March 6, 1962 H. GLASTRA 3,023,656

CUTTING DEVICE

Filed Oct. 20, 1958

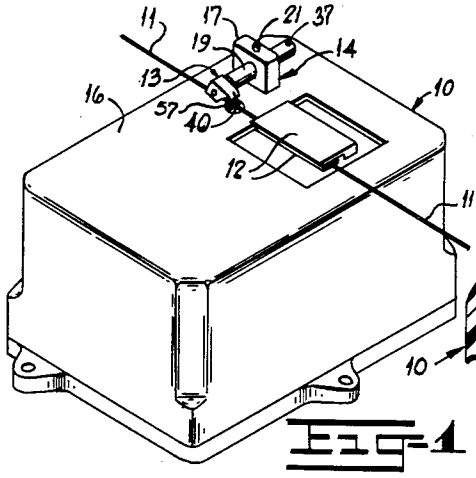


Fig-1

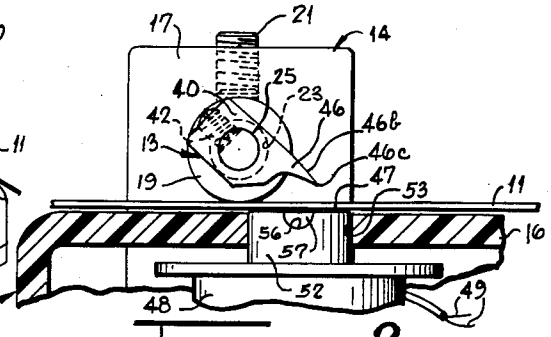


Fig-2

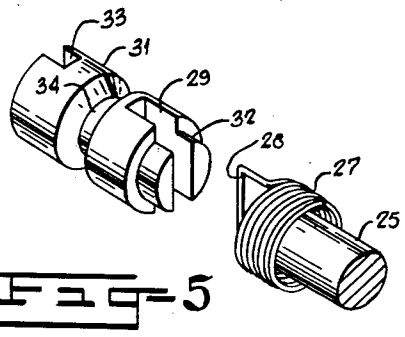


Fig-5

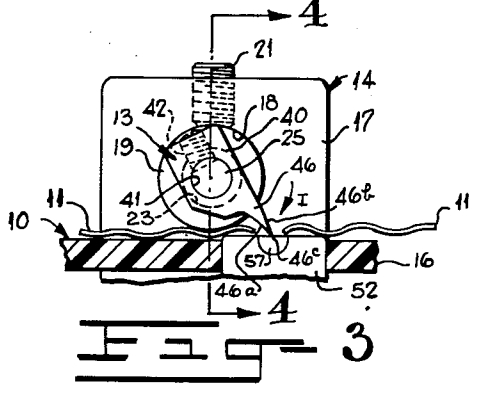


Fig-3

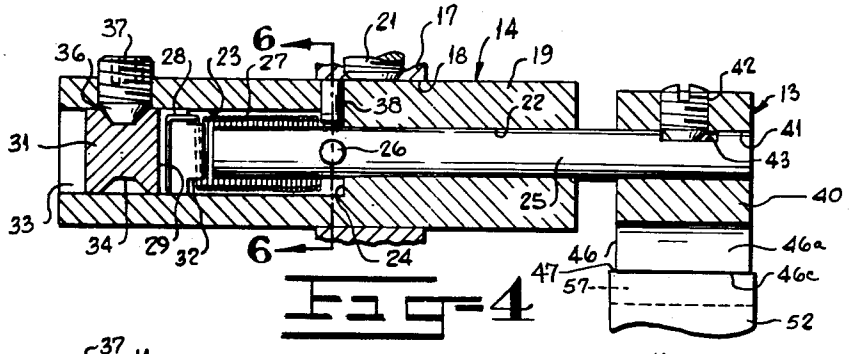


Fig-4

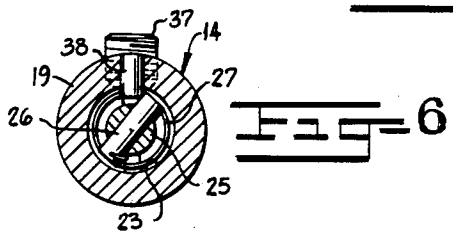


Fig-6

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3,023,656

CUTTING DEVICE

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This invention relates to the manufacture of textile material such as yarns or the like, and more particularly relates to a cutting device for severing textile yarn in response to a predetermined yarn condition such as the presence of defects and the like.

In the production of textile material such as yarns and the like, particularly where quality control is involved, it is a common practice to provide various devices for severing advancing yarn so as to permit correction of a particular yarn condition. For example, during the manufacture of yarns, yarn clearing or cleaning devices are widely employed which detect and provide for the elimination of yarn defects such as "slubs" which are present in the yarn at various stages of its manufacture.

The term "slub" has been used throughout the textile industry to denote a multitude of yarn conditions. However, it is used here in its most widely known sense to denote an undesirable thick or dense place in the yarn caused by improper drafting or the incorporation of a small mass of lint with the longer fibers forming the yarn. Such slubs are highly undesirable in that they reduce the quality of the yarn both in uniformity and strength.

Various means for slub detection and elimination in the manufacture of textile yarn have been employed which are commonly called "slub catchers." The detection and elimination of slubs is accomplished with these slub catchers, for example, during a yarn winding operation. In many instances, the slub catcher is mounted on a winder of the type employed to wind the yarn from one type of package into another type of package. By positioning the slub catcher between the supply package and the take-up package on the winder, the winding operation serves the dual purpose of winding the yarn into the desired package and permitting the slub catcher to detect and provide for the elimination of undesirable slubs. Various types of slub catchers, both mechanical and electrical, are employed to detect slubs in the yarn during a winding operation, many of which, upon detection, act to sever the yarn before the slub is wound into the take-up package on the winder. Upon discovery of the severed yarn, the winder attendant removes the slub from the yarn, reties the yarn minus the slub, thereby permitting the winder to resume its normal winding operation.

Slub catchers of the mechanical variety have long been in use in the art of yarn manufacturing. These mechanical slub catchers, in essence, provide a restricted opening having a cutting edge through which normal diameter yarn only will pass so that a slub engaging the restricted opening causes the yarn to be severed. The crudity of these mechanical devices is readily apparent and the lack of preciseness with which they operate leaves much to be desired.

In one type of electrically operated slub catcher, spaced capacitor plates are provided between which the yarn passes. The mass change in the yarn caused by the presence of a slub within the plates produces a change in the capacitance of the plates. This capacitance change produces an electrical signal which is utilized to perform a control function such as the actuation of a suitable yarn cutting device. As yarn being wound is generally traveling at a relatively high rate of speed, a yarn cutting device of the type utilized in such a slub catcher must be extremely sensitive and act with great speed in a positive manner so as to engage the yarn with the proper cutting

force following the detection of a slub. Yarn cutting devices presently available are subject to the accumulation of lint, dust and similar foreign particles so that they are prone to jam on occasion and consequently permit a yarn defect or slub to pass. Furthermore, even though these cutting devices receive an actuating signal, often sufficient force was not developed to completely sever the yarn and malfunctioning resulted or the response of the cutting device was delayed momentarily, permitting a yarn defect to pass prior to the cutting of the yarn.

Another major problem typical of the prior art cutting devices is their complicated construction and high cost which militated against their being incorporated in the small, neat, and compact construction so vital in the design of attachments for textile machinery wherein space is at a premium. In addition, the wide variety of yarn and similar material which such cutting devices might be called upon to sever is not acted upon similarly by the complex, non-adjustable type of yarn cutting device typical of the prior art so that uniformity of performance could not be obtained throughout the wide range of yarn sizes and materials processed.

One type of slub catcher which incorporates a cutting device such as that referred to above and which is of the electrical type is disclosed in the copending application of Hendrick Van Lingen et al. entitled, Apparatus for the Examination of Textile Thread, Serial Number 470,472, filed November 22, 1954 and now abandoned. This compactly arranged slub catched, which has met with outstanding commercial success, incorporates a cutting device which is constructed in accordance with the instant invention and utilizes spaced capacitor plates for accommodating the advancing yarn so that momentary mass changes of the yarn within the plates, which may be of the type caused by a slub, create an electrical impulse or signal which is employed to actuate the associated cutting device and sever the yarn.

With the above background material in mind, a primary object of the invention is to provide a new and novel cutting device for textile material such as yarn and the like.

Another object of the invention is to provide a new an improved cutting device for an electrically operated slub catcher which is compactly arranged as a component part of the slub catcher.

A further object of this invention is to provide a new and novel electrically operated yarn cutting device for slub catchers of the capacitor type which when actuated by the detection of a slub within the capacitor plates moves instantaneously into yarn severing action.

This invention further contemplates the provision of a new and improved cutting device for yarn which may be readily and compactly incorporated in an electrically operated slub catcher, which is substantially dust proof, is simple and inexpensive in construction, and which is capable of operating over an indefinite period of time without breakdown and with a minimum of wear.

Still another object of this invention is to provide a new and improved yarn cutting device for electrically operated slub catchers and the like which responds instantaneously to an actuating signal of relatively low power to move into yarn severing engagement with a maximum cutting force.

A still further object of this invention is to provide a new and improved cutting device for slub catchers and the like having a blade of such construction as to completely sever advancing textile material such as yarn without fail when actuated and which returns rapidly to the inoperative position with a readily adjustable force subsequent to each cutting operation.

In general, the objects of the invention and other re-

lated objects are accomplished by providing a cutting device for textile material such as yarn and the like which is arranged to be mounted on a compactly designed slub catcher of the capacitor type closely adjacent the slub detecting capacitor plates. The cutting device includes a cutting blade mounted for pivotal movement and normally positioned by adjustable urging means in spaced apart overlying relationship with a cutting surface to permit the passage of yarn therebetween. Electromagnetic means responsive to a signal generated by the presence of a slub within the capacitor plates are provided for pivotally moving the blade into yarn severing engagement against the cutting surface and in the specific embodiment illustrated, the cutting surface comprises a core operatively associated with the electromagnetic means.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds when taken in connection with the accompanying drawings, in which—

FIGURE 1 is a perspective view of an electrically operated slub catcher which incorporates a cutting device constructed in accordance with the present invention;

FIGURE 2 is an enlarged end view, partially in section, of the cutting device of the invention shown mounted on a slub catcher as in FIGURE 1 with the cutting blade in the inoperative or de-energized position;

FIGURE 3 is a view similar to FIGURE 2 showing the cutting blade in the operative or yarn cutting position;

FIGURE 4 is a sectional view taken substantially along line 4—4 of FIGURE 3 in the direction of the arrows;

FIGURE 5 is an enlarged perspective view of a portion of the cutting device of FIGURE 1; and

FIGURE 6 is a sectional view taken substantially along line 6—6 of FIGURE 4 in the direction of the arrows but with the moving parts shown arranged in the inoperative position of FIGURE 2.

Referring now to the drawing and particularly to FIGURE 1, the numeral **10** broadly indicates an electrically operated slub detector or slub catcher of the capacitor type which is disclosed and claimed in the above-mentioned Van Lingen et al. copending patent application. The unit **10** may be mounted on any conventional type of textile apparatus such as a drum winder or spindle winder wherein yarn is wound from one package onto a holder to form another package. The winder has not been shown for the purpose of clarity.

A slub catcher of this type is generally associated with each spindle on the winder and one of the slub catchers is therefore positioned between each supply package and take-up holder or bobbin on the winder. With this arrangement, each end of yarn **11** being wound advances between a pair of capacitor plates **12** and under the cutting blade designated generally by the numeral **13** of a cutting device broadly indicated by the numeral **14** in its path of travel from the supply package to the take-up yarn holder. Both the capacitor plates **12** and the cutting device **14** are positioned on the upper surface of the slub catcher top wall **16** in any suitable manner as shown and the advancing yarn **11** is preferably maintained in spaced relationship with the fixed parts to reduce friction and the like. As is well known, the take-up yarn holders of winders in general are driven by any suitable means so as to pull the yarn from the supply package which is supported so as to rotate freely under the pulling action exerted on the yarn by the take-up yarn holder.

Referring now to FIGURES 1, 4, the cutting device **14** comprises supporting means such as a stand or post **17** which is fixedly positioned within the slub catcher **10** in any suitable manner so as to project upwardly as shown through the slub catcher top wall **16**. The post **17** is provided with a bore or opening **18** extending therethrough as shown best in FIGURE 4 and the bore is suitably dimensioned so as to accommodate an elongated bearing housing **19**.

The bearing housing **19** is preferably circular in cross-section and is arranged to be held securely within the post opening **18** in any adjusted rotary position by means such as a set screw **21**. The bearing housing **19** is provided with a central bore **22** having an enlarged portion **23** to thereby form an annular shoulder **24**. As shown best in FIGURE 4, the bearing housing bore **22** is arranged to rotatably accommodate an elongated stub shaft or spindle **25**. The spindle **25** is positioned within the bearing housing **19** as shown in FIGURE 4 and axial movement of the spindle to the right as viewed in FIGURE 4 is limited by means of a pin **26** (FIGURE 6). The pin **26** is suitably secured to the spindle **25** such as by extending transversely therethrough so that it abuts the shoulder **24** within the bore **22**.

Means have been provided for urging the spindle **25** to a predetermined rotary position and as shown in FIGURE 4, a coil spring **27** has been provided, which is positioned in encircling relationship with the spindle. One end of the spring **27** is fixedly secured to the spindle pin **26** as shown in FIGURE 6 in any suitable manner such as by welding or the like. The opposite end of the spring **27** is formed with a transversely extending hook **28** which is arranged to be inserted within a slot **29** formed in one end of an adjusting member **31** suitably dimensioned so as to be loosely fitted within the enlarged bore portion **23** of the bearing housing **19**.

The adjusting member **31** is provided at one end with an axially extending portion of reduced diameter **32** which is inserted within the free end of the coil spring **27** when the adjusting member **31** is in the position of FIGURE 4 and thus permits the spring hook **28** to be inserted within the adjusting member slot **29**. The other end of the adjusting member **31** is provided with a slot **33** (FIGURE 5) into which a suitable tool such as a screw driver or the like may be inserted for rotating the adjusting member **31** to a selected rotary position. The adjusting member **31** is also provided with a peripheral groove **34** for accommodating the inner end **36** of a set screw **37** positioned for radial movement as shown in the bearing housing **19** so that the adjusting member **31** may be secured fixedly in the selected rotary position.

In order to limit the rotation of the spindle **25** to a predetermined position in one direction, namely in a counterclockwise direction as viewed in FIGURE 2, a radially extending stop pin **38** is positioned within the bearing housing **19** and is suitably located as shown in FIGURE 6 so that when the spindle **25** has moved to the predetermined counterclockwise position, the spindle pin **26** will engage the pin **38** which therefore serves as a check member or stop for restraining the spindle **25** against further rotation.

In order to mount the cutting blade **13** on the forward or outer end of the spindle **25**, the blade is provided with a body portion **40** containing a central bore **41** which is arranged to snugly receive the outer end of the spindle **25**. The blade **13** is fixedly secured to the spindle **25** by means of a set screw **42**, the inner end of which cooperates with a keyway **43** formed on the spindle as shown.

In order to provide a yarn cutting edge on the cutting blade **13**, which in the specific embodiment is formed of a magnetic material such as steel, the blade contains a tooth **46** formed integral with the blade body portion **40** as shown best in FIGURE 2. In order to obtain the desired yarn cutting effect by the blade **13**, the tooth **46** is provided with a sharpened edge **46*c*** which can be formed as shown by grinding or machining an arcuate surface **46*a*** on the underside of the tooth and similarly forming an angularly disposed, substantially flat surface **46*b*** on the upper surface of the tooth.

As will be explained hereinafter, it is highly desirable that as much mass of material as possible be provided in the blade **13** with the specific construction illustrated in order to obtain the optimum yarn cutting action. Furthermore, the arcuate surface **46*a*** extends rearwardly of the

edge 46c for a limited distance only so as to retain a large mass of blade material adjacent the cutting edge 46c.

Referring now to FIGURE 2, the cutting blade 13 is shown in inoperative position wherein the spindle 25 has been rotated under the action of the spring 27 until the spindle pin 26 strikes the stop pin 38. It should be understood that the spring 27 is placed in the tensioned position by means of the adjusting member 31 which has been rotated to a selected rotary position carrying with it the spring hook 28 whereby sufficient tension for operation of the cutting device 14 is developed in the spring 27.

Means have been provided upon the detection of a slub for actuating the cutting device 14 and moving the cutting blade 13 in a colckwise direction as indicated by the arrow I in FIGURE 3 into yarn severing action against a cutting surface designated by the numeral 47. More specifically, electrically operated means such as an electromagnet, designated by the numeral 48 in FIGURE 2, is positioned within the slub catcher housing 10 and is suitably connected electrically by means of conductors 49 to control means such as the slub responsive means of the above discussed slub catcher. As discussed in the above mentioned patent application, an electrical signal is produced within the circuit of the slub catcher which momentarily energizes the coil of the electromagnet 48 through the conductors 49 and as this will be well understood by reference to such copending application, no further discussion of the circuit will be made herein.

As previously discussed, the cutting blade 13 is arranged to move downwardly into engagement with a cutting surface 47 as shown in FIGURE 3 and which, in the specific embodiment illustrated, comprises the upper face of a cylindrical core 52 associated in the well-known manner with the electromagnet 48. As shown in FIGURES 2, 3, the electromagnet core 52 extends upwardly through an opening 53 in the slub catcher top wall 16 so that its upper face or cutting surface 47 lies in a substantially horizontal plane below the blade 13 and the blade tooth 46, in spaced relationship therewith, when the blade is in the inoperative position of FIGURE 2 to permit the passage of the yarn 11 therebetween as shown. When the electromagnet 48 is energized, the core 52 exerts a magnetic force of attraction on the magnetic material of the cutting blade 13 so as to pivot the cutting blade in a clockwise direction into striking engagement with the core face 47 and sever the yarn passing thereover.

As previously explained, the balde 13 is preferably composed of a relatively large mass of steel so as to be readily attracted by the magnetic lines of force developed by the core 52. It can be seen that the blade tooth 46 not only cuts the yarn but a "tearing" action on the yarn is obtained as the yarn being wound is pulled by the wind-up mechanism (not shown) against the tooth edge 46c. The tooth 46 is therefore also of a relatively large mass in order to obtain not only a positive cutting action on the yarn 11 but to insure that this desired yarn tearing action is obtained. To this end, the surfaces 46a, 46b are relatively short in order to limit removal of the material from the tooth 46 and are provided primarily to give the necessary degree of sharpness to the tooth cutting edge 46c.

Any other suitable arrangement may be employed for providing a sharpened cutting blade edge such as by securing a relatively thin plate or the like having a sharpened forward edge along the blade upper surface which contains the flat surface 46b. The tooth 46 may be thickened somewhat without sharpening and the plate is positioned so that its sharpened edge projects slightly outward from what was formerly the sharpened edge 46c.

Another outstanding feature of the invention may be understood by reference to FIGURE 1 as it can be seen that the yarn 11 passing over the electromagnet core face 47 does not necessarily maintain the same lateral position during such advance. In other words, vibrations and the like of the yarn 11 cause the yarn to move throughout a wide range of lateral positions relative to the center of the core face 47. However, by providing a substantially straight cutting edge 46c on the blade tooth 46 which extends parallel to the core face 47, a positive yarn severing action will be obtained in each case regardless of the lateral position of the yarn relative to the core face 47. In other words, the entire tooth edge 46c will strike the core face 47 in the cutting position and any tendency of the yarn 11 to slide laterally outward such as would occur when the tooth edge 46c is canted or forms with the core face 47 what might be described as a wedge-shaped opening, is eliminated.

It can be seen that when utilizing an electromagnet to actuate the pivotal movement of blade 13, the de-energization of the electromagnet would of course collapse the magnetic field produced but sufficient residual magnetism could be retained on occasion in the core 52 so as to hold the blade 13 in the cutting position with the tooth 46 against the core face 47. Means therefore have been provided for securing positive release of the blade 13 and permitting it to return to the inoperative position of FIGURE 2 immediately following de-energization of the electromagnet 48.

As shown in FIGURES 2, 3, the circular core face 47 is provided with a groove 56 preferably extending diametrically thereon in which is positioned a strip 57 composed of a suitable nonmagnetic, wear resistant material such as copper, plastic, and the like. This strip 57 is positioned so as to engage the entire length of the tooth cutting edge 46c and therefore forms a surface against which the tooth cutting edge will strike as it moves into engagement with the core face during the movement of the blade 13 into a yarn cutting position of FIGURE 3. Since this strip 57 is composed of a nonmagnetic material, no residual magnetism is retained by the strip and no holding force is exerted on the blade 13 which might retain the blade tooth 46 against the core face after the electromagnet 48 is de-energized. Furthermore, as it is desirable to maintain a sharp blade edge 46c, the relatively soft copper strip prevents undue wear of the edge reducing the frequency with which the edge must be sharpened.

It has been found in practice that the operation of the blade 13 is most satisfactory from the standpoint of retaining magnetism if the steel of which the blade is composed is relatively low in carbon content or is what may be termed "carbon poor." The smaller the amount of carbon in the steel the less magnetism the blade 13 will retain.

In the operation of a slub catcher of the type shown in FIGURE 1, the cutting device 14 is preferably calibrated for operation in accordance with the magnetic force produced by the electromagnet core 52. To this end, the set screw 37 is released so that the adjusting member 31 may be rotated and the coil spring 27 suitably tensioned so as to urge the spindle pin 26 against the bearing housing stop pin 38 with a predetermined force. To accomplish this adjustment, a suitable tool may be inserted within the slot 33 of the adjusting member 31 and it is rotated to a selected position as described above whereupon the set screw 37 is then tightened to securely hold the member 31 in the adjusted position.

Upon the actuation of the eletctromagnet 48 by means of the current transmitted through the conductors 49, the magnetic action of the core 52 pivots the cutting blade in a clockwise direction against the urging force of the loading spring 27 into yarn severing engagement against the cutting surface 47 and when the electromagnet force is de-energized, the cutting blade 13 is quickly brought back to the inoperative position of FIGURE 2 by means of the spring 27.

Although the invention has been particularly described in association with a slub detector or slub catcher of the type disclosed in the above-mentioned application, it should be understood that the novel cutting device of the invention is not limited to slub catchers only but may be

employed for yarn severing action in response to any suitably generated signal.

It can be seen with the novel construction of the invention that a compact, inexpensively constructed, and reliable yarn cutting device for textile material such as yarn and the like has been provided which may be actuated into yarn cutting engagement by relatively small and rapid electrical impulses but which produces a relatively large cutting force. Not only is the cutting device of the invention positively acting upon actuation to sever yarn traveling at high speeds without fail during each operation but it responds with extreme rapidity so that although the knife is located closely adjacent to a signal generating device such as the capacitor plates of an electrically operated slub catcher between which the yarn is advancing, it is virtually impossible for the advancing yarn to travel any appreciable distance after the signal is produced and possibly avoid severance. The cutting device contains a blade which may be operated a relatively large number of strokes without the need for sharpening and is provided with means for positively and quickly returning the blade to the inoperative position after the cutting action is completed. The cutting blade is normally maintained in the inoperative position and readily adjustable means are provided with the novel construction of the invention which permit the force required to move the blade downwardly and consequently the force returning the blade to its inoperative position to be easily pre-set. Furthermore, the novel construction of the invention permits the position of the cutting blade to be preset so that the distance the cutting blade is required to travel prior to severing engagement with the yarn may be also predetermined. The cutting device of the invention lends itself readily to many types of textile apparatus with very little additional cost and may be used in conjunction with a wide variety of signal generating means.

In the drawings and specification there has been set forth a preferred embodiment of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claims.

I claim:

1. A cutting device for textile material such as yarn and the like comprising, in combination, a selectively rotatable bearing housing having a central bore, an upstanding post arranged to support said bearing housing for adjustable rotary movement, means on said post for releasably retaining said bearing housing in a predetermined rotary position, a spindle rotatably supported in the bore of said bearing housing and having an end portion extending outwardly therefrom, cooperating check members on said spindle and said bearing housing for limiting the extension of rotation of said spindle in one direction, a coil spring within the bore of said bearing housing, said spring surrounding a portion of said spindle and having one end fixed thereto, an adjusting member rotatably mounted in the bore of said bearing housing, said adjusting member being connected to the other end of said spring, said spring being tensioned to urge said spindle to rotate in said one direction against said check members, means for releasably retaining said adjusting member in a selected rotary position in said bearing housing to predetermine the urging force of said spring, a cutting blade of magnetic material fixedly mounted on said outwardly extending end portion of said spindle for rotation therewith, said blade being normally maintained in an inoperative position defined by the limit of rotation of said spindle in said one direction imposed by said check members, a tooth on said cutting blade, a cutting edge on said tooth, an electromagnet disposed beneath said cutting blade, said electromagnet having a core presenting a substantially flat end face in alignment with the tooth on said cutting blade, said tooth being positioned in spaced relationship with respect to the flat end face of said core when said blade is disposed in inoperative position to permit the yarn to pass therebetween, the flat end of said core defining a yarn cutting surface, means to actuate said electromagnet for energizing said core to magnetically attract said blade, and said blade and said spindle rotating about their respective axes in the opposite direction from that imparted by said spring in response to the energization of said core to move the cutting edge of said tooth into yarn severing engagement against the flat end face of said core.

2. A cutting device in accordance with claim 1 wherein the flat end face of said core includes an inert of non-magnetic material, said insert being positioned to receive the cutting edge of said tooth when the cutting edge is moved into yarn severing engagement against the flat end end face of said core.

References Cited in the file of this patent

UNITED STATES PATENTS

918,813	Armstrong	Apr. 20, 1909
1,958,132	Davis	May 8, 1934
2,186,884	Shoemaker	Jan. 9, 1940
2,543,596	Penn	Feb. 27, 1951