Aug. 13, 1940. W. F. KNEBUSCH 2,210,914

WINDING REEL

Original Filed Jan. 16, 1933 2 Sheets-Sheet 1

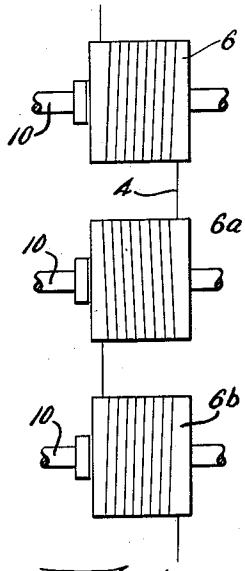


Fig. 4.

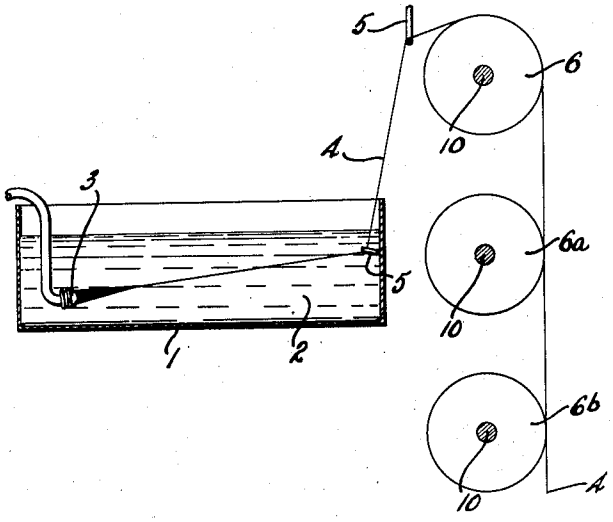


Fig. 3.

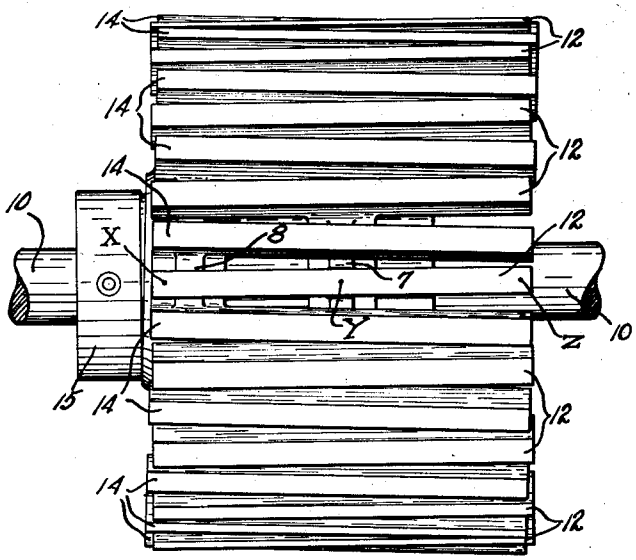


Fig. 1

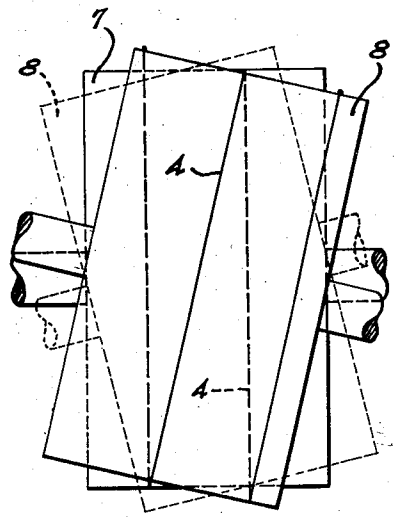


Fig. 2.

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Original Filed Jan. 16, 1933 2 Sheets-Sheet 2

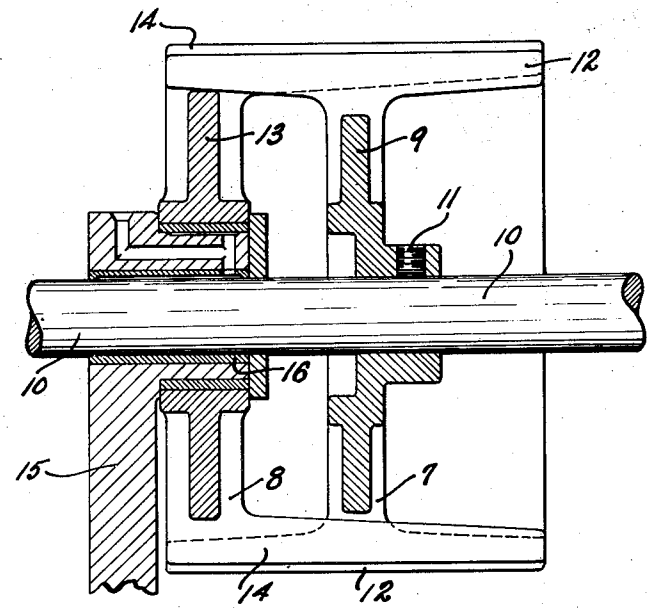


Fig. 7.

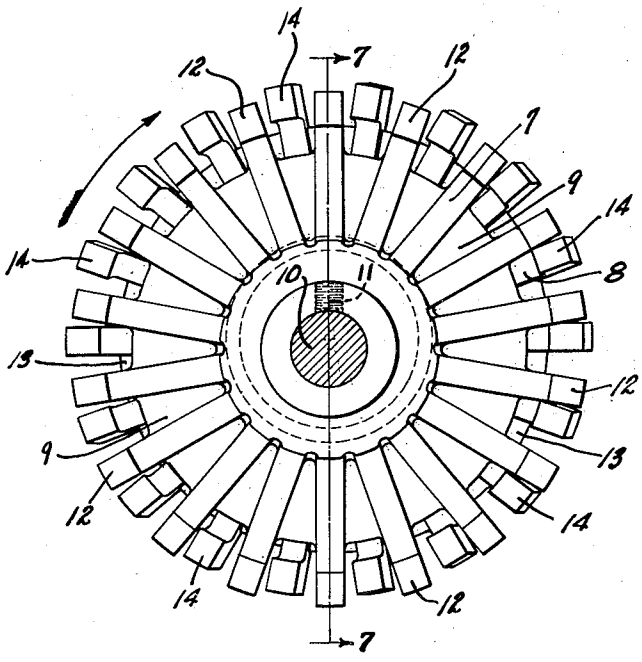


Fig. 5.

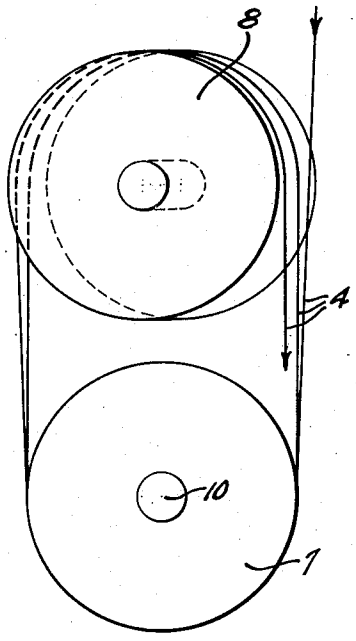


Fig. 6.

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WINDING REEL

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Application January 16, 1933, Serial No. 652,089
Renewed June 15, 1939

30 Claims. (Cl. 242—53)

This invention relates to a winding reel for the manufacture of thread or the like, as, for example, artificial silk thread. The invention has to do with a reel of this type by and upon which the thread or the like is wound in a manner permitting it to be subjected in a relatively long length to any processing operations to which it may be desired to expose it. The winding reel of the present invention may be regarded as an improvement upon the type of reel shown and described in a prior application for Continuous spinning machine, Serial No. 651,404, filed January 12, 1933, to which reference may be had if desired. It may also be treated as an improvement upon the several types of reels respectively shown and described in United States Patents Nos. 34,494, 1,052,125, and 1,983,221.

An object of the present invention is to provide a simple, improved reel of the character described consisting of two like members, both of rigid form, closely associated in the sense that they are more or less superimposed upon each other or occupy substantially the same space, but having their axes displaced with relation to each other, for the purpose of advancing, turn by turn, thread or the like led to it, all with dependable uniformity and regularity of action, without harmful effect upon the thread or the like, and in a manner to avoid errors in operation as the result of wear and tear in the apparatus. A further object of the invention is to provide a reel of this kind which can be made in any desired length within reasonable limits; which can advance one thread or thread-like article or, if desired, a plurality of threads or thread-like articles, the several threads or thread-like articles being kept separate from each other; and in which the mechanism need embody only relatively simple bearings, and driving means, and other parts.

Further objects of the invention are in part obvious and will in part appear more in detail hereinafter.

In the drawings, Fig. 1 represents a plan of one form of reel embodying the invention; Fig. 2 is a corresponding explanatory diagram; Fig. 3 is a sectional elevation, more or less diagrammatic, illustrating three reels coordinated into a machine and cooperatively related to a spinning device; Fig. 4 is an elevation of the reels, as seen from the left in Fig. 3; Fig. 5 is an end elevation of the reel from the right in Fig. 1; Fig. 6 is a corresponding explanatory diagram; and Fig. 7 is a sectional elevation of the reel on substantially the line 7—7, Fig. 5.

While the invention may be employed under any conditions making it desirable to provide a reel capable of advancing thread or the like or of storing a considerable length of thread or the like, so as to serve as a store device therefor, the invention is illustrated in the drawings and will be described hereinafter as employed as an element of a continuous spinning machine for the production of artificial silk thread, particularly a machine of the kind in which a separate step of the process is performed upon the thread on each of a plurality of reels to which the thread is led in succession, all as generally described in the prior application above referred to. It is obvious, however, that the reel is not limited in its usefulness to continuous spinning machines for the manufacture of artificial silk thread, but may to advantage be employed, either alone or in association with other reels, in a wide variety of machines of wholly different types.

While the invention may be used with any of the well known processes for producing artificial silk thread, such as the cuprammonium, cellulose acetate, cellulose nitrate and the viscose processes, it will for convenience be described only in connection with the practice of the viscose process. Referring first to Figs. 3 and 4, trough 1 is illustrated as containing a coagulating bath 2 into which the viscose is extruded through the usual spinneret 3, the multiple filament thread 4 being led through suitable guides 5 to the first of a series of rotating reels 6, 6a, 6b, each of which is designed to receive the thread, form it into a series of helical turns spaced at relatively short intervals, and advance it bodily along the reel toward its opposite end to a take-off point from which the thread is led to the next reel. It is of course understood that on each of said reels a different step of the process of manufacture is performed upon the thread until the latter finally emerges in completed or partially completed form ready to be gathered upon a collecting device. The present invention has to do with the specific form of the reels employed.

In the arrangement shown in Figs. 1, 5 and 7, the reel comprises two reel members 7, 8, each of which constitutes a self-contained rigid structure having its periphery, which is of substantially circular cross section, defined by a series of longitudinally extending parallel bars or bar-like members. Both the reel diameter and length may be varied within reasonable limits, as will more fully appear hereafter. The two reel members, 7, 8, are very closely associated in the sense that they are more or less superposed or so arranged as to occupy and rotate in substantially

the same space. Each reel member comprises not only the longitudinal bars aforesaid, but a supporting structure which may be of spider, wheel or disc form with a central hub. The supporting structures of the two reel members are sufficiently spaced longitudinally from each other so that said members can occupy substantially the same space, as stated.

In the arrangement shown, the reel member 7 is provided with a supporting structure consisting of a spider or disc 9 secured to a shaft 10, as by the set screw 11, said spider or disc 9 carrying at its periphery a series of longitudinally extending bars 12 which extend longitudinally in both directions from the spider or disc 9, the latter being conveniently, but not necessarily, disposed intermediate the ends of member 7. This reel member is illustrated as a true cylinder and exactly coaxial with the shaft 10. The outer edges or surfaces of its bars are actually elements of a cylinder coaxial with said shaft and it rotates and is driven by the shaft.

The second reel member 8 is also provided with a spider or disc 13 carrying a series of like longitudinally disposed bars 14 on its periphery, but in this case the spider or disc is shown as disposed at one end of the reel member and the bars project longitudinally in one direction only from the spider or disc, the arrangement being such that the bars of the two reels lie side by side and are coextensive longitudinally. Reel member 8 is also shown as a true cylinder in the sense that the outer edges or surfaces of its bars form elements of a cylindrical surface, but it is not coaxial with the shaft 10. The bearings for its spider or disc 13 are carried by a portion of the machine frame 15 and are so arranged that the axes of the two reel members are displaced from each other in two respects, as will hereinafter appear.

First, the axes of the two reel members are displaced laterally from each other by a uniform amount along the full length of the reel and, second, the axis of one reel member is canted to an inclined position with reference to the axis of the other reel member. The axes of the reel members are thus in skew relation to each other. In other words, looking at the diagrams, Figs. 6 and 2, which greatly exaggerate conditions, reel member 7 is assumed to be coaxial with the shaft 10 and the reel member 8 has been displaced laterally with relation to member 7 until the reel members are entirely separated from each other, as shown in Fig. 6, and reel member 8 has been canted to an inclined position with relation to member 7, as shown in Fig. 2. As a matter of fact, in a reel of say ten inches in diameter, the parallel displacement may amount to say one-eighth of an inch and the cant shown in Fig. 2 may amount to a matter of only a very degrees, say seven-sixteenths of an inch in a total reel length of forty-eight inches.

Thus in the preferred embodiment of the invention the axes of the reel members may be defined in geometrical terms as represented by skew lines.

The number of bars in the two reel members may vary, but, other things being equal, the total number of bars should be as large as possible consistent with proper construction, operation, etc. As shown in Fig. 5, the bars of the two reel members preferably alternate with each other. Also, one of the reel members; to wit, reel member 7 in the form shown, serves as a driving member and the other, reel member 8 in the form shown, serves as a driven member. Member 8, as shown in Fig. 7, is journalled upon a bearing of tubular form carried by the fixed frame 15, which bearing is so disposed as to be displaced from the axis of shaft 10 in the two particulars above mentioned.

With this arrangement, when shaft 10 is driven, the two reel members rotate together or as a unit, one driving the other by bar to bar engagement. The lateral displacement of the axes of the two reel members causes the bars of the driving reel member 7 to project outward beyond those of the other member 8 during a part of a complete rotation, say through the lower 180° in Fig. 5, and the bars of the driven member to project outward beyond those of the driving member through the other half of the complete rotation, the upper 180° in Fig. 5. This back and forth relative radial motion of the two sets of bars makes possible a transfer of the turns of thread from one reel member to the other. Furthermore, the canted disposition of the driven reel member 8 produces bodily advance of portions of the thread which are carried by it during that portion of the complete rotation when its bars are supporting the thread, to wit, during the upper half of the complete rotation, as shown in Fig. 5.

The total effect is to cause a thread led to one end of the reel to be wound upon the reel in substantially helical form, turn after turn, with the succession of turns bodily advanced toward the far end of the reel. In this manner a thread led to the reel can be stored upon it in the form of a large number of very closely spaced turns, even as many as fifty to two hundred turns, and if the reel is of relatively large diameter, say ten inches, it is possible to store upon it a very long length of thread, even as much as five hundred feet. Thus if a bath of treating liquid is showered upon or otherwise applied to the reel, a given portion of the thread will be subjected to said bath for a material length of time, depending upon speed of rotation, number of turns and lead of the thread helices, etc.

Obviously, the amount of lead or the spacing of turns of thread from each other depends upon the amount of cant, in other words, the second factor in the displaced relation between the two reel members before referred to and by varying the amount of such cant any desired lead may be obtained within limits.

The skew relationship of the axes of the reel members characterizing the preferred ambodiment of the invention may be arrived at in various ways. If it is assumed that the final relative positions of the reel members are reached by first laterally displacing them and then turning them about an imaginary axis radial to the shaft 10, it will readily be perceived that such axis may be located at any point along the length of the reel as a whole, or, in other words, at any one of a number of points, three of which have been marked X, Y and Z in Fig. 1. In the reel shown, the cant has been accomplished by twisting reel member 8 about an imaginary radial axis at the point Y and the cant is therefore balanced or equal but in opposite directions on opposite sides of the axis Y longitudinally of the shaft. If, however, the inclination is accomplished by canting reel member 8 around axis X or axis Z, all of the angular relationship will be on the same side of such axis. Twisting about axis Y produces a reel which is more or less hour-glass in shape, while twisting about axis X or axis Z produces a reel which is more or less conical in shape.

Of course it will also be understood that, for a given direction of rotation of the reel members, the turns of thread may be caused to move in either direction along the reel in accordance with the direction of cant of the displaced reel member with reference to the other reel member. In other words, referring to Fig. 2, when the canted reel member is twisted or turned clockwise in Fig. 2, as shown in full lines, the turns of thread will be bodily advanced toward the right, but if the canted reel member is turned counterclockwise to the position indicated in dotted lines, Fig. 2, the thread turns will move to the left. By proper organization of the reel members on successive reel units the thread may be led back and forth in the manner shown in Fig. 4, travelling to the right on reel 6, to the left on reel 6*a*, to the right on reel 6*b*, etc.

In the arrangement shown in Figs. 1 to 7 inclusive, each reel is designed to support a single thread in the proper number of turns thereof but if desired the reel may be made long enough to support a plurality of threads simultaneously led to it.

Of course, since the reel is drenched by the bath of liquor showered upon or otherwise applied to it for treatment of the thread, it is obvious that the reel and all of its parts, including supports, etc., should be made of materials which are not affected by and do not affect the bath liquors, as will be readily understood. In general, chemical-resistant materials will be employed throughout with the possible exception of reels used only for washing, drying or like operations not involving the use of corrosive reagents. Obviously, acid-resistant materials, whether metallic or non-metallic, will be used in reels coming into contact with acids, as, for example, in reels used in conjunction with the coagulating bath in the viscose process of manufacturing artificial silk thread.

While in the foregoing description frequent reference has been made, for purposes of illustration, to the production of artificial silk thread, it is to be understood that the winding reel of the present invention has many and varied uses not in any way connected with artificial silk thread or, for that matter, with the various steps involved in the actual manufacture of thread of any particular kind. It is obviously capable of use in the manipulation and/or processing of thread quite apart from the method of its manufacture, regardless of whether the thread so manipulated or processed is of natural or synthetic origin. As a matter of fact, the winding reel of the present invention is suitable for use not only in conjunction with the manufacture, manipulation and processing of thread, but also in conjunction with the manufacture, manipulation and processing of other articles that, speaking in the broadest sense, are of generally thread-like character. These articles it is intended to include, together with thread, within the scope of such generic expressions as "thread or the like" and "thread-like article" as used in the specification and claims hereof.

It is intended that the patent shall cover, by suitable expression in the appended claims, whatever features of patentable novelty reside in the invention.

What I claim is:

1. Reel mechanism comprising two longitudinally extending reel members the peripheries of which intersect each of which is formed as a rigid unit of substantially circular cross section, one of said reel members being mounted to rotate about an axis inclined to the axis of rotation of the other reel member.

2. Reel mechanism comprising two longitudinally extending reel members the peripheries of which intersect each of which is formed as a rigid unit of substantially circular cross section, one of said reel members being mounted to rotate about an axis disposed within the periphery of the other reel member but inclined to the axis of rotation of such other reel member.

3. Apparatus of the character defined in claim 2 in which the axes of rotation of said reel members are disposed in parallel planes but in inclined relation to each other.

4. A winding reel comprising two intermeshing sets of longitudinally extending bar members each of which sets is formed as a rigid unit of substantially circular cross section, the axes of said sets being displaced with respect to each other but disposed in each case within the periphery of the other set.

5. A winding reel comprising two intermeshing generally cylindrical sets of longitudinally extending bar members each of which sets is formed as a rigid unit of substantially circular cross section, the axes of said sets being inclined with respect to each other.

6. A winding reel comprising two intermeshing sets of longitudinally extending bar members each of which sets is formed as a rigid unit of substantially circular cross section, the axes of said sets being disposed in parallel planes but in inclined relation to each other.

7. A winding reel comprising two intermeshing sets of longitudinally extending bar members each of which sets is formed as a rigid unit of substantially circular cross section, the axes of said sets being disposed in different planes but in each case within the periphery of the other set.

8. A unitary winding reel comprising a plurality of interleaved sets of bar members mounted in such manner that the axes of rotation of said sets are displaced with respect to each other but disposed in each case within the periphery of the other set, corresponding ends of the bar members of each of said sets lying at all times in a plane perpendicular to the axis of rotation of such set.

9. A unitary winding reel comprising a plurality of interleaved sets of bar members mounted in such manner that the axes of rotation of said sets are inclined with respect to each other, corresponding ends of the bar members of each of said sets lying at all times in a plane perpendicular to the axis of rotation of such set.

10. A unitary winding reel comprising a plurality of interleaved sets of bar members mounted in such manner that the axes of rotation of said sets are disposed in parallel planes but in inclined relation to each other, corresponding ends of the bar members of each of said sets lying at all times in a plane perpendicular to the axis of rotation of such set.

11. A unitary winding reel comprising a plurality of interleaved sets of bar members mounted in such manner that the axes of rotation of said sets are disposed in different planes but in each case within the periphery of the other set, corresponding ends of the bar members of each of said sets lying at all times in a plane perpendicular to the axis of rotation of such set.

12. A unitary winding reel comprising two rigid cage members the axes of rotation of which are disposed in parallel planes but in inclined relation to each other, said cage members being interleaved.

13. A unitary winding reel comprising two rigid cage members the axes of rotation of which are inclined with respect to each other, said cage members being interleaved.

14. A unitary winding reel comprising two rigid cage members the axes of rotation of which are disposed in different planes but in each case within the periphery of the other cage member, said cage members being interleaved.

15. A unitary winding reel comprising two rigid cage members the axes of rotation of which are displaced with respect to each other but disposed in each case within the periphery of the other cage member, said cage members being interleaved.

16. A winding reel comprising a first set of laterally spaced bar members extending lengthwise of the reel; a second set of laterally spaced bar members extending lengthwise of the reel, the bar members of said second set alternating with the bar members of said first set; and means for supporting each of said sets, taken as a whole, for rotation about an axis inclined from parallelism with the axis of rotation of the other set, taken as a whole.

17. A reel of the character defined in claim 16 in which one of said sets is carried by said supporting means in such manner that the bar members thereof are incapable of translatory movement.

18. A reel of the character defined in claim 16 in which each of said sets is carried by said supporting means in such manner that the bar members thereof are incapable of translatory movement.

19. A winding reel comprising a first set of laterally spaced bar members extending lengthwise of the reel; a second set of laterally spaced bar members extending lengthwise of the reel, the bar members of said second set alternating with the bar members of said first set; and means for supporting each of said sets, taken as a whole, for rotation about an axis offset from and inclined to the axis of rotation of the other set, taken as a whole.

20. A reel of the character defined in claim 19 in which one of said sets is carried by said supporting means in such manner that the bar members thereof are incapable of translatory movement.

21. A reel of the character defined in claim 19 in which each of said sets is carried by said supporting means in such manner that the bar members thereof are incapable of translatory movement.

22. A winding reel comprising two intermeshing sets of longitudinally extending bar members each of which sets is formed as a rigid unit of substantially circular cross section, the axes of said sets being displaced with respect to each other, and, associated therewith, means for rotating both of said sets in the same angular direction.

23. A winding reel comprising a frame member; a shaft mounted rotatably with respect to said frame member; a first wholly rigid set of bar members which is substantially circular in cross section mounted concentrically on said shaft; and a second wholly rigid set of bar members which is substantially circular in cross section carried by said frame member for rotation about an axis inclined to the axis of rotation of said shaft, the bar members of said second set alternating with the bar members of said first set.

24. Apparatus of the character defined in claim 23 in which said second set of bar members is mounted for rotation about an axis inclined to but disposed in a plane paralleling the axis of said shaft.

25. A winding reel comprising a projecting frame member which is supported at one end only thereof; a rotatable shaft passing through and extending from the projecting end of said frame member; a rigid set of spaced, longitudinally extending bar members concentrically mounted about said shaft which set is of substantially circular cross section; rigid supporting means mounted on the projecting portion of said frame member for rotation about an axis inclined to the axis of said shaft; and, interdigitating with the bar members of said first set, a second rigid set of bar members which is substantially circular in cross section, which is coaxial with the axis of rotation of said supporting means, and which is rigidly connected at one end only thereof to said supporting means, the other end of said set being unsupported.

26. Apparatus of the character defined in claim 25 in which the supporting means for said second set of bar members is mounted for rotation about an axis inclined to but disposed in a plane paralleling the axis of said shaft.

27. Apparatus of the character defined in claim 25 in which said first set of bar members is mounted for rotation with said shaft and the supporting means for said second set of bar members is freely rotatably mounted on said frame member.

28. A winding reel comprising a projecting frame member which is supported at one end only thereof; a rotatable shaft passing through and extending from the projecting end of said frame member; a rigid set of spaced, longitudinally extending bar members concentrically mounted about said shaft which set is of substantially circular cross section; rigid means mounted on said shaft rigidly supporting said bar members, said supporting means being of an external diameter smaller than the diameter defined by said bar members; supporting means mounted on the projecting portion of said frame mmber for rotation about an axis inclined to that of said shaft; and, extending between the bar members of said first set around the supporting means for said first set, a second set of bar members which is substantially circular in cross section, which is coaxial with the axis of rotation of said supporting means, and which is rigidly connected at one end only thereof to said last-mentioned supporting means.

29. Apparatus of the character defined in claim 28 in which the supporting means for said second set of bar members is mounted for rotation about an axis inclined to but disposed in a plane paralleling the axis of said shaft.

30. Apparatus of the character defined in claim 28 in which said first set of bar members is mounted for rotation with said shaft and the supporting means for said second set of bar members is freely rotatably mounted on said frame member.

WALTER F. KNEBUSCH.

CERTIFICATE OF CORRECTION.

Patent No. 2,210,914. August 13, 1940.

WALTER F. KNEBUSCH.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, line 54, after the word "has" insert --then--; and second column, line 53, for "ambodi-" read -- embodi- --; page 3, first column, line 21, after "thereof" insert a comma; line 59, for "conjunction" read --connection--; and second column, line 24, claim 5, strike out "generally cylindrical"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 5th day of November, A. D. 1940.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents.