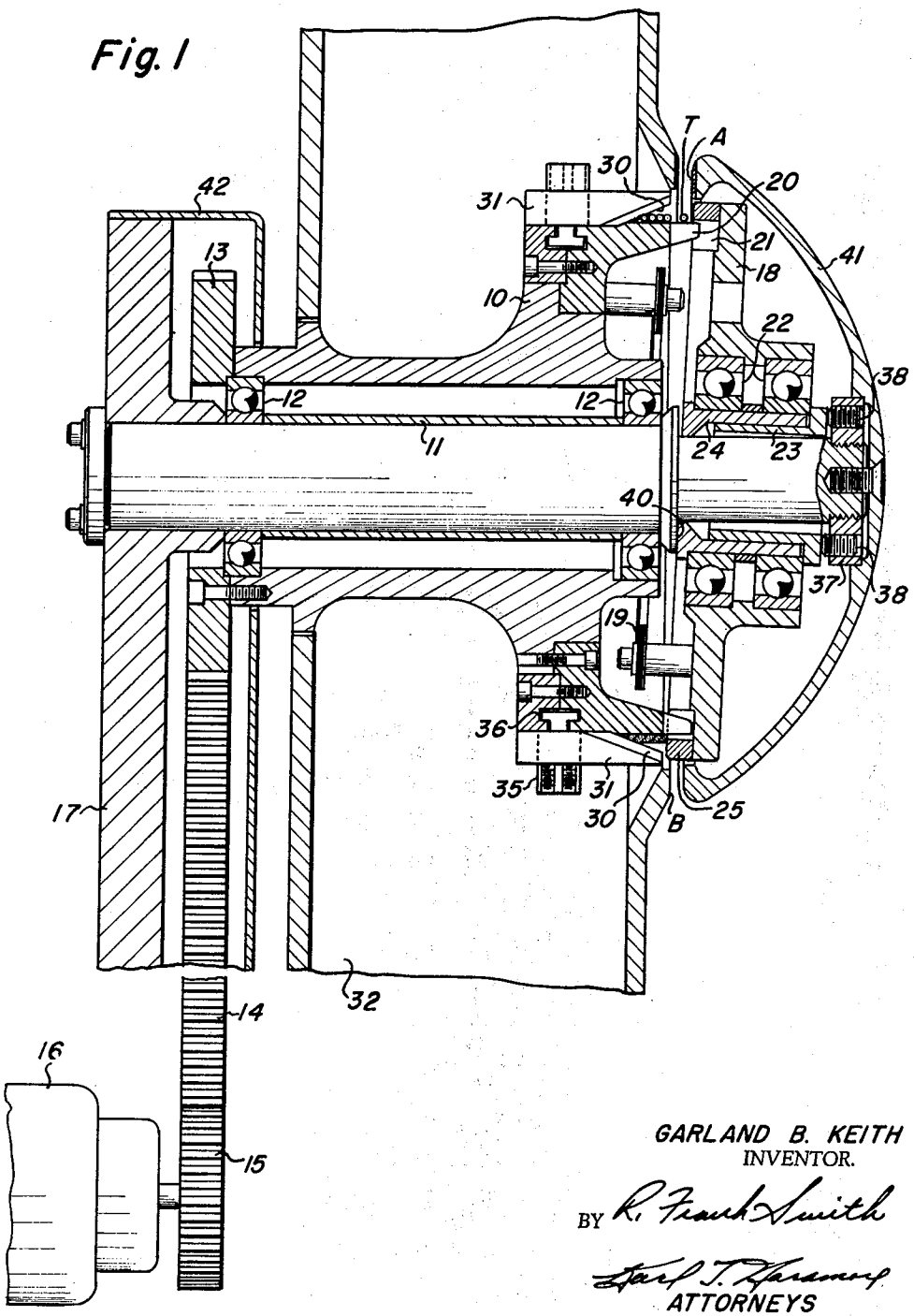
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APPARATUS FOR CUTTING TEXTILE FIBERS

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Fig. 1



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Fig. 2

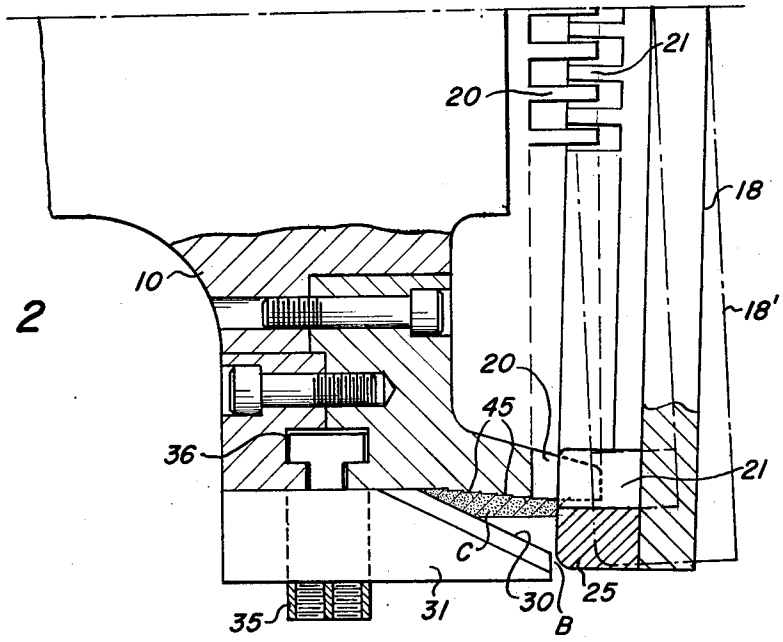
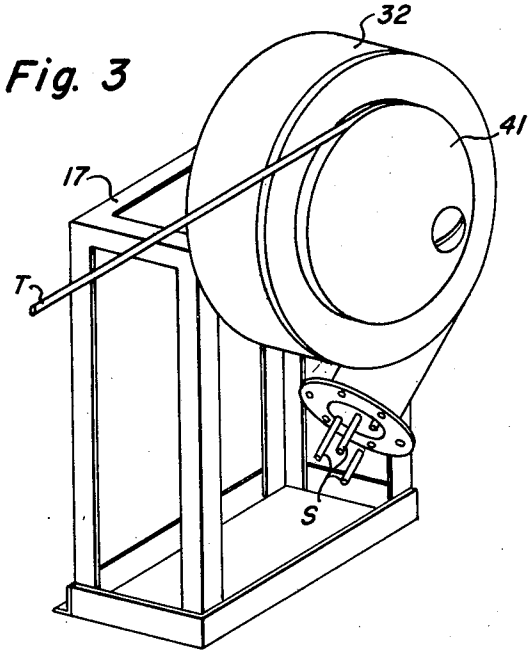


Fig. 3



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APPARATUS FOR CUTTING TEXTILE FIBERS

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This invention relates to the production of artificial textile staple fiber from a continuous tow, and more particularly to an apparatus for cutting textile fibers and similar materials which can be fed into it in rope-like form or tow.

One object of the present invention is to provide an apparatus for cutting into staple fiber of desired length any textile fibers which can be run in the form of a tow or continuous rope.

Another object of the invention is to provide a cutting apparatus of the type described by the use of which it is possible to cut staple fibers of varying lengths without changing machine settings.

And another object is to provide an apparatus of the type described by the use of which it is possible to cut many different lengths of staple fiber on the same machine with few adjustments.

And another object is to provide a staple fiber cutting apparatus which will positively eliminate uncut odd lengths of staple from the product.

Still other objects are to eliminate a major portion of the maintenance now encountered in conventional tow cutters, to extend the knife life because of longer usage before resharpening is necessary, to lower the horsepower and hence the space requirements of such cutting apparatus, to provide for easier threadup, and to decrease the initial cost of the cutting apparatus.

The novel features that I can consider characteristic of my invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its methods of operation, together with additional objects and advantages thereof, will best be understood from the following description of specific embodiments when read in connection with the accompanying drawings wherein:

FIG. 1 is a vertical cross section of a staple fiber cutting apparatus constructed in accordance with a preferred embodiment of the present invention;

FIG. 2 is an enlarged sectional detail of the lower portion of the apparatus shown in FIG. 1 where the tow is forced into a spiral pattern on the reel, and indicating the degree of thrust produced by the canted disk as well as a true view of the clearance between the fingers on the end of the reel and the fingers on the rim of the disk, and

FIG. 3 is a perspective view, on a reduced scale, showing the appearance of the complete cutting apparatus, and showing a tow being fed thereinto and cut staple fiber being discharged therefrom.

Essentially, the present tow cutting apparatus comprises a rotating reel onto the periphery of which a continuous tow is wrapped. Means associated, and rotating, with the reel forces the tow as it is wrapped on the reel into a spiral pattern and eventually after several turns of the reel a given wrap of tow is forced across the edges of a plurality of knives carried by, and spaced circumferentially of, the reel to cut the tow into staple fiber of desired length. After the tow is cut the staple fiber is flung by centrifugal force into a collector from which it is discharged. By adjusting the number and/or the relative spacing of the knives about the periphery of the reel staple fibers of any desired length can be readily obtained. So far as the cutting action of the knives is concerned, the tow is moved relative to the knives rather than vice versa, and since the tow is clamped between the reel

periphery and the knife edges until completely cut through there is no chance of random lengths of staple fibers being flung from the reel by virtue of the centrifugal force to which they are subjected.

Referring now to the drawings wherein a preferred embodiment of my tow cutting apparatus is shown, the objects of the invention are accomplished by feeding tow T to be cut into the opening A where it is wrapped on the end of a rotating reel or mandrel **10**, said reel or mandrel being rotatably mounted on fixed shaft **11** by virtue of bearings **12**. The reel can be driven by any suitable means such as a gear **13** fixed to the reel and driven through a chain or drive belt **14** engaging a gear **15** connected to the shaft of motor **16**. Shaft **11** is stationarily mounted in frame **17** and does not rotate.

Reel **10** is connected to disk **18** by a flexible coupling **19**, or other suitable means, so that the reel and disk rotate with spaced fingers **20** on the end of the reel and spaced fingers **21** on the disk always in mesh but never touching, see FIG. 2. Disk **18** is rotatably mounted on bearings **22** which are in turn mounted on canted sleeves **23** and **24** which rest against the end of shaft **11**. The disk **18** has an annular rim **25** which embraces the periphery at the end of the reel and which rim may be integral with fingers **21** on the disk, as shown, or may be separate therefrom. Disk **18** by virtue of being canted with respect to reel **10** gives a wide gap at A where the tow to be cut is fed in, but gives a narrow gap at B where the last wrap of tow laid on the reel periphery is engaged by the face of rim **25** and is forced into a spiral pattern on the reel with the successive wraps of tow being in a partially overlapping relation as shown at C in FIG. 2 to form what might be called a "shingled cake." But virtue of this axial thrust applied to the overlapped layers of tow at point B a given wrap of tow is eventually, or after several turns of the reel, shoved axially of the reel periphery and across the cutting edge **30** of a plurality of knives **31** where it is cut into staple fibers of a desired length. Cut staple S is flung by centrifugal force, or other means if necessary, into the collector chamber **32** where it is carried away by compressed air or a conveyor system.

Knives **31** are held secure to the reel by clamps **35** which are in turn held in T-shaped slots **36** running circumferentially of the reel and hence can be spaced at any desired intervals simply by adding or taking away knives from the clamps and/or adjusting the clamps in the T-shaped slots **36**. It will be noted that the cutting edges **30** of the knives intersect the reel periphery and form therewith a V-shaped crotch into which the wraps of tow are forced by the rim on canted disk **18**. When the wraps of tow are fed into these crotches those filaments which are not cut as they move into the crotches over the knife edges are gripped and prevented from escaping until they are cut into uniform lengths established by the knife spacing. The cant of disk **18** is controlled by set screw ring **37** and set screws **38** to accommodate various sizes of tow. Reel **10** and disk **18** are prevented from clashing at point B by the contact between the end of shaft **11** and sleeve **24** at point **40**. End cover **41**, drive cover **42** and collector housing **32** house the rotating assembly to make it safe to operate.

In the enlarged view of FIG. 2 the wraps of tow on the reel periphery are shown as they actually appear upon disassembling the machine while it is loaded. It will be noted that the wraps of tow are wrapped in a spiral overlapping relation, as shown at C, having been compressed and advanced along the reel periphery by engagement between the last laid down wrap and the face of rim **25** on disk **18**. These compressed overlapped layers of tow are sometimes referred to as a "shingled cake," as mentioned above, and the most efficient operation of the ap-

paratus depends upon the wraps of tow being compressed into this type of formation as it moves along the reel periphery into cutting position. The magnitude of advance of the wraps along the reel periphery per revolution of the reel is illustrated by the outline of disk **18** shown in phantom lines **18'** in FIG. 2. After the tow is cut it emerges in an uncompressed, or puffed up condition as cut staple S. To facilitate feeding of the wraps along the reel periphery and to prevent the resiliency of the compressed layers from causing back slip along the reel during that portion of the winding revolution when the canted disk **18** releases its pressure to again receive the tow at windon point A, the reel periphery is machined in steps **45** which are progressively smaller in diameter starting at the end of the reel. Stepping the periphery of the reel in this manner slightly loosens the "shingled cake" of tow to make it easier to slide along the reel surface as it reaches the cutting position, and provides a series of positive stops for preventing the compressed shingled cake from sliding back along the reel when said pressure is momentarily relieved therefrom. Actually the steps **45** are only in the order of 0.004 inch in height so that over the span of nine such steps the diameter of the reel periphery decreases by a total of 0.072 inch. However, in order to adequately illustrate the presence and purpose of these steps **45** in FIG. 2 it has been necessary to greatly exaggerate the size of the individual steps and consequently the change in diameter of the reel from the windon point to the point where the tow is cut and as a result of which it gives the appearance that the tow is capable of expanding, and actually does, by an appreciable extent in a direction radially of the reel whereas this is not actually the case.

This tow cutting apparatus presents many advantages over conventional cutters, some of which will now be mentioned specifically. This device is easy to thread up since one turn of the tow around the reel and it is threaded up. The tow is pulled in by the wrapping action of the reel and the end of the tow where the cut is made may be eight to ten turns from the windon point thus insuring that the end will never escape and the threadup will not be lost. The tow cannot pass through the machine without being cut because the several wraps of tow are pushed along the periphery of the reel as long as the tow is intact and it cannot escape until it has been freed by cutting. For this reason, tow characteristics will have no effect on the cutting action, hence all types of tow, including "dry" tow (tow without oil) can be cut with this device. Few, if any, conventional cutters will cut dry, hard tows satisfactorily. Tow can be cut in staggered, as well as equal, lengths at will since the knives are held in a circular T slot and can be readily adjusted in spacing as well as in number as desired. In this cutter the knife action is perfect for the reason that the tow is pushed parallel along the stationary knife edge to slice it.

While I have shown and described certain specific embodiments of my invention, I am aware that many modifications thereof are possible. My invention, therefore, is not to be limited to the precise details of construction shown and described but is intended to cover all modifications coming within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. An apparatus for cutting a tow of textile fibers into staple fiber of desired length comprising in combination a reel; means for rotating said reel; means for guiding a continuous length of tow onto the periphery of said reel near one end thereof to wrap it around said reel in juxtaposed layers; a plurality of knives fixed to said reel to rotate therewith and spaced circumferentially thereof in accordance with the length of staple fiber desired, said knives arranged so that the cutting edges thereof intersect the periphery of said reel at an acute angle and form a V into which the layers of tow on the reel are adapted to be moved to be cut; and means disposed at and embracing the end of said reel and rotated in synchronism therewith adapted to engage and force the tow as it is wrapped on said reels into a spiral pattern and push the layers of tow previously applied to the reel periphery axially of said reel and into the V formed between the knife edges and the reel periphery to cut the tow into staple fibers of desired length.

2. A tow cutting apparatus as set forth in claim 1, in which said last mentioned means includes a disk, an annular rim extending axially from one face of said disk and having an inside diameter slightly larger than the periphery of said reel, and means for rotatably mounting said disk in canted relation with said reel and with the rim embracing the periphery thereof whereby the edge of said rim is adapted to engage the last wrap of tow as it is laid on said reel periphery and push it and the preceding wraps of tow axially of the reel and along the cutting edge of the knives.

3. A tow cutting apparatus as set forth in claim 2, in which said disk is connected to said reel by a flexible coupling to be rotated by rotation of said reel.

4. A tow cutting apparatus according to claim 2, in which the end of said reel and the rim of said disk are provided with circumferentially spaced fingers which mesh without physical contact to prevent the tow from slipping off the end of said reel.

5. A tow cutting apparatus according to claim 2, in which the periphery of said reel is provided with steps of reduced diameter in a direction away from the end of said reel to prevent the layers of tow from back slipping toward the end of the reel due to their resiliency and loosening the layers of tow on the reel periphery as they approach the cutoff knives.

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