Aug. 13, 1940. W. F. KNEBUSCH 2,210,913

WINDING REEL

Original Filed Jan. 16, 1933

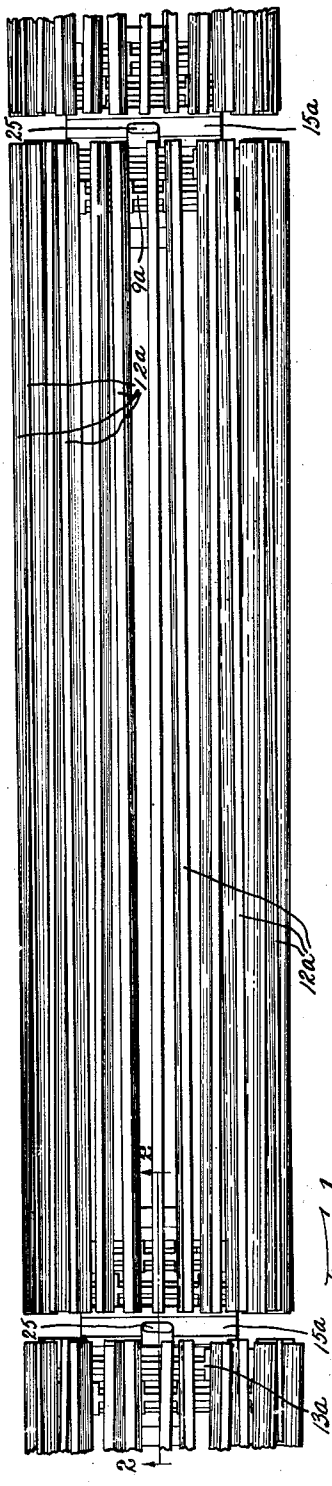


Fig. 1.

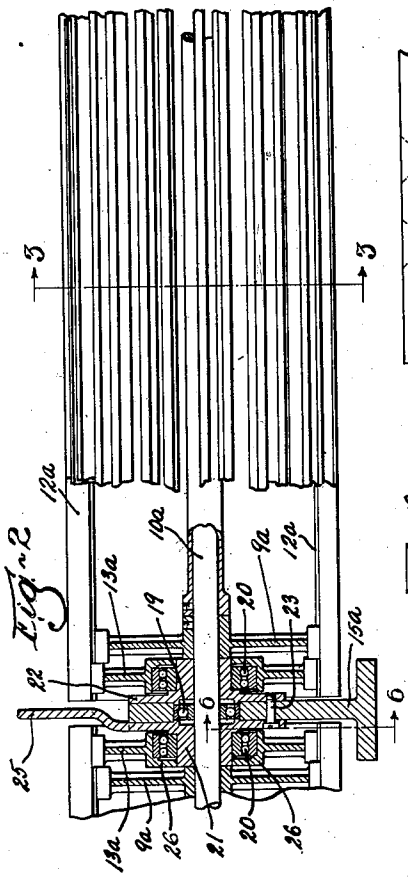


Fig. 2

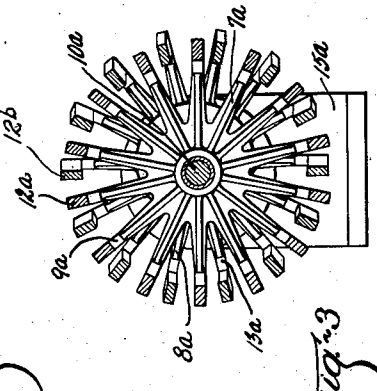


Fig. 3

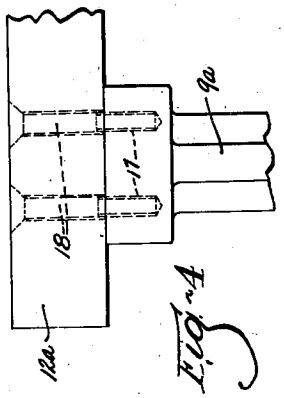


Fig. 4

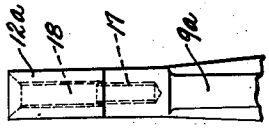


Fig. 5

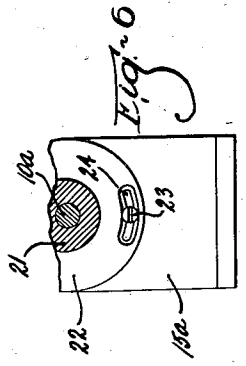


Fig. 6

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WINDING REEL

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17 Claims. (Cl. 242—53)

This invention relates to the manufacture, manipulation and processing of thread or the like, as, for example, artificial silk thread, and, more particularly, to apparatus therefor. The invention has to do with a winding reel by which the thread or the like is supported and upon which it is wound in a manner to permit it to be continuously subjected in the form of a relatively long length to one or more of the various 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 British Patent No. 413,413. The present application is a division of prior application Serial No. 652,089, filed January 16, 1933, for "Winding reel."

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 offset laterally and canted with relation to each other, for the purpose of receiving and advancing, turn by turn, the 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 support and transmit 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 in the latter case kept separate from each other; and in which the mechanism need embody only relatively simple bearings and driving means. Still a further object of the invention is to provide a reel of this kind in which the two reel members are adjustable with relation to each other so as to vary the amount of cant relation within reasonable limits for the purpose, among other things, of insuring uniform action by each reel of a series of reels in the same machine.

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

In the drawing, in which like reference characters refer to like parts, Figure 1 represents a plan of one form of reel embodying the invention; Figure 2 is an elevation thereof, parts being shown in section on the line 2—2, Figure 1; Figure 3 is a sectional elevation on the line 3—3, Figure 2; Figure 4 is a detail elevation of one end of one of the reel bars; Figure 5 is an end view from the left in Figure 4; and Figure 6 is a detail sectional elevation on the line 6—6, Figure 2.

While the invention may be employed under any conditions making it desirable to provide a reel capable of receiving and transmitting a thread or the like or of storing upon itself a material length of thread or the like so as to serve as a store device therefor, the invention is illustrated in the drawing and will be described herein 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 British Patent No. 413,413. 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 applied, either alone or in association with other reels, to spinning machines of other types. Broadly speaking, the reel may be used wherever it is desired to process a thread or thread-like article, whether of natural or synthetic origin.

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 viscose processes, it will for convenience be described herein only in connection with the practice of the viscose process as carried out on a continuous spinning machine of the kind disclosed in British Patent No. 413,413. In this process, viscose is spun through the usual spinneret into a coagulating bath contained in a trough, from which the thread is led through suitable guides to the first of a series of rotating reels, each of which is designed to receive the thread, form it into a series of helical turns laid side by side and spaced at relatively short intervals, and advance it bodily along the reel 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 tread 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 a specific form of reel which may be employed in such apparatus.

As shown in Figures 1, 2 and 3, the reel of the

present invention comprises two members each of which constitutes a self-contained rigid structure of more or less squirrel cage form. Each is truly cylindrical and has its cylindrical boundary defined by a series of rigidly disposed longitudinally extending parallel bars or bar-like members. The two reel members are 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 or plurality of supporting structures which may be of spider, wheel or disc form with a central hub. The supporting structures are sufficiently spaced longitudinally of each other so that the reel members can occupy substantially the same space.

In the arrangement shown, the reel member 7a is provided with a plurality of supporting structures, one at each end of the reel member, each of which consists of a spider or disc 9a secured, as by set screws, to a shaft 10a in the manner illustrated in Figures 2 and 3. The spiders or discs 9a support at their peripheries a first series of rigidly disposed bars 12a, which extend longitudinally between the spiders or discs 9a, the latter being disposed, as shown in Figure 2, adjacent to the ends of reel member 7a. The latter is a true cylinder and is coaxial with the shaft 10a. The outer surfaces of bars or bar members 12a are actually elements of a cylinder rotated with and driven by the shaft 10a.

The reel member 8a is provided with a plurality of spiders or discs 13a serving to support a second series of rigidly disposed bars or bar members 12b which extend longitudinally between spiders or discs 13a, disposed at the ends of reel members 8a just outside the spiders or discs 9a of reel member 7a. The arrangement is such that the bars or bar members 12b of reel member 8a lie side by side in alternation and are longitudinally coextensive with the bars or bar members 12a of reel member 7a. Reel member 8a is a true cylinder in the sense that the outer surfaces of its bars or bar members form elements of a cylindrical surface; but, unlike reel member 7a, it is not coaxial with shaft 10a. As shown in Figure 2, spiders or discs 13a are suitably mounted on bearings.

The bearings of the reel members 7a and 8a are so arranged that the axes of the reel members are displaced from each other in two respects. First, the axes of the reel members are offset laterally from each other by a uniform amount along the full length of the reel and, second, the axis of one reel member, in the present case the reel member 8a, is inclined from parallelism with the axis of the other reel member, in the present case the reel member 7a. To assist in understanding the relation between the reel members, it may be assumed that reel member 8a has first been offset with relation to reel member 7a and has then been canted in a horizontal plane. In a reel of, say, ten inches diameter, the offsetting may amount to, say, one-eighth of an inch and the cant may amount to a matter of only a very few degrees, say, seven-sixteenths of an inch in a total reel length of forty-eight inches.

As shown in Figures 4 and 5, the arms of spiders or discs 9a are socketed at their outer ends, as at 17, to receive screws 18 for securing thereto the bars or bar members 12a and in like manner the bars or bar members 12b of reel member 8a may be fixed to the spiders or discs 13a. Shaft 10a, to which is secured reel member 7a, is mounted to turn in bearings 19 in a fixed frame 15a. The shaft 10a may, if desired, extend through frame 15a, and carry a reel on each side thereof; so that by increasing the length of the shaft 10a and spacing supports 15a suitable at intervals along its length, a single shaft may be used to operate and drive a number of reels disposed end to end in alined relation. The frame 15a preferably carries the bearings for the reel member 8a, the spiders or discs 13a of which are journalled in bearings 20 on a cylindrical boss 21 of a disc-like plate 22 attached to the frame 15a. As shown in Figure 2, the bosses 21 are formed with their external cylindrical surfaces eccentric to the axis of shaft 10a, the amount of offset so provided being, of course, the same at both ends of the reel.

The canting of reel member 8a is accomplished by inclining the axes of the bearing portions from parallelism with each other.

Adjustment of the askew relation thus characterizing the reel of Figs. 1, 2 and 3 is readily accomplished by rotating one of the plates 22 at one end of the reel around the axis of shaft 10a with reference to the plate 22 at the other end of the reel which has the effect of carrying the bearing axis at one end of the reel circumferentially around the axis of shaft 10a to such amount as is necessary to produce the required degree of cant. The two plates 22 are secured to the frame 15a by bolts 23, which pass through circumferentially elongated slots 24 in one of the plates 22, and then through plain round holes in supports 15a into threaded opening in the next plate 22. The plate 22 having elongated slots 24 may, as shown, be provided with a handle 25, accessible beyond the reel periphery. By loosening the bolts 23, of which any number circumferentially distributed may be used, said plate 22 may be turned until the desired amount of cant relation is secured and the parts may then be tightened.

Figure 2 also illustrates how the heads 13a for the canted reel member are provided with hub portions 26 which, with the plates 22 and their boss members 21, form a housing enclosing the bearings 20. By packing the rotating joints, it is possible to shield the bearings from the access of bath liquor or the escape of lubricant. It will be understood that the bearings 20 shown are of self-alining form and inherently capable of providing, without strain on the bearings themselves, sufficient accommodation to take care of the small degree of cant required in this construction. As a consequence, all surfaces may be machined square and all openings drilled at right angles, the only unusual condition to be provided for being the offsetting of the external cylindrical surfaces of the bosses 21.

With this arrangement, when shaft 10a is driven, the two reel members rotate as a unit, one driving the other by bar to bar engagement. The offsetting of reel member 8a causes the bars or bar members of the reel member 8a to project outward beyond those of reel member 7a during a part of a complete rotation, and the bars or bar members of reel member 7a to project outward beyond those of reel member 8a through the other half of the complete rotation. Advantage is taken of this relative oscillatory motion of the two sets of bars to effect transfer of the turns of thread from one reel member to the other. The canted relation of reel member 8a produces bod-

ily advance of portions of the thread which are carried by it during that portion of the complete rotation when its bars or bar members are supporting the thread. It will be understood that the turns of thread will move in either direction along the reel in accordance with the direction of cant of reel member 8a with reference to the other reel member 7a; also, that as the degree of cant is modified, the pitch of the thread turns is changed.

The total effect is thus 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, as many as several hundred. If the reel is of moderately large diameter of about, say, ten inches, it is therefore possible to store upon it a very long length of thread, even as much as five hundred feet; so that if a bath of treating liquid is showered upon 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.

Of course, since the reel is drenched by the bath of liquor showered upon it for treatment of the thread, it is obvious that the reel and all of its parts, incldng supports, should be made of materials which are not affected by and do not affect the bath liquors. Steel, iron, Monel metal, and other metals are usually suitable for the bearings, supports, etc. The reel bars may be made of non-corroding materials, as will be readily understood. Obviously, where a number of reels are employed for different process steps in a single machine, the materials of which the respective reels are made may have to differ from reel to reel, depending on the nature of the processing treatments to which the thread is subjected.

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 is claimed is:

1. Reel mechanism comprising two rigid, interfitted sets of bar members each of which sets is substantially circular in cross section mounted in adjustable inclined relation to each other, the individual bar members of each of said sets being immovable with respect to the other bar members of such set.

2. Reel mechanism as described in claim 1 including a frame member, a shaft journalled in said frame member upon which one of said sets of bar members is mounted, and, associated with said frame member, a support for the other set of bar members.

3. Reel mechanism as described in claim 1 including a frame member, a shaft journalled in said frame member upon which one of said sets of bar members is mounted, and, associated with said frame member, an adjustable support for the other set of bar members.

4. Reel mechanism as described in claim 1 including a frame member, a shaft journalled in said frame member upon which one of said sets of bar members is mounted, and, associated with said frame member, a support for the other set of bar members, said support being adjustable to vary the inclined relation characterizing said sets of bar members.

5. Reel mechanism as described in claim 1 including a frame member, a shaft journalled in said frame member upon which one of said sets of bar members is mounted, and, associated with said frame member, a support for the other set of bar members, said support being rotatably adjustable about said shaft to vary the inclined relation characterizing said sets of bar members.

6. Reel mechanism comprising a frame; a shaft rotatably mounted in said frame; a first wholly rigid cage member adapted to rotate coaxially with said shaft; a second wholly rigid cage member adapted to rotate about an axis disposed within the periphery of said first cage member but in inclined relation to the axis of said shaft; and means for varying the amount of inclination between the axis of said second cage member and the axis of said shaft.

7. Reel mechanism comprising a frame; a shaft rotatably mounted in said frame; a first wholly rigid cage member adapted to rotate coaxially with said shaft; a second wholly rigid cage member adapted to rotate about an axis disposed within the periphery of said first cage member but askew to the axis of said shaft; and means for varying the askew relation between the axis of said second cage member and the axis of said shaft.

8. Reel mechanism comprising two interfitted sets of longitudinally extending bar members, each of said sets taken as a whole being disposed in askew relation to the other, and means for varying said askew relation.

9. Reel mechanism comprising two interfitted sets of longitudinally extending bar members, each of said sets taken as a whole being disposed in inclined relation to the other, and means for varying said inclined relation.

10. A reel comprising two interfitted cage members each of which is of rigid construction; means for supporting said cage members with their axes in inclined relation to each other; and, associated with said supporting means, means for varying said inclined relation.

11. A reel comprising two interfitted cage members each of which is of rigid construction; means for supporting said cage members with their axes in askew relation; and, associated with said supporting means, means for varying said askew relation.

12. A reel comprising two interfitted cage members each of which is of rigid construction; means for supporting said cage members with their axes in displaced relation to each other; and, associated with said supporting means, means for varying said displaced relation.

13. A unitary reel comprising a first set of longitudinally extending bar members arranged at intervals about the periphery of the reel, said bar members being immovable with respect to each other; a second set of longitudinally extending bar members alternating with the bar members of said first set, said bar members being immovable with respect to each other; and, at each end of the reel, rigid supporting means fixed to the bar members of each of said sets by means of which said sets are mounted for rotation about axes displaced from each other.

14. A unitary reel comprising a first set of longitudinally extending bar members arranged at intervals about the periphery of the reel, said bar members being immovable with respect to each other; a second set of longitudinally extending bar members alternating with the bar members of said first set, said bar members being immovable with respect to each other; and, at each end

of the reel, rigid supporting means fixed to the bar members of each of said sets by means of which said sets are mounted for rotation about axes in inclined relation to each other.

15. A unitary reel comprising a first set of longitudinally extending bar members arranged at intervals about the periphery of the reel, said bar members being immovable with respect to each other; a second set of longitudinally extending bar members alternating with the bar members of said first set, said bar members being immovable with respect to each other; and at each end of the reel, rigid supporting means fixed to the bar members of each of said sets by means of which said sets are mounted for rotation about axes askew to each other.

16. A thread-advancing reel comprising two sets of alternately disposed bar members, each of said sets of bar members being substantially circular in cross section; means for supporting each of said sets about an axis of rotation in inclined relation to the axis of rotation of the other set, the axis of rotation of one of said sets being disposed within the periphery of the other set; and, associated with said supporting means, means for adjusting one of said sets so that the axis of rotation thereof may be moved to a variety of positions in which said axes are differently inclined with respect to each other.

17. A thread-advancing reel comprising two sets of alternately disposed bar members, each of said sets of bar members being substantially circular in cross section; means for supporting each of said sets about an axis of rotation in askew relation to the axis of rotation of the other set, the axis of rotation of one of said sets being disposed within the periphery of the other set; and, associated with said supporting means, means for adjusting one of said sets so that the axis of rotation thereof may be moved to a variety of positions in which said axes are differently skewed with respect to each other.

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