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FLUID SUPPLY AND REMOVAL CONNECTION FOR THREAD-ADVANCING REELS

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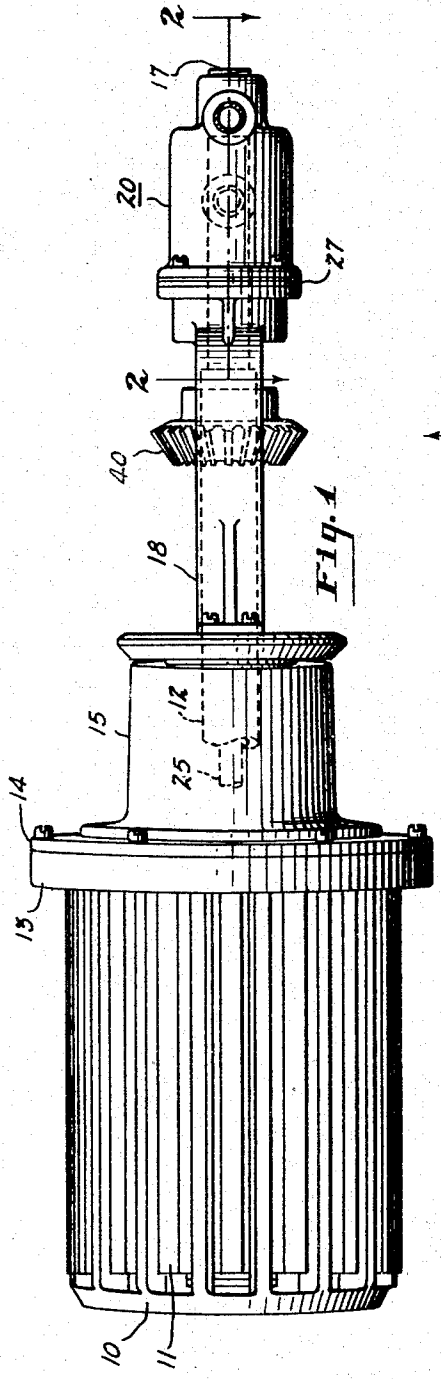


Fig. 1

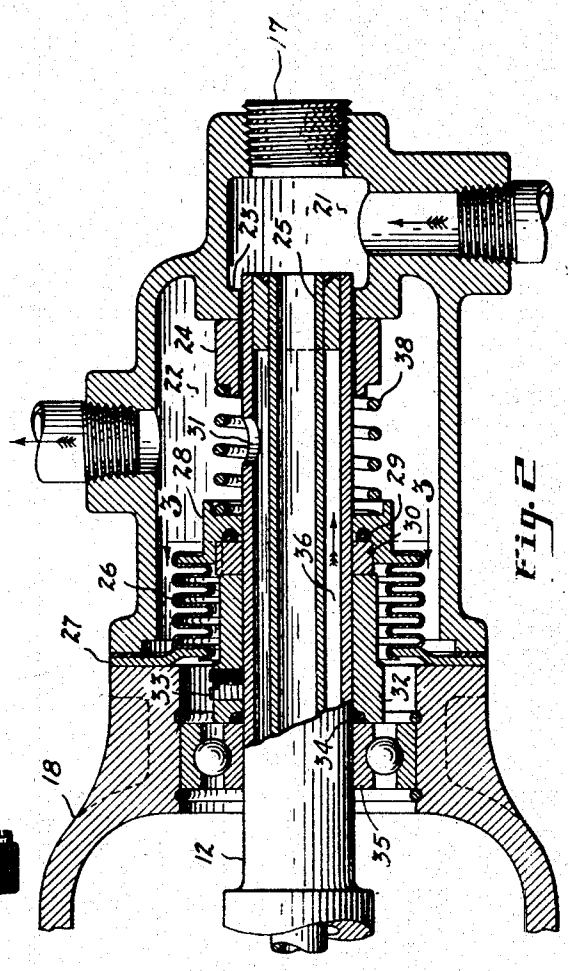


Fig. 2

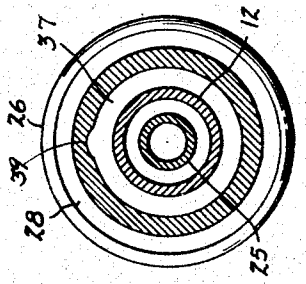


Fig. 3

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FLUID SUPPLY AND REMOVAL CONNECTION FOR THREAD-ADVANCING REELS

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9 Claims. (Cl. 34—153)

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The present invention relates to a processing apparatus of the thread-storing, thread-advancing type intended for processing and handling of thread filaments, bands, ribbons, etc.

The invention relates more particularly to a cantilever type reel, i. e., a reel supported and driven from one end only with its other end free and unobstructed. This type reel is used, for example, in the production of viscose rayon by the continuous process. The reel functions by virtue of an offset and inclined relation between the axes of the members supporting the thread, as shown and described in the Knebusch Patent 2,210,914.

Cantilever reels are advantageously used in the continuous process of producing rayon for performing a series of individual processing steps. Drying of viscose rayon is one of these steps and it is performed by advancing the wet yarn or thread over the periphery of a reel through whose interior a heating fluid is circulated. In such a cantilever type drying reel it is desirable, of course, to have a support for the reel of such construction that will provide substantially frictionless rotation of the shaft rotating the thread-advancing, thread-storing members while effectively preventing the escape of a heating fluid circulating within the reel. In such reels the heating fluid is usually admitted and exhausted at the supported end, and at this end a seal is desirable that will prevent leakage of heating fluid while the reel rotates.

One form of such a drying reel is shown and described in the Corey Patent No. 2,413,217. As shown in that patent, the seal at the supported end of the reel shaft through which the heating fluid is admitted and exhausted has two friction type sealing rings and means for maintaining the sealing rings continually in frictional engagement with adjacent surfaces. The sealing rings prevent the loss of the heating fluid to the exterior of the seal housing and also from the one chamber into the other of the seal housing.

This invention provides a relatively simple and effective means of preventing loss of heating fluid in the seal housing and makes possible the elimination of one of the sealing friction-type rings in the seal of the thread-advancing reel. Advantageously, the invention embraces the use of a sealing means which takes advantage of the pressure of the heating fluid to aid in effecting an efficient seal. These and other advantageous features will be apparent from the following description and drawing where:

Figure 1 is an elevation of a cantilever type drying reel employed in the drying of thread and the like;

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Figure 2 is an enlarged plan view, in section, of a seal housing taken on line 2—2 of Figure 1;

Figure 3 is a section taken across line 3—3 of Figure 2.

As shown in Figure 1, and also shown and described in the Corey patent, the thread-advancing drying reel comprises two reel members 10 and 11 operating on inclined and offset axes. The two reel members 10 and 11 are of rigid construction and are of substantially circular cross section. Their peripheries are formed of spaced, longitudinally extending bar members interleaved in interdigitating relation. The inclined and offset axes cause the reel members to advance thread in spaced, generally helical turns from the receiving end of the reel periphery to the other end.

The spaced, longitudinally extending bar members of reel member 11 form the periphery of a hollow cylinder through which a heating fluid continually circulates. The heating fluid enters the cylinder and is withdrawn therefrom through the shaft 12 which has a return flow and upon which shaft the reel member 11 is mounted for rotation. Interleaved reel member 10 has a flange 13 which is bolted to a flange 14 of a hub member 15. Hub member 15 supports reel member 10 and rotates on a sleeve (not shown) having an axis which is offset and inclined to the shaft and thus to reel member 11. The sleeve is mounted on shaft 12 and within one end of the supporting frame member 18. Reel member 11, which is mounted on shaft 12 will, therefore, through frictional contact or, otherwise, cause reel member 10 to rotate. Frame member 18 supports the reel members and has attached to one end a seal housing 20 adapted to seal off or prevent the escape of the heating fluid fed to and circulated through the reel.

The seal housing 20 comprises an inlet chamber 21 having a plug 17 and an outlet chamber 22. The chambers are substantially separated by the internal construction of the seal housing. As shown in Figure 2, chamber 21 is totally enclosed except for the incoming heating fluid opening and the inlet 25 of protruding shaft 12. The inner flange 23 of the housing forms a part of the chamber's enclosure through which the reel shaft 12 protrudes. The flange 23 also provides a partial seal against the incoming heating fluid and is machined closely to the shaft diameter. However, clearance is provided between the shaft 12 and the flange 23 to substantially prevent

actual frictional contact. In frictional contact with flange 23 is a sealing ring 24 made of a graphited material such as "Morganite." Sealing ring 24 is also machined to fit shaft 12 closely with minimum clearance between it and the shaft to substantially avoid frictional contact. The face of flange 23 is ground smooth in order to provide full contact with the face of the sealing ring 24. Flange 23 and ring 24 thus substantially prevent heating fluid from entering the outlet or adjacent chamber 22 of the seal housing. Sealing ring 24 can be an insert in flange 23 or the flange itself, if desired, can serve as a seal. In such instance, the spring 38 would not be necessary.

Since the sealing ring 24 and flange 23 do not bind shaft 12 but fit closely thereto, there will be a very small leakage of heating fluid into the outlet chamber 22. The small amount of leakage, however, for practical purposes may be disregarded since it flows into the outlet chamber and the advantage gained in eliminating a rotating frictional sealing bearing far outweighs the very small loss of heating fluid.

Chamber 22, the second chamber of the seal housing 20, is enclosed at one end by flange 23, stationary sealing ring 24, and shaft 12. At the other end, the chamber is enclosed by a resilient bellows seal 26. Outgoing heating fluid enters the chamber through the opening 31 in shaft 12. The bellows seal prevents the escape of the heating fluid from the chamber by providing a seal between the frame member 18 and the seal housing 20 and also provides a seal about the rotating reel shaft 12. One end of the bellows seal is welded or otherwise secured to the flange 27 which is clamped between the support frame member 18 and the seal housing 20. The other end of the bellows is welded or otherwise secured to a T-shaped collar 28. Located in a recess in collar 28 is a resilient ring 29 of substantially circular cross section made of a material such as rubber. In contact with ring 29 and positioned substantially within collar 28 is a friction type sealing ring 30 made of a graphited material such as "Morganite." Adjacent the sealing ring 30 is another collar 32 secured to shaft 12 by means of a set screw 33. Collar 32 which positions the frame bearing 35 also provides a face against which sealing ring 30 is maintained in frictional contact. Collar 32 also contains a resilient ring 34 similar to ring 29 but of a smaller diameter. The ring fits tightly about shaft 12 and abuts the bearing 35.

Since the bellows seal is fixed against rotation, the rotational frictional contact between collar 32 and the bellows seal occurs only between the faces of the collar and sealing ring 30. Continuous contact between the collar and the sealing ring is maintained by pressure exerted on the bellows by the fluid in the outlet chamber 22. Spring 38 also exerts some pressure on sealing ring 30 but it is essentially intended for maintaining sealing ring 24 in contact with the face of flange 23.

The provision of the rubber resilient rings 29 and 34 eliminates the possibility of any fluid leakage between the collar 28 and sealing ring 30, and also between shaft 12 and collar 32. Further, the rubber ring 29 is provided with a nipple at a point in its periphery to positively position the ring in the annular recess 37 (see Figure 3) of collar 28 adapted to receive it. The nipple is adapted to fit into the cavity 39 in the annular recess. The rubber ring 29 through frictional contact with the sealing ring 30 prevents the possible rotation of the sealing ring along with collar 32 which is fixed to shaft 12. The recess 37 can also be of any desirable shape other than circular to prevent the slippage of the rubber ring 29.

In operation, the reel is rotated by a gear 40 mounted on shaft 12 and within the yoke portion of frame member 18. Frame member 18 is held stationary. Heating fluid enters the inlet chamber 21 of the seal housing 20 attached to frame member 18; then the fluid flows into and through the core passage 25 of shaft 12 to the interior of the reel. The heating fluid is withdrawn through a return concentric passage 36 and through opening 31 in the shaft 12 into the outlet chamber 22 from which it is exhausted.

In its course through the apparatus, the heating fluid is positively prevented from escaping from the outlet chamber 22 and substantially so from inlet chamber 21 of the seal housing 20. The bellows seal will always maintain a pressure on the sealing ring 30. The spring 38 provides some additional pressure on collar 28 but its purpose is essentially to position sealing ring 24 against flange 23.

I claim:

1. In combination with a thread-processing apparatus having a reel adapted to advance thread over its periphery in a helical manner, a stationary supporting frame member for said reel, a seal housing having a heating fluid inlet and an outlet chamber attached to one end of said frame member, a sealing flange in said housing separating said inlet from said outlet chamber, a rotating shaft journaled in said frame member and projecting therethrough and into said seal housing, said shaft having heating fluid inlet and outlet means within said seal housing communicating with said inlet and outlet chambers, a fixed seal about said shaft and within said seal housing for preventing the escape of heating fluid from said housing, and a collar around said shaft, said fixed seal having one end secured to said collar.

2. In combination with a thread-processing apparatus having a reel adapted to advance thread over its periphery in a helical manner, a stationary supporting frame member for said reel, a seal housing having a heating fluid inlet and an outlet chamber attached to one end of said frame member, a sealing flange in said housing separating said inlet from said outlet chamber, a rotating shaft journaled in said frame member and projecting therethrough and into said seal housing, said shaft having heating fluid inlet and outlet means within said seal housing communicating with said inlet and outlet chambers, a seal fixed against rotation about said shaft and within said seal housing for preventing the escape of heating fluid from said housing, a collar around said shaft, and a sealing means in said collar, said fixed seal having one end secured to said collar.

3. In combination with a thread-processing apparatus having a reel adapted to advance thread over its periphery in a helical manner, a stationary supporting frame member for said reel, a seal housing having a heating fluid inlet and an outlet chamber attached to one end of said frame member, a sealing flange in said housing separating said inlet from said outlet chamber, a rotating shaft journaled in said frame member and projecting therethrough and into said seal housing, said shaft having heating fluid

inlet and outlet means within said seal housing communicating with said inlet and outlet chamber, a seal fixed against rotation about said shaft and within said seal housing forming one of said chambers and for preventing the escape of heating fluid from said housing, a collar around said shaft, a sealing means in said collar, said fixed seal having one end secured to said collar, and a second sealing means within said same chamber about said shaft and abutting said sealing flange within the seal housing and around said shaft.

4. In combination with a thread-processing apparatus having a reel adapted to advance thread over its periphery in a helical manner, a stationary supporting frame member for said reel, a seal housing having a heating fluid inlet and an outlet chamber attached to one end of said frame member, a sealing flange in said housing separating said inlet from said outlet chamber, a rotating shaft journaled in said frame member and projecting therethrough and into said seal housing, said shaft having heating fluid inlet and outlet means within said seal housing communicating with said inlet and outlet chambers, a seal fixed against rotation about said shaft and within said seal housing for preventing the escape of heating fluid from said housing, a collar around said shaft, a sealing means in said collar, said fixed seal having one end secured to said collar, and a second sealing means within the seal housing opposite said first seal and about said shaft, said second sealing means abutting the sealing flange.

5. In combination with a thread-processing apparatus having a reel adapted to advance thread over its periphery in a helical manner, a stationary supporting frame member for said reel, a seal housing having a heating fluid inlet and an outlet chamber attached to one end of said frame member, a sealing flange in said housing separating said inlet from said outlet chamber, a rotating shaft journaled in said frame member and projecting therethrough and into said seal housing, said shaft having heating fluid inlet and outlet means within said seal housing communicating with said inlet and outlet chambers, a flexible seal fixed against rotation about said shaft and within said seal housing for preventing the escape of heating fluid from said housing, a collar around said shaft, a sealing ring in said collar, said fixed seal having one end secured to said collar, and a second collar adjacent to said first collar fixed to said shaft to rotate therewith, said first-mentioned sealing ring frictionally engaging said second collar.

6. In combination with a thread-processing apparatus having a reel adapted to advance thread over its periphery in a helical manner, a stationary supporting frame member for said reel, a seal housing having a heating fluid inlet and an outlet chamber attached to one end of said frame member, a sealing flange in said housing separating said inlet from said outlet chamber, a rotating shaft journaled in said frame member and projecting therethrough and into said seal housing, said shaft having heating fluid inlet and outlet means within said seal housing communicating with said inlet and outlet chambers, a flexible seal fixed against rotation about said shaft and within said seal housing for preventing the escape of heating fluid from said housing, a collar around said shaft, a sealing ring in said collar, said fixed seal having one end secured to said collar, a second collar adjacent to said first collar fixed to said shaft to rotate

therewith, said sealing ring in said first collar frictionally engaging said rotating second collar, a second sealing means opposite said first seal within said seal housing and about said shaft, and means urging said second sealing means against said sealing flange.

7. In combination with a thread-processing apparatus having a reel adapted to advance thread over its periphery in a helical manner, a stationary supporting frame member for said reel, a seal housing having two chambers attached to one end of said frame member, a sealing flange in said housing separating said chambers, a rotating shaft journaled in said frame member and projecting therethrough and into said seal housing, said shaft having a heating fluid inlet means communicating with one of said chambers and an outlet means communicating with the other of said chambers of said seal housing, a flexible seal fixed against rotation about said shaft and within one of said chambers of said seal housing for preventing the escape of heating fluid from said chamber, a collar around said shaft, a sealing ring in said collar, said fixed flexible seal having one end secured to said collar, a second collar fixed to said shaft to rotate therewith, said sealing ring in said first collar being adapted to frictionally engage said second rotaing collar, a second friction sealing ring in said chamber opposite said first seal and around said shaft, and a resilient means between said first collar and said second sealing ring, said resilient means urging said second sealing ring against the sealing flange.

8. In combination with a thread-processing apparatus having a reel adapted to advance thread over its periphery in a helical manner, a stationary supporting frame member for said reel, a seal housing having a heating fluid inlet chamber and an outlet chamber attached to one end of said frame member, a sealing flange in said housing separating said inlet from said outlet chamber, a rotating shaft journaled in said frame member and projecting therethrough and into said seal housing, said shaft having a heating fluid inlet means communicating with said inlet chamber and an outlet means communicating with said outlet chamber of said seal housing, an expansible diaphragm fixed against rotation about said shaft and within said outlet chamber for preventing the escape of heating fluid therefrom, a collar around said shaft, said expansible diaphragm having one end secured to said collar, said collar having a recess, said recess having an eccentric portion, a resilient ring adapted to fit into said recess, a sealing ring adjacent said resilient ring and substantially encompassed by said collar, a second collar fixed to said shaft for rotation therewith, said sealing ring in said first collar adapted to frictionally engage said rotating second collar, a second friction sealing ring in said outlet chamber and about said shaft, and means urging said second sealing ring against the sealing flange in said seal housing, said expansible diaphragm being subject to the fluid pressure in the chamber in which it is positioned thereby exerting pressure on said first sealing ring.

9. The combination of a stationary frame member, a rotating shaft journaled therethrough, said shaft having a central inlet conduit and an outlet conduit concentric therewith for the admission and exhaust of a heating fluid, the opening of said inlet conduit being in the end of said rotating shaft and the outlet of said concentric

conduit being in the side of said shaft and substantially adjacent said inlet, a seal housing on one end of said frame member and attached thereto, said seal housing encompassing the end of said rotating shaft and said heating fluid inlet and outlet, said seal housing having adjacent chambers communicating with said heating fluid entry and outlet of said shaft, one of said chambers being adapted to admit said heating fluid prior to its entry into the inlet of said central conduit and the other of said chambers being an exhaust chamber for said heating fluid from said side shaft outlet, an annular internal sealing flange in said seal housing separating said chambers, sealing means within said outlet chamber for sealing off the heating fluid from the respective chambers, one of said sealing means comprising a flexible diaphragm fixed against rotation and positioned about said shaft, a collar attached to said flexible diaphragm and positioned around said shaft, a sealing ring in said collar, a second collar fixed to said shaft and adapted to rotate therewith, said sealing ring in said first collar adapted to frictionally engage said rotating second collar, an annular disc attached to the

other end of said flexible partition, said annular disc adapted to be rigidly held between said sealing housing and said frame member end, and a second sealing means within said outlet chamber comprising a friction sealing ring fixed against rotation and around said shaft, said second sealing ring abutting said internal annular sealing flange.

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