July 9, 1940. W. F. KNEBUSCH ET AL 2,207,588

APPARATUS FOR TRANSFERRING THREAD

Original Filed July 10, 1933 2 Sheets-Sheet 1

Fig. 1.

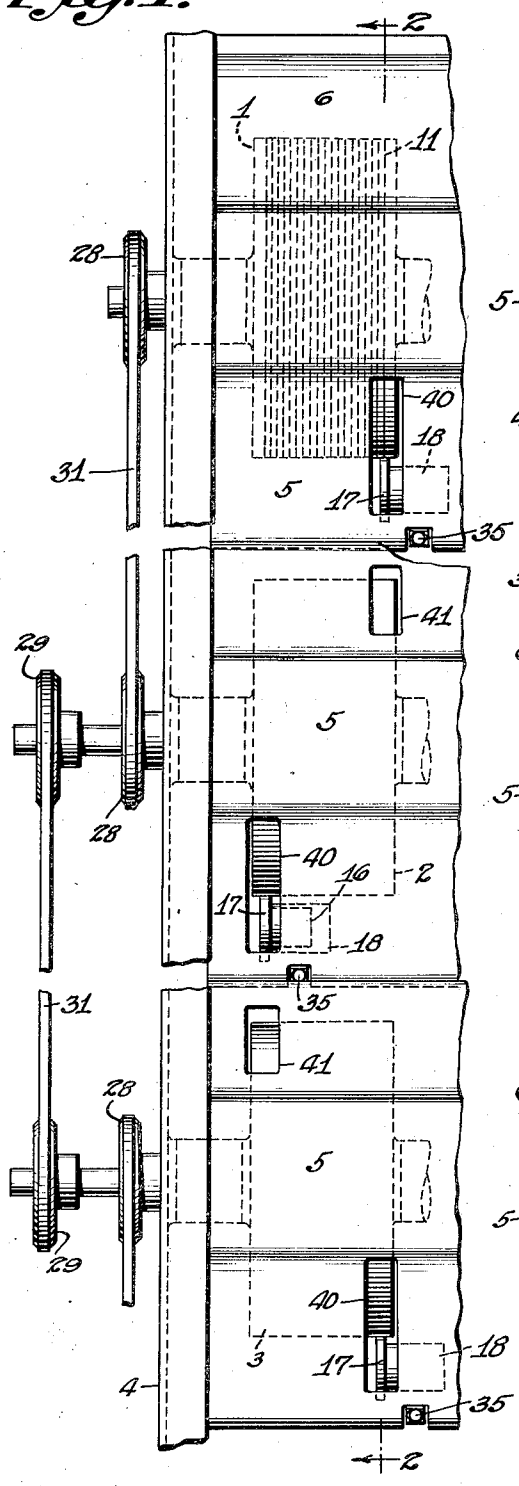
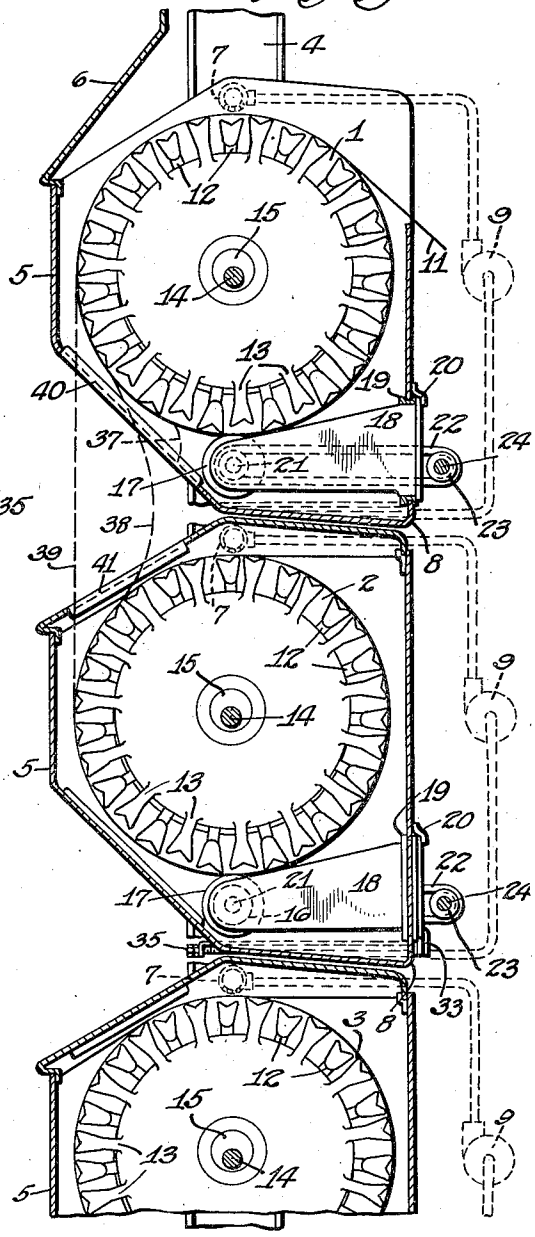


Fig. 2.



Inventors:

WALTER F. KNEBUSCH

FOSTER F. HILLIX

by Charles P. Kerr Strom

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Fig. 3.

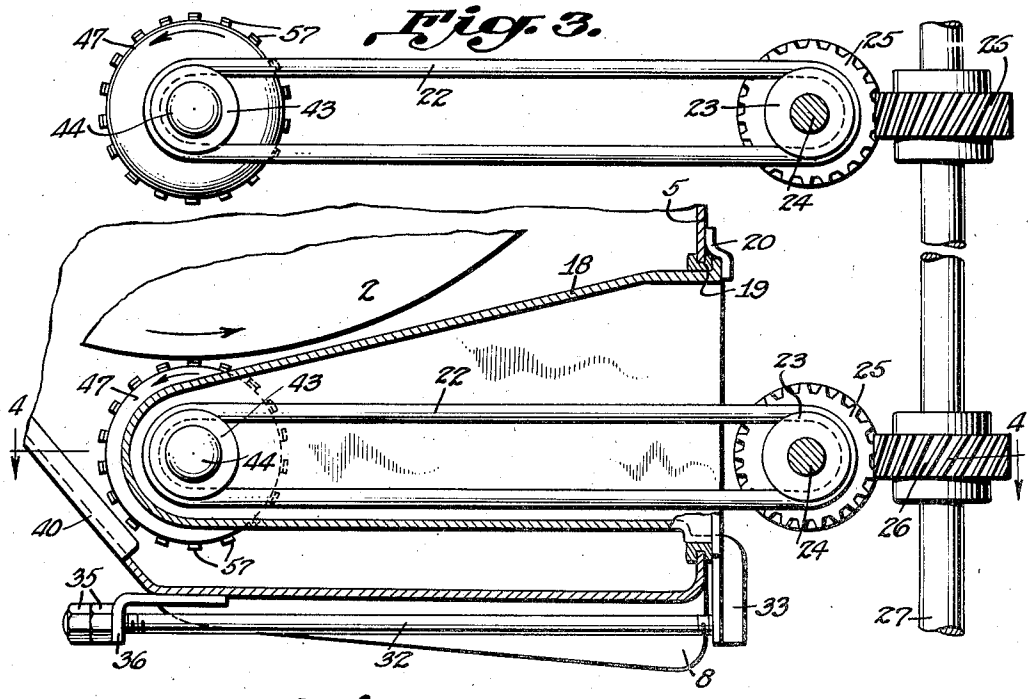
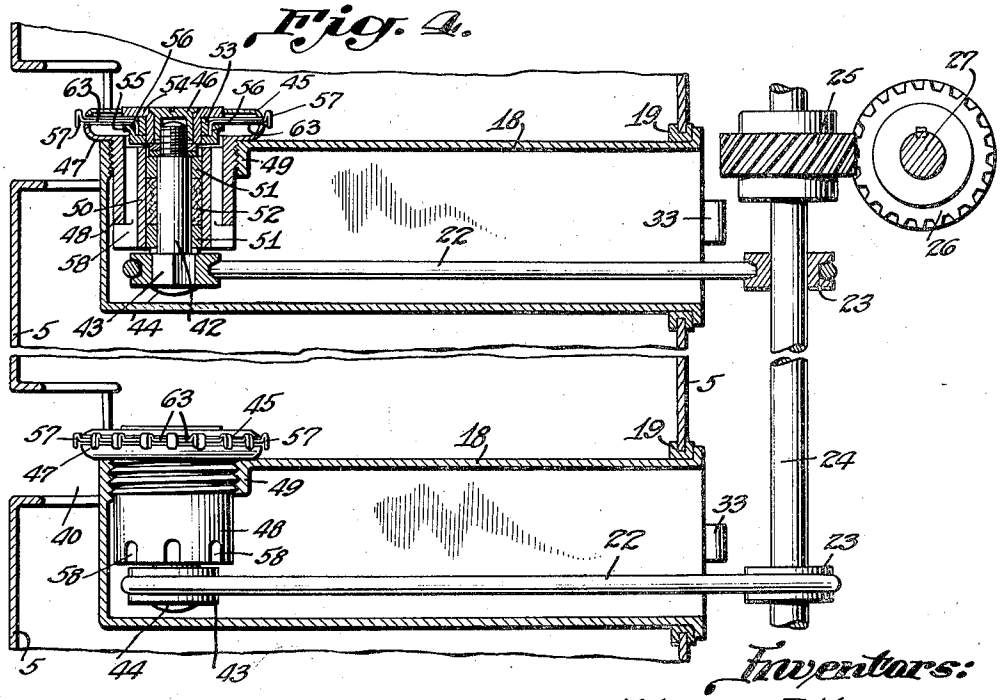


Fig. 4.



Inventors:
WALTER F. KNEBUSCH
FOSTER F. HILLIX
by Charles E. Herrstrom

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2,207,588

APPARATUS FOR TRANSFERRING THREAD

Walter F. Knebusch, Cleveland, and Foster F. Hillix, Lakewood, Ohio, assignors to Industrial Rayon Corporation, Cleveland, Ohio, a corporation of Delaware

Original application July 10, 1933, Serial No. 679,606. Divided and this application November 1, 1935, Serial No. 47,884

9 Claims. (Cl. 18—8)

In the manufacture of artificial silk thread, particularly by the viscose process, it is possible to subject the thread to the various operations necessary for its complete formation by running the thread from the spin bath over a plurality of reels on each of which is performed one or more operations, such as washing, desulphurizing, souring, drying, etc. As described in application Serial No. 651,404, filed January 12, 1933, this process is carried out while the thread passes over a given reel, traveling from one end of the reel toward the other and being in effect stored thereon for a sufficient length of time to permit a particular operation to take place. When such operation is complete, the thread descends to the next lower reel, vertically spaced from the first reel, upon which it travels in the reverse direction. This action is carried out for as many reels as may be employed, sometimes nine or more.

In Patent No. 2,131,723 there have been described a method and means for positively and with certainty producing a free leading end when the thread reaches the discharge end of a reel, as by breaking, tearing or otherwise severing the thread at a point back of the actual leading end, which may have washed under, to insure thereby a free leading end. Said application further discloses means by which the newly established leading end is freed from the reel in such manner that it can carry over to the next succeeding reel. Such method is, however, a manual one and the mechanism described requires the attention of an operator in order to effect each transfer. Consequently, where a large number of threads are being run in a given plant, and these may number many thousands even in a plant of moderate size, it will be seen that the labor, time and expense involved in transferring each of these threads over a number of reels may be considerable.

It is, accordingly, an object of the present invention to provide means for automatically forming a new leading end on a thread being wound on a reel of this kind and for automatically freeing such end from the surface. Another object of the invention is to provide means for positively and automatically removing a newly formed leading thread end from such a reel and transferring the same to another reel in such manner that the running of the thread is not interrupted. Still another object of the invention is to provide rotary means for automatically forming a new leading end on the thread capable of automatically removing such leading thread end from the reel. Other objects of the invention will in part be obvious and will in part appear hereinafter.

This application is a division of application Serial No. 679,606, filed July 10, 1933, which has since become Patent No. 2,067,881.

In the drawings, which illustrate one manner of carrying out the invention, Figure 1 is a front elevation of a portion of a continuous spinning machine with the thread-forming mechanism in place; Figure 2 is a section taken along the line 2—2 of Figure 1; Figure 3 is a vertical section, somewhat enlarged, through two of the thread-removing mechanisms in operative position; and Figure 4 is a section taken along the line 4—4 of Figure 3. The drawings show a portion of a continuous spinning machine with rotatable thread-removing devices in operative position so as to carry out the method described and also show a preferred form of the thread-severing device of the invention.

Referring to Figures 1 and 2, reels 1, 2 and 3 are shown as mounted in a frame of which one of the uprights 4 is shown. Each horizontal row of reels is surrounded by a housing 5 which confines the liquid showered onto the reel, except in the case of the upper row, where the housing is left open at the top to permit the thread to be brought manually from the spin bath to the reel. A guard 6 is provided in this instance to deflect spray from the front of the installation. The liquid, which may be any one of the various solutions or washing liquids applied to the thread during the process of treatment, is distributed over the reel and thread by a perforated pipe 7, a trough, or any other suitable device. The liquid is collected in the housing in a trough 8 at the bottom thereof and is returned to the distributing device by means of pump 9. The distributing system may assume any one of various forms and it is intended to indicate the same, for the purpose of the present invention, only in a more or less general way.

Assuming the reel 1 to be the first reel of a series of reels, the thread 11 is brought from the spin bath (not shown) through the open top of the uppermost casing 5 and is applied manually to the starting end of such reel 1, which has previously been started rotating.

Each reel consists of two interdigitating cages made up of bars 12 and bars 13, each set of bars going to make up one of the cages. The cages are canted with respect to each other and rotate eccentrically about the centers 14 and 15. This results in movement of the bars 12 with respect

to the bars 13, so that the thread is alternately carried first by one set and then by the other. At the same time, due to the canted relation of the cages, the thread is advanced along the reel. This results in the thread being wound on the reel in a single layer and spread out so as to be effectually processed by liquid applied to the reel.

The present invention concerns particularly the handling of the thread when it has reached the end of the reel and it is desired to transfer it to another reel to perform a different treating operation.

When, for example, the thread reaches the discharge end of the reel 1, it is desired to remove the same from such reel 1 and bring it into contact with the next reel 2. According to the present invention this is done by means of rotatable thread-severing means 16 disposed adjacent the discharge end of the reel 1. The thread-severing means 16 includes a disk-like member 17 having radially disposed peripheral irregularities constituting thread-severing elements. The disk is rotated in the same direction as the reel with which it cooperates, thus causing the contacting surfaces of the two parts to move in opposite directions. A thread traveling along the reel in a path which, while not a true circular helix, may be considered as substantially such is immediately severed by the rotating disk so as to provide a free thread end regardless of any under-wind or under-wash of the thread.

The thread-severing device 16 is mounted in a combination housing and bracket 18 which is bodily inserted into an opening in the housing 5, in which it is resiliently mounted by means of a rubber gasket 19. A clip 20 on the housing 5 assists in retaining the bracket in the opening in the housing. The disk 17 is mounted on a spindle 21 and is driven by means of a belt 22 running over a pulley 23. For each thread-severing device, there is one of these pulleys suitably mounted on jack shaft 24, there being a jack shaft for each horizontal row of thread-severing devices. Each jack shaft is driven by means of a spiral gear 25 meshing with another gear 26 at right angles thereto and keyed to a shaft 27 driven by a motor (not shown). This driving arrangement for the thread-severing devices is independent of the drive for the reels which have their own pulleys 28 and 29 driven by belts 31 which are operated by another motor.

The bracket 18, which, together with the thread-severing device, is removable as a unit from the housing, holds the disk 17 resiliently against the surface of the reel 1 with just enough contact so that the thread, traveling in a helical path, is cut or otherwise severed. Adjustment of the disk with relation to the surface of the reel may be had by means of the screw bolt 32 carrying a lug 33 bearing against the lower part of the bracket 18. The screw bolt lies below the housing 5, which is shown as being recessed to receive it, although this is not essential, and is equipped with nuts 35 bearing against bracket 36. Pressure may thereby be exerted against the lower part of the bracket 18 to swing the same about clip 20 as a pivot, forcing the bracket against the lower part of the gasket 19 and thus bringing the disk 17 closer to the reel. Loosening the nuts effects the opposite result.

As mentioned above, the disks 17 are rotated rapidly in the same direction as the spinning reels are rotated, the surfaces of contact moving in opposite directions, during the time that the continuous spinning machine is being set in operation and their action is such that the helically traveling thread is immediately severed when it reaches the zone of contact of the disk with the reel. The severed end thus formed is thereby removed from the surface of the reel, whether such surface is wet or not, partly due to the windage set up by the high speed of rotation of the disk 17. This causes the severed end to leave the surface of the reel as indicated at 37. The free end then billows out as indicated by the intermediate position 38 until it contacts with the surface of the reel 2 and is quickly drawn straight, as it commences winding on the latter reel; so that it assumes the position 39, running direct from reel to reel. This completes the transfer of the thread from the first reel to the second. Openings 40 and 41 are provided in the casing of the upper and lower reels, respectively, to permit the thread to run from one reel to another.

Once the thread has been started winding on the subsequent reel, the thread-severing device cannot again cut it, since the thread will not travel beyond the point at which it runs off to the subsequent reel; on the other hand, if the thread breaks between two reels, it is free to travel across the first of such reels until it again reaches the thread-severing device.

The thread now travels helically across the second reel, but in the reverse direction to that followed on the first reel, until it reaches the zone of contact of another disk 17. The action here is the same as in the preceding case and the thread is quickly and automatically removed and contacted with reel 3. This action continues in sequence until the thread is winding helically over each reel in turn and following a continuous path from the spin bath to the packaging device or other collecting location. When the thread is observed to be running onto the packaging device or to be otherwise collecting, the operator may shut off the motor which drives the thread-severing devices until such time as it is again necessary to set them in operation. Since one motor may drive a large number of jack shafts, each shaft carrying the thread-severing devices for each of the nine stages, more or less, involved in treating one thread, it is apparent that very little attention is required. Even this slight attention may be dispensed with if the thread-severing devices are left running at all times, as may be done where wear and power consumption are not great.

Referring now to Figures 3 and 4 of the drawings, there has been illustrated a preferred thread-severing device, although it will be understood that many other mechanisms may also be used for practicing the invention. In general outline, the device includes a rotatable shaft and driving means therefor, the shaft carrying radially disposed blades which constitute the thread-severing elements of the device. These blades are intended to be rotated in the same direction as that of the spinning reel adjacent which they are mounted, thus causing the blades to move in the opposite direction to the reel surface at the point of contact. These blades project between two disk-like plates, hereinafter called shrouds, one of which rotates with the shaft and the other of which is stationary, the purpose of the shrouds being to exclude thread ends from contact with moving parts of the wheel and prevent consequent clogging of the mechanism by a collection of these thread ends. The shrouds also aid in directing a stream of air, set up by the rotation of the blades, against the thread end which has been severed by these blades. The radially dis-

posed blades are mounted on a ring of flexible material, such as rubber, secured around the shaft by appropriate annular members, such resilient mounting being for the purpose of causing the heads of the blades to contact with the reel on which the thread to be severed is wound, with a somewhat yielding action which severs the thread but does not cause severe wear between the two oppositely rotating surfaces.

The mechanism consists of the spindle 42 carrying a pulley 43 rigidly mounted on the shank thereof against the button head 44, the belt 22 running over this pulley and one of the pulleys 23. At its other end the spindle carries a rotating shroud 45 held on the shaft by means of a nut 46 engaging with the threaded end of the spindle. A stationary shroud 47 is positioned back of the rotating shroud and has an annular portion 48 which surrounds the spindle for a portion of its length and has a threaded outer surface engaging with a threaded shoulder 49 on the bracket 18. The inner surface of the portion 48 surrounds and secures Babbit bearings 51 and felt oil retainers 52, in which the spindle 42 rotates.

The rotating shroud 45 and stationary shroud 47 are curved toward each other at the periphery of the disk to provide a narrow circumferential slot through which the radially disposed blades 63 project. A ring 53 of some resilient material, such as soft rubber, is positioned around the spindle 42, such ring being held within the space provided between an inner retaining cup 54 and an outer retaining cup 55. Both of these cups have flanges extending for a short distance radially along the blades to constitute a support for the latter at right angles to the axis of rotation for a portion of their length. The blades 63 are bent or formed at their inner ends to a right angle foot 56 adapted to rest on the ring 53, the blades being of such number and the feet of such width as to completely fill the inner circumference of the outer retaining cup 55 with approximately .002" to .003" clearance between each blade. The inner retaining cup 54 passes through the hole in the ring 53 and supports the ring against the blade feet.

The effect of this resilient mounting of the blades 63 is to permit a slight radial movement thereof inwardly toward the axis of the spindle and also a slight angular movement thereof along the periphery of the wheel so that the blades 63, when they encounter the surface of the spinning reel, tend to be pushed closer to the center of the wheel, due to the combined radial and angular motion made possible by the resilient mounting, and thus cause the wheel to yield somewhat as it contacts with the spinning reel, to reduce wear, while yet accomplishing effective severance of the thread on the reel. The slight clearance between the feet of the blades 63 allows freedom of motion for the angular movement of the blades as described. Adjustment of the degree of flexibility with which the blades are displaced upon contact with the reel may be had by varying the size of the cavity provided between the retaining cups 54 and 55 for a given amount of rubber or by varying the amount of rubber which is disposed in a cavity of given size, thus altering the pressure under which the rubber is retained and, consequently, the rigidity of the material. By proper proportioning of the amount of rubber with respect to the size of the cavity, any desired degree of flexibility may be obtained.

The outer ends of the blades 63 are bent or coined so as to form heads 57 which present cutting edges for the severance of the thread. A narrow slot is necessarily provided through which the blades 63 extend, this slot being located between the inwardly curved peripheries of the two shrouds. However, if no precautions were taken to prevent it, thread ends produced by the action of the wheel would pass through this slot and gradually build up around the rotating parts inside the mechanism so as to eventually clog the wheel. For this reason, the heads 57, extending parallel to the axis of the spindle 42, should overlie the inwardly curved edges of both shrouds in order to prevent thread ends from working into the center of the wheel. The wheel otherwise presents no parts which would tend to build up a mass of thread ends since the face of the rotating shroud 45 is practically flat and provides no exposed rotating surface on which a thread end can wind and cause trouble. The stationary shroud 47 presents no problem in this regard since it does not rotate and merely directs random ends of thread away from the blade slot between the two shrouds. The thread-severing devices thus require little attention during their operating life.

As the rotatable shroud 45 and the blades 63 rotate at a high rate of speed in the same direction as the rotation of the reel, causing the blades 63 to move in the opposite direction to the surface of the reel at the point of contact, considerable windage is set up which acts to blow away from the surface of the reel the free thread end which has just been formed by the action of the blades against the surface of the reel. Such windage may be found sufficient to effect removal of the thread or it may be desired to increase this windage by providing air passages 58 through which air will be sucked by the impeller action of the blades 63 and will pass between the two shrouds to be blown out through the blade slot at the periphery of the wheel. This provision increases the available windage and removes the thread more vigorously, if such more powerful action be necessary.

Since the thread-severing devices must operate in the presence of the liquid which is being showered upon the thread and reel, it is necessary to construct the devices so that the corrosive action of any chemicals in the liquid will not cause a breakdown. This may be done in the case of the radial blades 63 by making them of stainless steel when intended to be used in the presence of caustic reagents and of aluminum alloy for acid and all other baths. Other resistant material may, of course, be substituted. The same materials may be used for other exposed metallic surfaces, such as the rotating shroud, the retaining cups and the nut, all of which may be made of stainless steel or aluminum alloy or other resistant material. Stationary shroud 47 may be made of Bakelite or similar resin compound, which is resistant to corrosion but does not require to have the strength necessary in the material of the rotating parts. The assembly as a whole is screwed into the protective housing and bracket 18, as described, so that any members within the housing will be protected from the reagents and will not require to be made of resistant material. Thus, the spindle 42 may be made of common steel and the drive pulley 43 of fiber. Likewise, the belt 22 may be made of rubber composition or other material suitable for its function without regard

to its chemical-resisting properties, since the belt is also fully protected in the bracket.

In operation, jack shaft 24 drives pulleys 23 over which runs a belt 22 which, in turn, drives the spindle 42 of the transfer mechanism or wheel. This causes the rotatable shroud 45 and the radial blades 63 to rotate in opposition to the reel with which the mechanism contacts. As the heads 57 of the blades 63 strike the surface of the reel, they sever the thread which has reached or nearly reached the end of the reel and the thread end snaps away from the reel and into the air stream from the wheel. As the blades 63 contact with the reel, they are pushed back slightly by the friction and are thus angularly displaced so as to bring a given head 57 nearer to the axis of the wheel as it slides by the reel and thus reduce wear on the contacting surfaces. This action is possible due to the resilient mounting 53 for the blades. At the same time, air will be drawn in through the passages 58 and blown out between the shrouds 45 and 47 so as to increase the windage available for removing the thread.

After the thread has been caused to wind over all of the reels necessary in order that it may be properly treated and is being collected on a packaging device or otherwise, the series of thread-severing devices which have transferred the thread in turn from reel to reel are preferably stopped from rotating until another transfer is necessary. It might be expected that the wheels, permanently positioned adjacent the reels so as to sever the thread on such reels, would cause wear of the reel surface and blade heads since the spinning reel continues to rotate. Such wear is, however, negligible due to the fact that the negative clearance between reel and transfer device is very small, being only great enough to permit the blades 63 to sever a thread on the reel and even this slight contact is still further minimized due to the fact that the transfer wheels tend to come to rest in such a position that the lowermost point of the adjacent spinning reel lies in the space between two blades rather than against any one blade.

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. A device for transferring thread comprising a shaft, a hub on said shaft, outwardly extending inserts mounted in said hub and shrouds partially enclosing said inserts.

2. A device for transferring thread comprising a shaft, flanges on said shaft providing an annular space, resilient filling material in said annular space, metallic inserts mounted in said filling material extending radially outward from said shaft, and means for compressing said filling material.

3. A device for transferring thread comprising a shaft, a stationary shroud, a rotatable shroud, and thread-engaging members mounted between said shrouds.

4. Apparatus for transferring thread from a thread-storage, thread-advancing device, comprising a plurality of spaced transfer elements having at their extremities heads adapted to contact with the thread to be transferred in such manner that the thread to be transferred is engaged and severed.

5. Apparatus for transferring thread from a thread-storage, thread-advancing device comrising a plurality of transfer elements and resilient mounting means for said transfer elements, said resilient mounting means supporting said transfer elements in contact with the thread to be transferred in such manner that the thread to be transferred is engaged and severed.

6. Apparatus for transferring thread from a thread-storage, thread-advancing device comprising spaced shrouds, transfer elements disposed between said shrouds, and rotatable means supporting said transfer elements in contact with the thread to be transferred in such manner that the thread to be transferred is engaged and severed.

7. Apparatus for transferring thread from a thread-storage, thread-advancing device comprising a series of circumferentially arranged thread-engaging elements and, associated therewith, a body of elastic material disposed centrally of said circumferentially arranged elements, the extremities of said thread-engaging elements being adapted to contact with the thread-bearing surfaces of said thread-storage, thread-advancing device.

8. A device for transferring thread comprising a shaft, a hollow member on said shaft, resilient filling material in said hollow member, and, extending outward from said shaft, inserts mounted in said filling material.

9. A device for transferring thread comprising a shaft, an annular member on said shaft, and, resiliently mounted in said annular member in a manner permitting circumferential movement, a series of outwardly extending thread-engaging elements.

WALTER F. KNEBUSCH.
FOSTER F. HILLIX.