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REEL DRIVING MECHANISM

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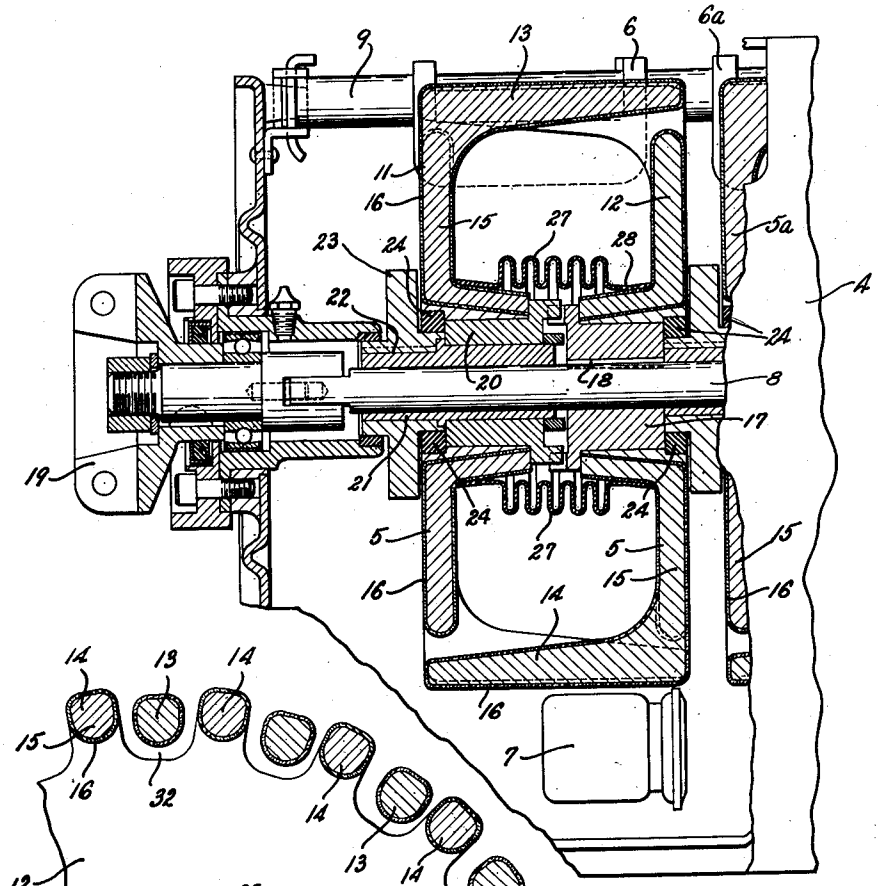


FIG.-1

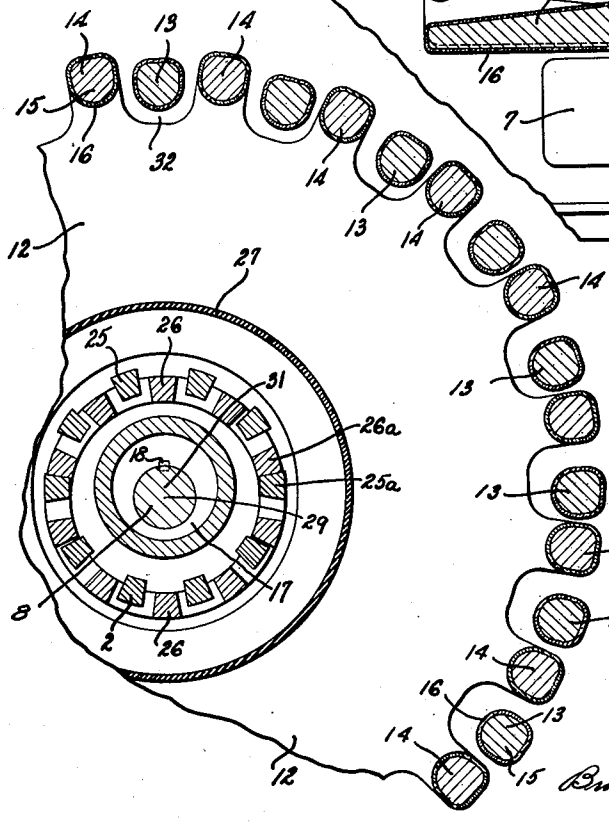


FIG.-2

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REEL DRIVING MECHANISM

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19 Claims. (Cl. 242—53)

This invention relates to mechanism for connecting in driving relation two rotatable members, the mechanism being of such characteristics that it can be sealed against penetration of corrosive fluids thereto and being especially adapted for interconnecting eccentrically mounted parts. More particularly, the invention relates to a form of drive for use with reels as, for example, reels of the kind sometimes employed in the spinning or other processing of artificial silk thread or the like. Such reels frequently operate under conditions in which corrosive chemicals that are applied to the thread or the like must be prevented from contacting with metal parts.

The invention comprises, in one embodiment, laterally extending radially disposed teeth on each of two reel members mounted to rotate about eccentric axes, the teeth of one reel member meshing with those of the other. The teeth may conveniently be located near the center line of the two reel members taken as a unit, the axis of rotation of each reel member being contained within the cylindrical boundary of the other reel member. Sealing means may be provided to exclude the corrosive atmosphere which may surround the mechanism. Of course, the driving mechanism may be found useful in situations where a corrosive atmosphere does not prevail and, in such instances, the seal may be omitted.

While the invention is capable of use wherever it is desired to drive one rotatable member by another which is eccentrically disposed with relation thereto, it will be particularly described in connection with a reel for spinning or otherwise processing artificial silk thread, such as that set forth in copending application Serial No. 652,089, filed January 16, 1933. In the spinning of artificial silk thread or the like by a continuous method, the thread or the like leaving the spin bath is caused to travel over a series of reels in turn, the thread or the like following a helical path along the surface of the reel and being subjected to different treatment on each reel. Thus, the thread or the like may be sprayed with a desulphurizing liquor on one reel, a wash liquor on another, and souring and bleaching liquors on still others. Some of these baths are very corrosive to metal, necessitating that the parts of the reel which come in contact with the same be made of non-corrosive materials. As a result, the thread-supporting elements of the reel are preferably constituted of metal frames coated with a corrosion-resistant coating, such as glass or a ceramic material, the metal frame providing the necessary strength, which is not to be found in an all-ceramic structure, and the coating protecting the metal.

As described in the aforementioned application, these spinning reels are made up of two cage members mounted to rotate about axes both offset and askew with relation to each other and including bars which extend axially so that the bars of one cage member intermesh with the bars of the other member. One cage member drives the other through bar to bar contact and the eccentric mounting results in the thread or the like being shifted axially along the reel as it is alternately picked up and dropped by the bars of the respective cage members. Since there is continuous contact between some bars of the respective cage members at all times, considerable wear results which would not be of great consequence if the bars could be made of a corrosion-resistant material throughout but which assumes importance when a coated structure, such as that mentioned above, is employed. In such case, the coating may eventually be worn through and the exposed metal will then corrode in the chemical atmosphere present with consequent destruction of the bar and contamination of the bath which, in turn, contaminates the thread or the like. Since metal must be used in order to impart the necessary strength to the reel, it is desirable to employ a drive between the two cage members which will avoid bar to bar contact and wearing through of the bar coating.

This is done, according to the present invention, by placing the drive nearer the center line of the reel so that a sealing member can be placed over it to exclude corrosive fluids, while leaving the thread-carrying portions necessarily exposed, and by so constructing the drive that contact between the bars is prevented. The net result is a structure in which thread-carrying parts may be coated with a corrosion-resistant material and driving parts, which cannot be so coated and which may require lubricants which would also contaminate the baths, are enclosed in a space to which corrosive substances cannot penetrate and in which added lubricants, if used, are confined.

It is, accordingly, an object of the present invention to provide a driving mechanism suitable for interconnecting rotatable members mounted to rotate about axes eccentric to each other. Another object of the invention is to provide a mechanism which may be enclosed in a sealed space for interconnecting in driving relation eccentrically mounted elements. A further object of the invention is to provide a driving mech-

anism for the eccentrically mounted cage members of a reel capable of being used in the spinning or other processing of artificial silk thread or the like, the mechanism being enclosed by a seal which excludes the corrosive fluids present in the manufacture of artificial silk and being so constructed that contact between the bars of the respective cage members does not occur. Other objects will in part be obvious and will in part appear hereinafter.

In the accompanying drawing there has been illustrated a structure embodying the principles of the invention but the same is intended for purposes of illustration only and modifications thereof may be made without departing from the scope of such invention. In said annexed drawing:

Fig. 1 is a longitudinal section through a reel and housing, the reel incorporating the mechanism of the invention; and Fig. 2 is a fragmentary transverse section, somewhat enlarged, taken through the reel shown in Fig. 1.

Referring to Fig. 1 of the drawing, a casing 4 houses a reel 5, along which the thread or the like travels axially in a helical path, a reagent distributor 6, which showers a particular treating agent, such, for example, as one of those employed in the viscose process on the thread or the like as it travels along the reel, and a transfer mechanism 7 for removing the thread or the like from the reel when it reaches the end thereof. The reel is mounted on a shaft 8 which may carry a number of reels, such as 5 and 5a, in a horizontal row. Similarly, a manifold 9 extends parallel to the shaft and feeds a number of reagent distributors 6, 6a, etc., suspended from the manifold and positioned above the respective reels. Means are also provided for collecting the reagent in the bottom portion of the casing 4 and returning it to the manifold 9 for redistribution over the thread or the like.

Each reel is made up of two cage members 11 and 12 having longitudinally extending bars 13 and 14 which alternate with each other and carry the turns of thread or the like. The cage members are mounted to rotate about axes both offset and askew with relation to each other, the offset causing the bars to move in and out radially with respect to each other and thus alternately pick up and drop the thread or the like and the askew or canted disposition of the axes causing the thread or the like turn to be picked up by each bar at a point a little in advance axially of the point at which it rested on the preceding bar. This results in an axial advance of the thread or the like in approximately helical turns along the reel.

As may be seen from the drawing, these cage members, including the bars, are composed of a metal core 15, the metal being cast iron, steel, aluminum or other metal or substance having the requisite strength. This core or frame is coated with a layer 16 of glass, ceramic material or other corrosion-resistant material. The coating, while having no great strength in itself, effectively protects the metal from contact with the corrosive fluids which constantly bathe the reel.

The cage members are mounted on the shaft 8 for eccentric rotation in the following manner: Cage member 12 is leaded to a hub 17 and this hub is, in turn, keyed to shaft 8 by means of a key 18. The cage member 12 thus rotates with the shaft 8 to which it is keyed, the shaft being driven from any suitable source of power through a coupling 19. Also, the hub member 17 being concentrically mounted about the shaft 8, the cage member 12 will rotate concentrically with such shaft.

The cage member 11, on the other hand, is not keyed to the shaft 8, nor is it concentrically mounted with respect thereto. This cage member is leaded to a hub member 20 which rotates on a fixed sleeve or bushing 21, which is eccentrically and angularly disposed around the shaft 8 but does not rotate therewith, being fixed against rotation by the engagement of a slot 22 in its periphery into which the material of a bakelite nut 23 extends. The two cage members are, consequently, eccentrically and angularly disposed with respect to each other. Lubrication may be provided by constituting the hub members 17 and 20 of oil-less bronze which contains sufficient lubricant within its pores to lubricate the bearing surfaces, or other materials may be used for the hubs and lubricant added, although it is preferred not to use added lubricant in order to avoid contamination of the bath liquors. Packing rings 24 are provided at the outer ends of the hubs to further insure tight joints.

The two cage members are required to rotate together at the same speed and this is brought about by driving the cage member 11 through the cage member 12, the cage member 12 being driven, as mentioned above, by direct connection to the shaft 8. Heretofore, it has been proposed to effect this intercage drive from bars 14 to bars 13 but, as pointed out above, such bar to bar contact is not desirable where coated bars are employed. In place of this bar to bar drive, the present invention provides what may be termed a hub to hub drive from hub 17 to hub 20. This is brought about by forming these hubs with axially extending teeth 25 and 26 on the hubs of the respective cage members. These teeth mesh with each other and thus hub 20 may be driven by hub 17 and the two cage members attached to the hubs may be caused to rotate together.

Due to the disposition of the driving means closely adjacent the center line of the reel or close to the shaft 8, a sleeve 27 of flexible material may be provided which engages the surfaces of the cage members and constitutes an effective seal against the passage of corrosive fluids into the space where the teeth 25 and 26 are located. This permits making the teeth of durable metal which resists wear while, at the same time, leaving the outer portions of the cage members exposed to the corrosive atmosphere. The outer portions of the reel are thus exposed in order to bring about thorough contact between the thread or the like and the bath but, since such parts of the reel may be made of coated construction, no corrosion results. The sleeve 27 may be made of corrugated or convoluted shape in order to increase the flexibility of the sleeve and thus cause the collars 28 to remain in constant engagement with the surfaces of the cage members without such distortion by the flexing of the sleeve due to the eccentric relation of the two cage members as would raise the collars off the hub surfaces and admit corrosive fluid.

It is the purpose of the hub to hub drive to obviate the necessity of bar to bar contact and, in order to realize the advantages of the invention, the drive between the hubs should prevent such contact, which would result in wear and corrosion of the bars if permitted to take place. In order to achieve this result, the teeth 25 and 26 are so constructed and arranged as to prevent bar to bar contact, as may be seen in Fig. 2 of the draw-

ing. The bars 13 and 14 move toward and away from each other circumferentially, due to the offset and canted relation of their axes of rotation, the bars 13 rotating about the axis 29 and the bars 14 rotating about the axis 31. In order to limit the amplitude of this relative movement so that bar 13, for example, always moves within the limits of the space 32 provided between two consecutive bars 14 of the cage member 12 without contacting with either of the bars 14, the teeth 26 on the cage member 11 are positioned so that they will move into contact with adjacent teeth 25 before the bars can contact, all of the teeth, as well as all of the bars, being equally spaced around the respective circumferences.

For purposes of illustration, the simplest possible case is where there is one bar corresponding to each tooth, there being the same number of teeth and bars respectively on each hub and the cage member mounted thereon. In such instance, the teeth may be made wider in proportion to the periphery on which they lie than the corresponding bars and, both teeth and bars being equally spaced, a given tooth will move into contact with the adjoining tooth of the other hub before the bars of the related cage member can move into contact with the bars of the other cage member. In short, a space corresponding to fewer degrees of arc is left available for relative movement of a given tooth with respect to adjoining teeth than is left available for relative movement of the bars.

The teeth may be varied in size and number as desired, except, however, that on the one hand, a minimum spacing may be left between teeth just sufficient to prevent binding of the eccentrically mounted members or, on the other hand, a maximum spacing may be left which is somewhat less than the spacing between bars. However, the minimum spacing is preferable since this permits of driving the reel in either direction, the spacing being so small that the relative positions of the teeth do not change with change of direction of drive. The foregoing principle is applied in the construction illustrated in the drawing but here a larger number of bars having been provided than there are teeth, the larger number of bars being necessary to fill up the periphery of the reel without leaving spaces between bars so wide that unsupported lengths of thread or the like would tend to bunch with corresponding portions of adjacent turns, due to washing together of the unsupported lengths and capillary attraction, and thus be carried through the process in a form which does not present all surfaces of the thread to contact with the reagents. For this reason, bars 13 may be radially aligned with alternate teeth 26, although exact alignment is not necessary, and the intervening space occupied by two bars 14 and another bar 13 so that the reel illustrated has a total of forty bars in its periphery with corresponding reduction in the width of the spaces between bars, while the driving mechanism therefor requires a total of only twenty teeth. The bars 13 will not, however, contact with the bars 14 because the space between bars 13 has been equally divided and each bar separated from its adjacent neighbors by a space which is angularly greater than the space between any tooth 26 and adjacent tooth 25.

Various combinations may be made up in accordance with the principle of the invention and the same result secured provided only that the space available for relative angular movement of the teeth is less than the space available for corresponding angular movement of the bars. The intermeshing teeth are not all in driving contact at the same time but, in fact, the drive, at any given instant, is from one tooth on the driving reel to one tooth on the driven reel, the other teeth not being in driving contact at that instant. Thus, as shown in Fig. 2, the drive is from tooth 26*a* to tooth 25*a*, the drive, in the following instant being between the following pair of teeth, while 26*a* and 25*a* move away from each other. It follows that the two series of intermeshing teeth described herein may be replaced by other means embodying contact between the hubs, such as twin cam surfaces. Such means are included within the scope of the present invention, the particular form of the structure used being capable of variation provided the principles of the invention as herein set forth are followed.

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. A mechanism comprising two rotatable cylindrical members mounted to rotate about axes offset with respect to each other, the axis of each member being contained within the cylindrical boundary of the other member; opposed hubs structurally associated with said members, said hubs being correspondingly offset with respect to each other; drive means connecting said opposed hubs; and a sleeve engaging said members constituting a fluid-tight seal for said drive means.

2. A mechanism comprising two rotatable cylindrical members mounted to rotate about axes offset with respect to each other, the axis of each member being contained within the cylindrical boundary of the other member, axially extending teeth on each of said members intermeshing with the teeth on the other member, and a sleeve engaging said members and enclosing said teeth against admission of extraneous fluids.

3. A mechanism comprising two rotatable members mounted to rotate about different axes; equally spaced alternating elements encircling said rotatable members and mounted to rotate concentrically therewith; and axially extending, equally spaced teeth on each of said members meshing with the teeth on the other member, each of said teeth subtending a greater number of degrees of arc than each of said elements whereby one rotatable member may be driven by the other without contact between the alternating elements.

4. A reel comprising two cage members mounted to rotate about axes both offset and askew with respect to each other, means for driving one of said members, intercage driving means for driving the other of said members from said first-mentioned member, and a seal surrounding said intercage driving means.

5. A processing reel comprising two cage members mounted to rotate in a corrosive atmosphere about axes both offset and askew with respect to each other, driving means for said reel, inter-cage driving means for driving one of said cage members by the other, and a flexible seal surrounding said intercage driving means and excluding said corrosive atmosphere therefrom.

6. A processing reel comprising two reel members mounted to rotate in a corrosive atmosphere about axes offset with respect to each other, alternating bars on said reel members, a coating on said reel members and bars which is resistant to corrosion but which is subject to wearing

through, drive means connecting said cage members and maintaining said bars out of contact with each other, and a seal excluding said corrosive atmosphere from said drive means.

7. A reel comprising two reel members mounted to rotate about axes offset and canted with respect to each other, alternating equally spaced bars on said reel members, a coating on said reel members and bars which is resistant to corrosion but which is subject to wearing through, and axially extending equally spaced teeth on each of said reel members meshing with the teeth on the other reel member, each of said teeth subtending a greater number of degrees of arc than each of said bars whereby one reel member may be driven by the other without bar to bar contact.

8. A processing reel comprising two reel members mounted to rotate in a corrosive atmosphere about axes eccentric with respect to each other, alternating equally spaced bars on said reel members, a coating on said reel members and bars which is resistant to corrosion but which is subject to wearing through, opposed hubs structurally associated with said reel members, axially extending equally spaced teeth on each of said opposed hubs meshing with the teeth on the other hub, each of said teeth subtending a greater number of degrees of arc than each of said bars to drive one reel member by the other without bar to bar contact, and a sleeve of flexible material engaging said members constituting a seal excluding said corrosive atmosphere from said opposed hubs.

9. In a processing reel, a pair of intermeshing spider-like members having limited relative but common rotary movement, toothed driving means for said spider-like members, and sealing means contacting with each of said spider-like members enclosing said toothed driving means.

10. In a processing reel, a pair of intermeshing spider-like members having relative oscillatory and common rotary movement, toothed driving means for said spider-like members, and an extensible seal contacting with each of said spider-like members, said extensible seal enclosing said toothed driving means and preventing access of corrosive agents thereto.

11. In a processing reel, a pair of intermeshing spider-like members having limited relative but common rotary movement, toothed driving means for said spider-like members, and sealing means contacting with each of said spider-like members enclosing said toothed driving means and preventing access of corrosive agents thereto, said spider-like members intermeshing externally of said sealing means.

12. In a reel, interdigitating cage members, said cage members having relative oscillatory movement in the operation of said reel; a shaft upon which said cage members are mounted; means disposed between said cage members in close proximity to said shaft by which one cage member may be employed to drive the other; and sealing means disposed circumferentially about said shaft.

13. In a reel, a first set of axially extending bars disposed at spaced intervals about the periphery of said reel, a second set of axially extending bars disposed between the bars of said first mentioned set, said sets of bars being mounted to rotate about common supporting means, and driving means operatively associated with said common supporting means by which the bars of one set are prevented from contacting with the bars of the other set.

14. In a reel, a first set of axially extending bars disposed at spaced intervals about the periphery of said reel, a second set of axially extending bars disposed between the bars of said first mentioned set, said sets of bars being mounted to rotate about common supporting means, driving means operatively associated with said common supporting means by which the bars of one set are prevented from contacting with the bars of the other set, and sealing means enclosing said driving means.

15. In a reel, a shaft extending axially of said reel; a plurality of bars substantially parallel to said shaft disposed at intervals about the periphery of said reel, certain of said bars having limited movement relative to others of said bars; means connecting said shaft and said bars; intermeshing driving means associated with and in close proximity to said shaft; and flexible sealing means enclosing said driving means.

16. A reel comprising two cage members mounted to rotate about axes both offset and askew with respect to each other, means for driving one of said members, and intercage driving means disposed within said reel for driving the other of said members from said first-mentioned member.

17. A reel comprising two reel members mounted to rotate about axes offset with respect to each other, alternating bars on said reel members, and intermember driving means serving to maintain said bars out of contact with each other.

18. In a reel, interdigitating cage members, said cage members having relative oscillatory movement in the operation of said reel; a shaft upon which said cage members are mounted; and means disposed between said cage members in close proximity to said shaft by which one cage member may be employed to drive the other.

19. In a reel, a drive shaft extending axially of said reel; a plurality of bars substantially parallel to said drive shaft disposed at intervals about the periphery of said reel, certain of said bars having limited movement relative to others of said bars; means connecting said drive shaft and said bars; and intermeshing driving means for said bars disposed within said reel in close proximity to said drive shaft.

WALTER F. KNEBUSCH.

CERTIFICATE OF CORRECTION.

Patent No. 2,056,197. October 6, 1936.

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 6, after the word "silk" insert thread or the like; page 4, first column, lines 28 and 29, claim 8, for the words "to drive one reel member" read whereby one reel member may be driven; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 22nd day of December A. D. 1936.

Henry Van Arsdale

(Seal) Acting Commissioner of Patents.