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YARN CUTTING AND CLAMPING MECHANISM

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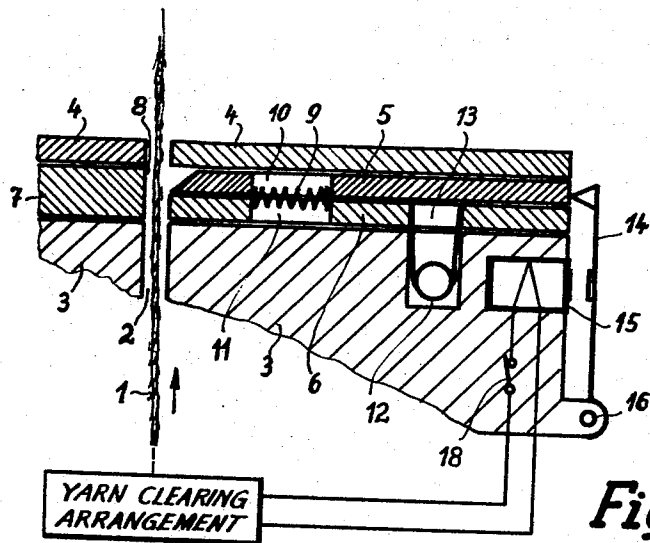


Fig. 1

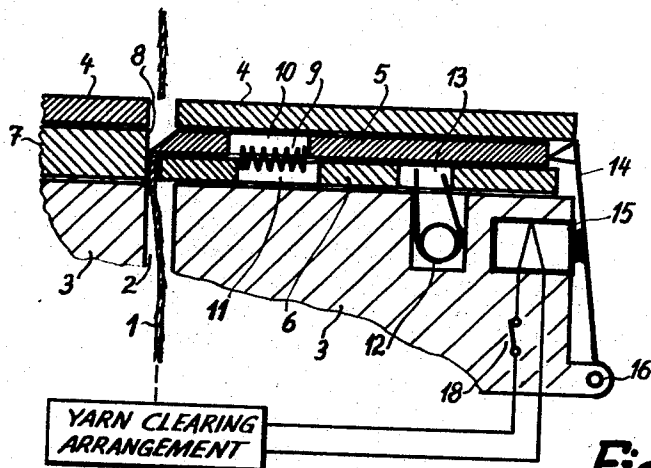


Fig. 2

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YARN CUTTING AND CLAMPING MECHANISM
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This invention relates to yarn clearing and spooling arrangements and, more particularly, to a novel and improved yarn cutting and clamping mechanism for such arrangements.

It is conventional to provide winding machines and similar yarn-processing apparatus with yarn-clearing arrangements for removing impurities, slubs or the like from the yarn. This removal is effected by cutting the yarn at the defective location and then piecing together the resulting ends. Devices have been developed wherein the separated yarn ends are automatically gripped and fed to a knotting apparatus. This makes it necessary that parts of the two yarn ends are always at a predetermined location so that the yarn ends can be presented to gripping elements at said location. In high-speed electronic yarn-clearing arrangements through which the yarn passes at a high speed, the end of the yarn cut at the clearing arrangement may snap back so that the respective gripping device cannot locate the yarn. In some machines, this causes the gripping mechanism to act as if the supply of yarn to be unreeled were exhausted and a bobbin change is initiated which, in fact, is not necessary.

In co-pending U.S. patent application, Ser. No. 423,756, filed Jan. 6, 1965, for "Yarn Cutting and Clamping Means and Yarn-Clearing Arrangements," there is disclosed a device for clamping yarns, in yarn-clearing arrangements on winding machines and the like, wherein a cutting member forming part of the yarn-clearing arrangement cuts the yarn on receipt of a cutting impulse and wherein, at the moment when the yarn is cut, the end of the yarn moving toward the cutting location is firmly clamped.

In the device shown in said U.S. patent application, the cutting and clamping operation is only triggered electromagnetically, with the actual cutting and clamping being effected purely mechanically. Thus, the cutting and clamping device is actuated due to the initial tension of a spring and, during the subsequent re-setting, this spring is re-tensioned by a mechanical movement. While this device is satisfactory in operation, it has certain disadvantages which detract somewhat from its commercial practicability.

For example, the arrangement shown in said U.S. patent application is relatively expensive to construct. An additional disadvantage is that a mechanical resetting means, which is not influenced by the cutting device, must be provided to release the clamping action. This separation of the cutting means and the clamping means, and particularly the provision of the mechanical resetting means, contributes considerably to the construction expense. A further disadvantage is that the severed yarn end is clamped until the engaging mechanism for the spooling device is actuated.

An object of the present invention is to provide in a yarn-clearing arrangement, yarn cutting and clamping mechanism including yarn cutting means, yarn clamping means, means selectively operable to actuate the cutting means to cut yarn, and means operatively associated with the cutting means and the clamping means and operable, simultaneously responsive to actuation of the cutting means, to actuate the clamping means.

Another object of the invention is to provide, in yarn-clearing arrangements or the like, yarn cutting and clamp-

ing mechanisms including electromagnetic means for operating a yarn cutting and clamping means in such a manner that the yarn first is cut by the cutting means and then is clamped by the clamping means for as long as the electromagnetic operating means remains energized.

A further object of the invention is to provide, in a yarn-clearing arrangement or the like, yarn cutting and clamping mechanism including yarn cutting means and yarn clamping means, electromagnetic means selectively operable to actuate the cutting means to cut yarn, and means operatively associated with the cutting means and the clamping means and operable, simultaneously responsive to actuation of the cutting means, to actuate the clamping means.

Yet another object of the invention is to provide, in a yarn-clamping arrangement or the like, yarn cutting and clamping mechanism in which a cutting means is actuated by an electromagnetic operating means which then exerts the force for maintaining the clamping mechanism actuated.

Still a further object of the invention is to provide, in a yarn-clearing arrangement or the like, yarn cutting and clamping mechanism including yarn cutting means and yarn clamping means, and in which the duration of the clamping may be selected as desired.

Still another object of the invention is to provide, in a yarn-clearing arrangement or the like, yarn cutting and clamping mechanism including electromagnetic means for actuating the yarn cutting means and for maintaining the yarn clamping means actuated to clamp the severed yarn until a known gripping means has gripped the severed yarn.

Still a further object of the invention is to provide, in a yarn-clearing arrangement or the like, yarn cutting and clamping mechanism including yarn cutting means and yarn clamping means, and electromagnetically energized means for actuating the cutting means and for maintaining the clamping means actuated to clamp the severed yarn at least until the yarn has become steadied following the sudden interruption of its movement.

For an understanding of the principles of the invention, reference is made to the following description of a typical embodiment thereof as illustrated in the accompanying drawings.

In the drawings:

FIG. 1 is a partial sectional view illustrating the yarn cutting and clamping mechanism of the invention as incorporated in a yarn-clearing arrangement, the cutting and clamping mechanism being shown in the inactive or rest position; and

FIG. 2 is a view similar to FIG. 1, but illustrating the cutting and clamping mechanism immediately after actuation thereof.

Referring to FIG. 1, the yarn 1 traverses the active part of a known or conventional yarn cleaner. In traversing the yarn cleaner, the yarn travels upwardly through a slot 2 which extends through both of the housing parts 3 and 4 and also through the cutting and clamping zone disposed therebetween. The cutting and clamping zone contains the yarn cutting and clamping mechanism of the invention.

Referring to FIG. 2, on one side of the slot 2 there are disposed a cutting knife 5 and a clamping slide 6, the cutting knife 5 being provided with a bevelled yarn cutting edge. On the other side of the slot 2 there is disposed a stationary counter-support or block 7 having a pressure surface 8 facing the slot 2 and engageable by the ends of the cutting knife 5 and the clamping slide 6.

Knife 5 and slide 6 are mounted in housing parts 3 and 4 for easy lateral displacement both individually and conjointly. Relative displacement of knife 5 and slide 6 is limited by a compression spring 9 which is disposed in

superposed recesses 10 and 11, one in knife 5 and the other in slide 6. The arrangement is such that, in the rest position illustrated in FIG. 1, the cutting edge of knife 5 and the clamping surface of slide 6 are substantially flush.

As stated, knife 5 and slide 6 are constrained into a preset relative position by means of the compression spring 9. The conjoint position of knife 5 and slide or clamp 6 in housing parts 3 and 4 may be determined, for example, by a spring 12. Spring 12 is mounted in a recess in housing part 3 and has arms extending into a recess or aperture in slide 6. When displacement forces are exerted on slide 6, one or the other of the arms of spring 12 is tensioned. The arrangement is such that, in the rest or inactive position shown in FIG. 1, slide 6 and knife 5 assume the position illustrated therein, under the influence of the springs 9 and 12.

An armature 14 is operatively associated with the outer end of knife 5. Armature 14 is swingably mounted on a pivot 16 on housing part 3, and is within the magnetic field of an electromagnet 15. When electromagnet 15 is energized, it attracts armature 14 and thus moves the same to the left. The electromagnet 15 is energized responsive to a cutting pulse, and armature 14 pushes knife 5 to the left so that the cutting edge of knife 5 severs yarn 1 against pressure surface 8. At the same time, clamping slide 6 is moved to the clamping position by means of the pressure of compression spring 9 so that its clamping surface presses the yarn 1 or, respectively, the part thereof running toward the cutting station, against pressure surface 8.

This movement of the members 5 and 6 tensions one of the arms of spring 12, as illustrated in FIG. 2. When armature 14 is released from electromagnet 15, the tensioned arm of spring 12 moves clamping slide 6 to the right and, through the medium of compression spring 9, also moves knife 5 to the right and into the rest position illustrated in FIG. 1. The dropping of armature 14 results in compression spring 9 equalizing the displacement between knife 5 and slide 6 resulting from the thickness of the clamped or cut yarn.

The interval of time between the impingement of armature 14 against knife 5, or, respectively, the cutting and clamping operation under the action of cutting pulse until the dropping of armature 14 resulting in cancellation of the clamping action, can advantageously be determined by opening of an external contact 18 included in the energized circuit of electromagnet 15. It is also advantageous if, after the decay of the cutting pulse, electromagnet 15 releases armature 14 only after a given time delay, to let clamping slide 6 return to its rest position. The release time of armature 14 can be set in a manner known to those skilled in the art.

Operation of the cutting and clamping means is effected, in the usual manner, by a pulse or signal from the yarn-clearing arrangement which, through the illustrated circuit, energizes the electromagnet 15. Such energization may be momentary or may be maintained for a predetermined period.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the principles of the invention, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. In a yarn-clearing arrangement including a slot through which the yarn runs, yarn cutting and clamping mechanism comprising, in combination, a counter member positioned at one side of said slot; a relatively elongated yarn cutting knife movable across said slot to sever yarn against said counter member; a relatively elongated yarn clamping slide movable across said slot to clamp severed yarn against said counter member; means biasing said knife and said slide to a retracted position relative to said slot; electromagnetic means selectively op-

erable to reciprocate said knife across said slot to sever yarn against said counter member; said knife and said slide being arranged in superimposed relation and each having a recess therein congruent with the recess in the other; a compression spring engaged in both recesses and normally constraining said knife and said slide to a position which said recesses are aligned; said spring, responsive to reciprocation of said knife, reciprocating said clamping slide to clamp the severed yarn against said counter member; a second recess formed in said clamping slide; and spring means mounted in said yarn-clearing arrangement and engaged in said second recess and normally constraining said clamping slide to a retracted position; said spring means being tensioned responsive to movement of said clamping slide to the clamping position and, responsive to de-energization of said electromagnetic means, restoring said clamping slide to the retracted position; said compression spring, responsive to movement of said clamping slide to the retracted position, moving said cutting knife to the retracted position.

2. In a yarn-clearing arrangement including a slot through which the yarn runs, yarn cutting and clamping mechanism comprising, in combination, a counter member positioned at one side of said slot; a relatively elongated yarn cutting knife movable across said slot to sever yarn against said counter member; a relatively elongated yarn clamping slide movable across said slot to clamp severed yarn against said counter member; means biasing said knife and said slide to a retracted position relative to said slot; electromagnetic means selectively operable to reciprocate said knife across said slot to sever yarn against said counter member; said knife and said slide being arranged in superimposed relation and each having a recess therein congruent with the recess in the other; a compression spring engaged in both recesses and normally constraining said knife and said slide to a position in which said recesses are aligned; said spring, responsive to reciprocation of said knife, reciprocating said clamping slide to clamp the severed yarn against said counter member; a second recess formed in said clamping slide; spring means mounted in said yarn-clearing arrangement and engaged in said second recess and normally constraining said clamping slide to a retracted position; said spring means being tensioned responsive to movement of said clamping slide to the clamping position and, responsive to de-energization of said electromagnetic means, restoring said clamping slide to the retracted position; said compression spring, responsive to movement of said clamping slide to the retracted position, moving said cutting knife to the retracted position; said electromagnetic means comprising an electromagnet and an armature movable toward and away from said electromagnet; and means movably mounting said armature; said armature being engaged with an end of said cutting knife whereby, upon energization of said electromagnet, said armature is attracted toward said electromagnet to reciprocate said cutting knife to the cutting position.

3. In a yarn-clearing arrangement including a slot through which the yarn runs, yarn cutting and clamping mechanism comprising, in combination, a counter member positioned at one side of said slot; a relatively elongated yarn cutting knife movable across said slot to sever yarn against said counter member; a relatively elongated yarn clamping slide movable across said slot to clamp severed yarn against said counter member; means biasing said knife and said slide to a retracted position relative to said slot; electromagnetic means selectively operable to reciprocate said knife across said slot to sever yarn against said counter member; said knife and said slide being arranged in superimposed relation and each having a recess therein congruent with the recess in the other; a compression spring engaged in both recesses and normally constraining said knife and said slide to a position in which said recesses are aligned; said spring, responsive to reciprocation of said knife, reciprocating said clamping

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slide to clamp the severed yarn against said counter member; a second recess formed in said clamping slide; spring means mounted in said yarn-clearing arrangement and engaged in said second recess and normally constraining said clamping slide to a retracted position; said spring means being tensioned responsive to movement of said clamping slide to the clamping position and, responsive to de-energization of said electromagnetic means, restoring said clamping slide to the retracted position; said compression spring, responsive to movement of said clamping slide to the retracted position, moving said cutting knife to the retracted position, said electromagnetic means comprising an electromagnet and an armature movable toward and away from said electromagnet; means movably mounting said armature; said armature being engaged with an end of said cutting knife whereby, upon energization of said electromagnet, said armature is attracted toward said electromagnet to reciprocate said cutting knife to the cutting position; an energizing circuit for said electromagnet arranged to receive an energizing signal

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from said yarn clearing arrangement; and a normally closed switch included in said energizing circuit and selectively operable to de-energize said electromagnet.

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