "rest" or mean position and imparted by the motion resulting upon release of the resilient mounting from its position of displacement from "rest" or mean position.

The concentric set of longitudinally extending bar members 2 are constituted of a cylindrical-cage member having a flange 4 at one end and an annular member 3 at the other end thereof holding them together as a unit and being appropriately slitted longitudinally to leave spaces alter-

nating between the bars 2 within which the bars 5 of the other set may be actuated. The cylindrical cage may be clamped between end flanges or spiders 6 and 7 by suitable spaced cap screws 8. The flanges 6 and 7 support the bars at their ends against radial deflection by the thread carried thereon. The system comprising the cylindrical cage and flanges 6 and 7 constitutes a housing which may have any axial length desired, and which may house the actuating mechanism for the other set of interdigitating bars 5. This housing is supported for rotation with respect to shaft 9 by means of suitable bearings 10 and 11. Flange 7 may be provided with a projection 12 of non-circular cross-section which is adapted to fit in a correspondingly shaped socket 12' of a coupling 121 upon the shaft 12'' which may be driven by the gear 122 keyed thereto. Secured to the shaft 9 is a suitable non-circular projection 13 adapted to be received by a corresponding recess in a normally stationary but retractable supporting element 13'.

Two sleeves 14 and 15 are mounted upon the shaft 9 and are suitably spaced by the ring 16. The sleeves 14 and 15 have external cylindrical surfaces whose axes are askew and eccentric to the axis of shaft 9 but parallel to each other. Upon each of the sleeves, a resilient spider member 17 is mounted, preferably by means of ball bearings 18. These spiders 17 are of a resilient material, preferably of thin spring metal, and have individual radially extending members 19 between opposed pairs of which, the bars 5 are secured by suitable means, such as by two nuts 21 screwed upon the ends of the non-circular rod 20 embedded within and extending through inward-extending portions 20' of the bars 5 and a spacing member 20''. Skew plates 22 and 23 are also carried by the bearings 18 and have outer flanged portions 24 which bear against the ends of the rods 20.

Where it is desired to protect the main operating parts from any possibility of clogging and corrosion when the reel is used for subjecting the filamentary material to liquids, a flexible sealing membrance 25, such as of rubber or synthetic rubber, may be secured to the outer portion of the resilient supporting means for the non-concentric bars and to the ends of the concentric cylindrical cage as shown.

As shown, the annular member 3 projects beyond the flange 6 and overhangs the outer rim of a stationary member 6', which is integral with or affixed to the support 13'. The outer peripheral surface of the member 6' preferably slopes inwardly from its outer rim to a generally cylindrical portion, which serves to hold any accumulation of thread formed after breakage of the thread being handled by the reel or during lacing up of the reel or any machine comprising the reel. Occasionally, stray filaments also tend to gather on this member 6'. The collecting member 6' has a surface of sufficient axial extent to provide adequate storage space and ready access for the operator to remove the accumulated filaments at his convenience without danger of injury to his hands, and without the necessity either of stopping the reel or of giving it immediate attention when the above-mentioned emergencies arise.

The actuatable bars 5 are reinforced against deflection under radial pressure exerted by the thread by virtue of their portions 20' and the intermediate spacing sleeve 20'' being clamped by the nuts 21. Each such bar is thus reinforced individually by the longitudinally extending means comprising elements 20, 20', 20'' and 21. A ring 40 is secured to the bars 2 of the other set and reinforces them against pressure exerted by the thread carried thereabout. Sufficient clearance is provided between the ring 40 and the surrounding surfaces of the apertures 50 formed through each reinforced actuatable bar assembly so that there is no interference with actuation.

In operation of the embodiment of Figures 1 and 2, the skew plate flanges 24 cause substantial axial motion of the bars 5, such motion being imparted individually to each of the bars 5 by virtue of the individual resilient projecting members 19. By virtue of the eccentricity of the resilient supporting means and the bars 5, the axial to and fro motion of the bars imparted by the skew plates is combined with a radial component of motion which alternately causes first the protrusion of the bars 5 outside the periphery of bars 2 and then their recession within that periphery, thereby resulting in the advancing of the thread axially of the reel.

Figures 3 and 4 show a modification in which reference numerals with the suffix letter *a* are applied to those parts which have corresponding parts in Figures 1 and 2 designated by the corresponding numerals without the suffix. The parts correspond in function, but may not be identical in structure, as will be apparent from the description hereafter.

Instead of clamping the actuatable bars 5*a* in flexible spiders (17 of Figures 1 and 2) the bar 20*a* of non-circular cross-section has its ends of reduced cross-section projecting from the clamping nuts 21*a* slidably through bores of complementary cross-section is discs 17*a* which are rigid and rotatably mounted on eccentric bearings 14*a* and 15*a*. The axis of these bearings 14*a* and 15*a* are eccentric but not inclined with respect to the axis of shaft 9*a*. Skew plates 24*a* are mounted on separate bearings 18'*a*, the axes of which are both eccentric and inclined to the axis of the shaft 9*a*. Thus, during rotation of the reel, the eccentric motion of bars 5*a* is obtained from the eccentric mounting of rigid discs 17*a* and longitudinal reciprocating motion is imparted by the skew plates 24*a*.

Instead of having the actuatable bars reinforced individually, a plurality may be joined so that they reinforce each other. For example, Figure 7 shows an actuatable bar assembly comprising a pair of bars 5*b* having a common longitudinal reinforcement comprising the integral underslung, U-shaped or trough-shaped, inwardly extending portion 20*b* through which the apertures 50*b* are cut to accommodate the reinforcing rings of the other set of bars. If desired, three or more of the actuatable bars may be joined with a common reinforcement extending longitudinally of the reel.

While the lengths of the reels shown in Figures 1 to 4 are of the same order of size as their diameter, the reels may be made of any length, regardless of their diameter.

Figures 5 and 6 show a modification in which reference numerals with the suffix letter *c* are applied to those parts which have corresponding parts in Figures 1 and 2 designated by the corsponding numerals without the suffix. As shown in Figures 5 and 6, when reels whose length is many times the size of their diameter are desired, a larger number of flexible supporting members comprising the flexible spiders 17*c* may be provided along the reel to obtain adequate sup-

port for the bars 5c to prevent them from sagging from the tension loads imposed by the filamentary material wound thereon. Also additional support for the cylindrical cage having bars 2c may be provided in the form of one or more rigid spiders 38 rotatably mounted upon intermediate portions of the shaft to support a corresponding annular member 39 secured to the inner periphery of the bars 2c. In addition, spaced rings 40c may be provided to stiffen the set of bars 2c in the cylindrical cage member. The rings 39 and 40c reinforce the concentric bars 2c and generally U-shaped braces 41 reinforce the bars 5c. The apertures 50c in the braces 41 have sufficient clearance to allow passage of rings 40c without interference with the actuation of bars 5c. Whereas two braces 41 are shown in the embodiment of Figures 5 and 6, longer reels may involve a greater number of such braces to reinforce the actuatable bars 5c, with or without additional rings 39 or 40c to reinforce the concentric bars 2c.

The various parts of the reel may be made of any particular materials desired. The construction shown in the figures lends itself readily to making the cylindrical cage members 3 (3a, 3c), the bar members 5 (5a, 5c), and bar members 2, (2a, 2c) associated therewith of materials which offer the most satisfactory bearing surface for the filamentary material to be handled thereby from the standpoint of smoothness, durability, and/or resistance to corrosion under the influence of any liquids with which the filamentary material is to be treated while being advanced longitudinally of the reel, without making the remainder of the reel thereof. This is of tremendous importance from the viewpoint of initial and depreciation cost of such reels, since materials which best meet the requirements specified are generally considerably more expensive than related materials which would be fully adequate for all portions of the supporting structure of the reel other than those intended to contact the filamentary material. Thus, parts 2, 3 and 5 may be made of porcelain, Durez, Alsimag, etc., while such other parts as 6 and 7 may be made of Bakelite, stainless steel, etc. These latter parts need not be made of materials which are entirely free of tendencies to be pitted or otherwise superficially altered by the combined action of corrosive chemicals and rubbing action of the filaments handled.

It is to be understood that changes and variations may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. Reel mechanism for handling strands and the like comprising two sets of annularly arranged, longitudinally extending bars, the bars of one set alternating with those of the other and being rotatably mounted on an axis eccentric to that of the other set, means for simultaneously rotating the sets bodily as a unit, means for imparting motion to the bars of the eccentric set relative to the bars of the other set to effect advancing motion of the strand endwise of the reel, a plurality of spaced rings arranged within and secured to the bars of the second set for reinforcing them as a unit, each pair of the first set being individually reinforced by spaced longitudinal braces, each longitudinal brace having a portion intermediate to points of attachment to its respective bar spaced from the bar, and one of the

reinforcing rings for the bars of the other set being arranged to extend through the last mentioned space with sufficient clearance to avoid interference with relative movement between the sets of bars.

2. Reel mechanism for handling strands and the like comprising two sets of annularly arranged, longitudinally extending bars, the bars of one set alternating with those of the other, means for simultaneously rotating the sets bodily as a unit, means for imparting relative motion between the bars of the two sets to effect advancing motion of the strand endwise of the reel, means adjacent the ends of one set of the bars for holding them together as a unit and supporting them against radial deflection by the strand carried thereon, means intermediate of and spaced substantially from said holding means and the ends of said one set of bars for reinforcing said set against pressure exerted by the strand carried thereon, and means intermediate of and spaced substantially from the ends of the other set of bars for reinforcing them against pressure exerted by the strand carried thereon, the reinforcing means for each set of bars being spaced from the reinforcing means for the other set of bars sufficiently to avoid interference with relative movement between the sets of bars.

3. Reel mechanism for handling strands and the like comprising two sets of annularly arranged, longitudinally extending bars, the bars of one set alternating with those of the other, means for simultaneously rotating the sets bodily as a unit, means for imparting relative motion between the bars of the two sets to effect advancing motion of the strand endwise of the reel, means adjacent the ends of one set of the bars for holding them together as a unit and supporting them against radial deflection by the strand carried thereon, means comprising at least one ring intermediate of and spaced substantially from said holding means and the ends of said one set of bars for reinforcing them as a unit, and means spaced from said reinforcing means for reinforcing the bars of the other set against pressure exerted by the strand carried thereon.

4. Reel mechanism for handling strands and the like comprising two sets of annnularly arranged, longitudinally extending bars, the bars of one set alternating with those of the other, means for simultaneously rotating the sets bodily as a unit, means for imparting relative motion between the bars of the two sets to effect advancing motion of the strand endwise of the reel, means adjacent the ends of one set of the bars for holding them together as a unit and supporting them against radial deflection by the strand carried thereon, a plurality of spaced rings arranged within and secured to the bars of said one set for reinforcing them as a unit and a plurality of separate, independent means spaced from said reinforcing means for reinforcing the bars of the other set against the pressure exerted by the strand carried thereon.

5. Reel mechanism for handling strands and the like comprising two sets of annularly arranged, longitudinally extending bars, the bars of one set alternating with those of the other, means for simultaneously rotating the sets bodily as a unit, means for imparting relative motion between the bars of the two sets to effect advancing motion of the strand endwise of the reel, means adjacent the ends of one set of the bars for holding them together as a unit and supporting them against radial deflection by the strand

carried thereon, means intermediate of and spaced substantially from said holding means and the ends of said one set of bars for reinforcing them as a unit, and a plurality of separate, independent means spaced from said reinforcing means for reinforcing the bars of the other set against pressure exerted by the strand carried thereon, said latter reinforcing means extending longitudinally of the bars reinforced thereby.

6. Reel mechanism for handling strands and the like comprising two sets of annularly arranged, longitudinally extending bars, the bars of one set alternating with those of the other, means for simultaneously rotating the sets bodily as a unit, means for imparting relative motion between the bars of the two sets to effect advancing motion of the strand endwise of the reel, means adjacent the ends of one set of the bars for holding them together as a unit and supporting them against radial deflection by the strand carried thereon, means comprising at least one ring arranged within and secured to the bars of said one set at a position intermediate of and spaced substantially from said holding means and the ends of said set of bars for reinforcing them as a unit, and a plurality of separate, independent means spaced from said reinforcing means and extending longitudinally within and secured to the bars of the other set for reinforcing them against the pressure exerted by the strand carried thereon.

7. Reel mechanism for handling strands and the like comprising two sets of annularly arranged, longitudinally extending bars, the bars of one set alternating with those of the other, means for simultaneously rotating the sets bodily as a unit, means for imparting relative motion between the bars of the two sets to effect advancing motion of the strand endwise of the reel, a plurality of spaced rings arranged within, and secured to, the bars of one set for reinforcing them as a unit, and each bar of the other set being individually reinforced by spaced longitudinal braces, said braces extending around a ring and being spaced from the ring sufficiently to avoid interference with relative movement between the sets of bars.

8. Reel mechanism for handling strands and the like comprising two sets of annularly arranged, longitudinally extending bars, the bars of one set alternating with those of the other, means for simultaneously rotating the sets bodily as a unit, means for imparting relative motion between the bars of the two sets to effect advancing motion of the strand endwise of the reel, a plurality of spaced rings arranged within and secured to the bars of one set for reinforcing them as a unit and each bar of the other set being individually reinforced by spaced longitudinal braces, each longitudinal brace having a portion intermediate two points of attachment to its respective bar separated from the bar to provide a space therebetween, and one of the reinforcing rings for the bars of the other set being arranged to extend through the last-mentioned space with sufficient clearance to avoid interference with relative movement between the sets of bars.

9. Reel mechanism for handling strands and the like comprising two sets of annularly arranged, longitudinally extending bars, the bars of one set alternating with those of the other and being rotatably mounted on an axis eccentric to that of the other set, means for simultaneously rotating the sets bodily as a unit, means for imparting relative motion between the bars of the two sets to effect advancing motion of the strand endwise of the reel, means adjacent the ends of one set of the bars for holding them together as a unit and supporting them against radial deflection by the strand carried thereon, means comprising at least one ring intermediate of and spaced substantially from said holding means and the ends of said one set of bars for reinforcing them as a unit, and a plurality of separate, independent means spaced from said reinforcing means for reinforcing the bars of the other set against pressure exerted by the strand carried thereon.

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