July 10, 1934. J. H. DAMON 1,966,423

METHOD OF AND APPARATUS FOR TRIMMING PROJECTING FIBERS

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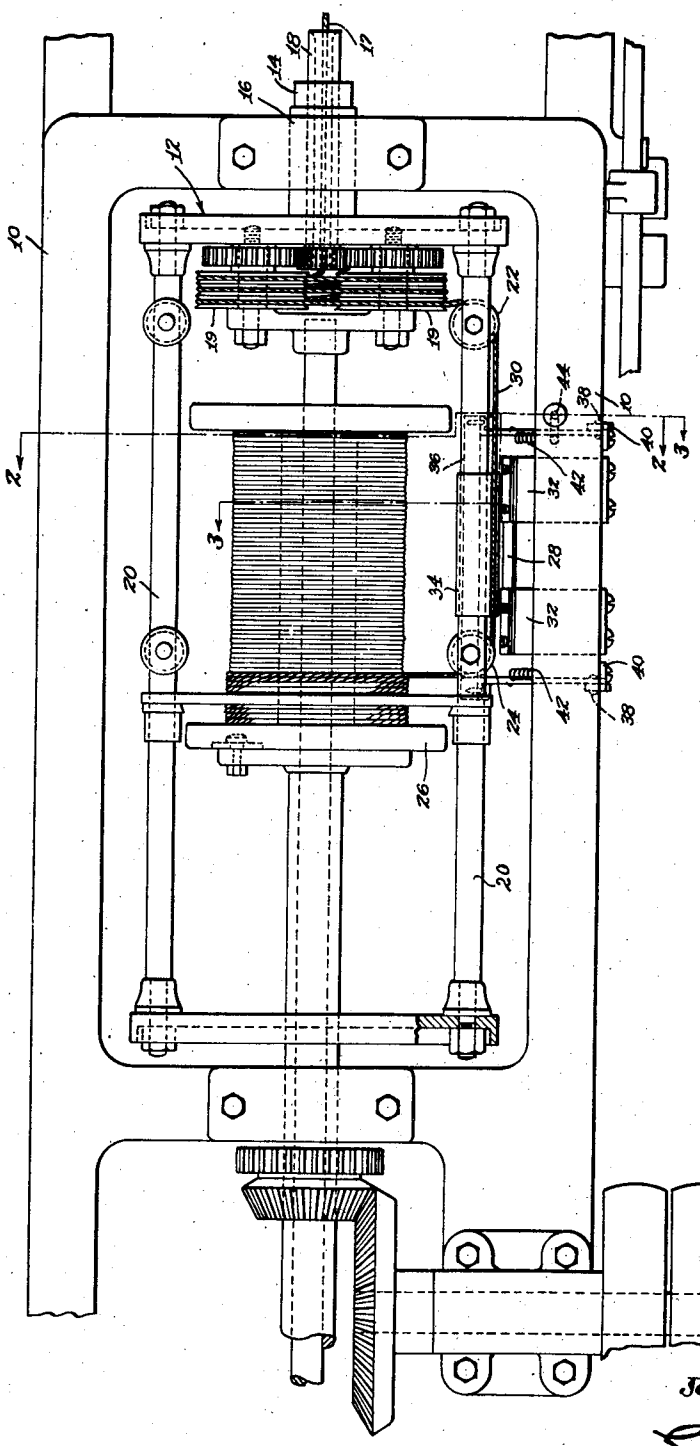


Fig. 1.

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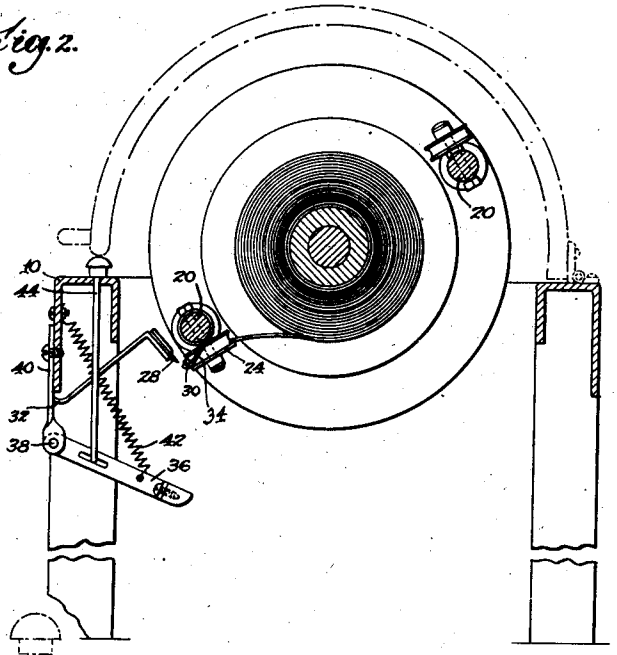
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Fig. 2.



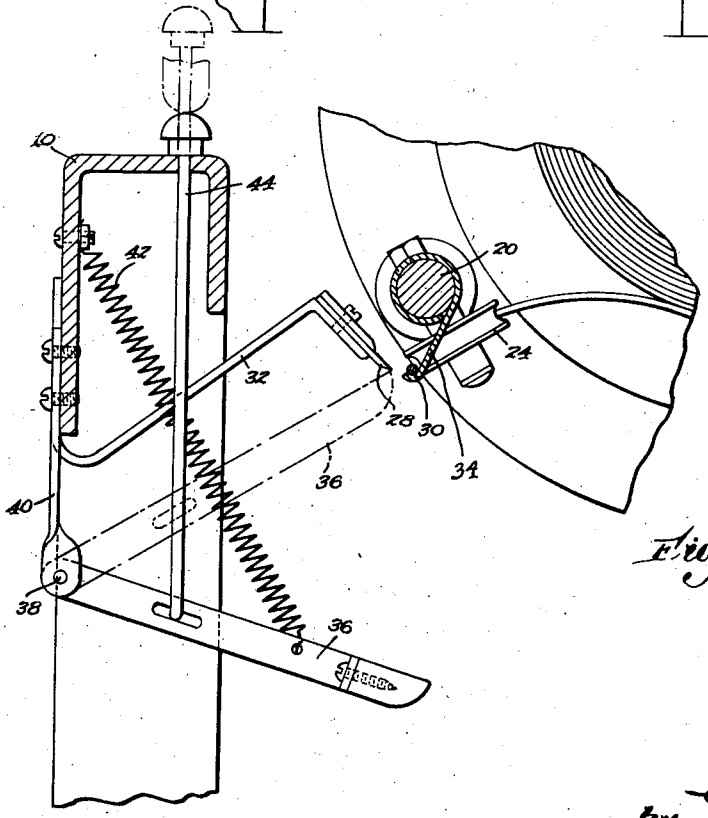


Fig. 3.

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UNITED STATES PATENT OFFICE

1,966,423

METHOD OF AND APPARATUS FOR TRIMMING PROJECTING FIBERS

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Application May 17, 1933, Serial No. 671,449

10 Claims. (Cl. 118—51)

This invention relates to improvements in methods of and apparatus for trimming projecting fibers.

While it may be employed for trimming the surfaces of various kinds of fibrous bodies, it has particular utility for loose fiber ends on threads, yarns, cords, strands and the like;—for which the term "twine" is herein used as a convenient generic term.

Such a trimming improves the appearance of the twine, eliminates difficulties which sometimes arise when loose fiber ends become bound or entangled with other parts of a ball, and has other advantages, one of which is that it makes possible an increase of the speed at which the flyer works in twisting or winding, and therefore an increase of rate of production, and another of which is that the desired trimming may be accomplished in connection with ordinary fiber-twisting mechanism.

The invention provides for utilizing centrifugal force for the extending, the stiffening, and the cutting of loose fiber-ends.

Binder twine, made of hemp, sisal and the like hard and relatively coarse vegetable fibers, in the style in which it has been known for many years, presents an extreme example of disfigurement by loose, projecting fibers. The invention will be disclosed herein as applied for clearing binder twine.

During the twisting of hard fibers, the loose ends cause great annoyance. The difficulty of removing them usually results in their being left on the twine; but their presence results in the flyer being operated at a speed considerably below its mechanical capacity, with consequent slowing down of production.

Among the various proposals made heretofore for clearing loose fiber ends, one theory has been that fibers drawn over a fixed cutter would be shaved. In practice, however, they become to a considerable extent pressed against the body of yarn. Whatever success this method attains with soft fibers, such as cotton, becomes a failure for hard fibers such as hemp and sisal. The latter have had to be cut, if at all, as a separate operation, by running the twine past a shearing mechanism; and even then many ends do not get caught by the shear; but remain as disfiguring elements on the twine.

It is among the objects of the present invention to provide for the cutting of loose ends of fibers, from twine and other like formations, of all sorts of fibers, effectively, completely and efficiently.

Another object is thus to clear the twine while it is on the twisting flyer, thereby permitting a speeding up of the flyer to the limit of mechanical expediency.

One feature provides a guard for my improved cutting device, which serves as a protector against injury to workmen.

Another provides means to restrain ballooning of the twine on the flyer, cooperating to some extent with the cutter as a shearing blade.

And it is an important feature that the invention is adapted for embodiment in any rotatable fiber-carrying device whose speed of rotation can be made sufficient for centrifugal force to throw the loose fiber ends out to extended positions.

These objects and results are attained with any ordinary or suitable twisting mechanism which has a rotating flyer for carrying the twine, whose fibers are being twisted together, around a location of axial feed of the fibers to the flyer. Usually the grouped fibers are drawn into the flyer along a line which is coextensive with the axis of the flyer; and at the flyer, they are led to an outer rotative portion thereof, and hence are run inward to a spool or bobbin within the flyer, on which the finished twisted twine is wound. The rotation of the flyer, accompanied by the continual advance of fibers in the device, accomplishes the twisting of fibers.

In practice, the twisting is complete by the time the twine gets to the said outer portion of the flyer; but loose ends of fibers project from the twisted body. In the case of soft fiber material, it has been possible to remove a considerable portion of the projecting fibers by the shaving method hereinbefore referred to. But the shaving of hard fiber material presents such difficulties that binder twine for example, usually goes to market with a veritable forest of projecting and disfiguring fiber ends.

The invention provides for driving the twisting flyer at such a high speed as to cause loose ends of fibers to be thrown, by centrifugal force, to positions of maximum projection from the axis around which the twine is revolving on the flyer. While thus projected the outstanding fibers encounter a cutter suitably positioned and fixed on the supporting frame of the flyer. Preferably the twisted twine is taken through a course which extends a little distance along the outer portion of the flyer before turning inward to the collecting bobbin; and the cutter has suitable length parallel to the axis so that every point along the revolving twine passes the cutter more than once. This ensures that practically all loose ends will

be cleared from the twine, since the twine itself will be slowly rotating on the flyer, due to the effect of the twisting of on-coming portions of the twine. Thus if loose ends on the inner side of the twine be not closely cropped, on first passing the cutter, these same fibers may be on the outer side of the twine, toward the cutter, on a subsequent rotation of the flyer, and will be cut close to the twine body.

As the speed of the flyer tends to balloon the length of twin extending along it parallel to its axis, a suitable means, provided for preventing such ballooning, is made to cooperate with the cutter so as to make the cutting of fibers in effect a shearing cut.

A guard protects the cutter edge when the device is not in use, and is movable out of the way during the fiber cutting operation.

It is intended that the patent shall cover, by suitable expression in the appended claims, whatever features of patentable novelty exist in the invention disclosed.

In the accompanying drawings:

Figure 1 is a plan of the flyer end of a spinning jenny having features of the invention embodied thereon;

Figure 2 is an elevation, in section on 2—2 of Figure 1; and

Figure 3 is an elevation, in section on 3—3 of Figure 1, on an enlarged scale.

Referring to the drawings, the twisting end of a spinning jenny frame is indicated at 10, and has a usual fiber twisting flyer 12 mounted thereon, with flyer sleeve 14 journalled in bearing 16 on the frame. The usual twist tube 18 extends within the sleeve 14, leading to the haul pulleys 19, around which the twisted fiber twine passes on its course to one of the flyer legs 20. In practice, the sliver of fibers proceeding from the finishing drawing frame (not shown) is treated to further drawing on a spike gill sheet (not shown) and then passes into a condenser (not shown) from which the condensed mass of fibers 17 enters the twist tube 18, wherein the fibers of the mass are twisted together. The twisted yarn or twine goes thence around the haul pulleys 19, carried by the flyer on opposite sides of its axis, and then passes outward to a guide pulley 22 on a leg 20 of the flyer, thence proceeding along the leg 20 to a second guide pulley 24 thereon, whence it passes inward toward the flyer axis where a spool 26, reciprocating along said axis, collects the finished product. All of the described mechanism, and the mechanism for reciprocating the spool 26, may be such as are well known in the fiber twisting, or fiber spinning art.

The present invention has particular reference to the method of and means for cutting and clearing loose fiber-ends from the twine while it is on the flyer. It utilizes that same centrifugal force which hitherto has led spinners to run the flyer at a speed considerably below its mechanical capacity, in order to minimize its effect in throwing out loose stretches of fiber ends,—and so to reduce the prominence of the fiber ends in the finished product. By this invention, on the contrary, it is particularly desirable to enhance the speed of flyer, and thereby to vitalize all loose ends of fibers so as to make them stand out centrifugally, projecting to a maximum extent, and to energize them with stiffness. This transformation being effected, the loose ends of fibers become possessed of sufficient momentum to decapitate themselves upon encountering a stationary knife.

To this end a knife 28 is mounted on the frame 10, with its cutting edge standing parallel to the axis of the flyer, and is set adjacent to the stretch 30 of twine between the guide pulleys 22, 24. The knife may be secured on a supporting bracket 32 which in turn is secured to frame 10. The knife edge stands closely adjacent to the cylinder of travel of the stretch 30 of twine; and it is directly in the path of all loose ends of fibers which project outward from that part of the twine. By running the flyer at high speed the cutting of loose end portions of fibers may be substantially complete, inasmuch as centrifugal force makes each loose portion thrust itself out to position of maximum projection from the axis of rotation of the flyer. This elimination of the primary cause for operating the flyer below maximum speed and the operating of it at higher speed permits a substantial increase in the output of each fiber twisting mechanism, and the whole train of drawing mechanisms which precede it, as compared with prior devices and methods. Also the finished twine, freed of its rough and ragged appearance, is more attractive both to purchasers and to users,—the latter because it can be wound into a ball or cop without projecting fibers becoming caught between convolutions of succeeding layers, and making trouble when being unwound.

High speed of the flyer tends to cause a centrifugal ballooning of the stretch of twine thereon, between the two guide pulleys 22, 24. The invention utilizes this, to an extent; but prevents objectionable ballooning of the twine. It provides the restraining clip 34 engaging around the twine carrying leg 20, at a suitable location near the knife 28, which clip may have an arm reaching out and engaging from the under side around the twine, to maintain the twine against being bowed outward, but to permit it to feed along the flyer in the customary way. The clip 34 may be ahead or behind the knife 28 with respect to the travel of the twine along leg 20 of the flyer; or it may be, as illustrated, adjacent to the knife, in which case the portion of clip which engages the twine cooperates to some extent in making the cutting a shearing action. By positioning this stretch of twine, as regards its radial limit from the axis, it both straightens the stretch, and makes it possible to set the blade 28 safely close to this fixed limit, beyond which centrifugal force cannot throw the twine body, while permitting centrifugal force to throw the loose fiber ends out against the knife.

It is preferable that a guard be provided for the knife, and I indicate one such at 36, pivoted at 38 on a bracket 40 which may depend from frame 10. The guard is yieldingly held in the dotted position (Fig. 2) against the knife edge by spring 42, when the knife is not in use, and may be moved away from the knife by any suitable means, as the thrust rod 44, when the knife is to perform its fiber cutting function.

The invention may be applied to present types of fiber twisting machines at small cost, but with substantial increase of efficiency, due to the permitted increase of operating speed. The improved appearance of the finished product, and the attaining of that without a separate clearing operation, are matters of consequence in the art.

I claim as my invention:

1. The method of clearing from fibrous bodies their loose ends of fibers, comprising the whirling of the body at a speed whereby its loose ends of fibers are moved by centrifugal force to posi-

tions wherein, projecting from the axis of whirling and projecting from said body, they are by the centrifugal force endowed with taut stiffness sufficient for co-action with a severing blade; and causing said taut projecting loose ends of fibers to strike a severing blade outside of the orbit of the nuclear part of the whirling body, whereby their whirling impact severs them.

2. The method of clearing from fibrous yarns, strands, ropes, and other twine, their loose ends of fibers, comprising the whirling of a rectilinear portion of the twine about an axis parallel to itself and eccentric to itself, meanwhile moving the twine endwise, with successive parts of itself becoming said rectilinear portion of the twine; whereby centrifugal force, generated in the twine by the whirling, makes the advancing loose ends of fibers therein stand away from the axis stiffly enough to be severed by co-action with a cutting blade; and the severing of the said stiffly outstanding loose ends progressively of the twine at a location outside of the orbit of the nuclear part of the twine.

3. In a fiber twisting device, the combination of a revolving twine guide along which the twine extends parallel to the axis of revolution, with a cutter, located adjacent to the orbit of the guide and adapted to engage and cut end portions of fibers projecting centrifugally from twine on the guide, as said guide and twine revolve.

4. In a fiber twisting device, a rotating flyer having an outer portion along which the twine moves slowly in a direction approximating parallelism to the axis of the flyer, combined with a cutter fixed adjacent to the orbit of the longitudinally moving twine; means for rotating the flyer at a high speed whereby centrifugal force moves loose end portions of fibers in the twine outward beyond the orbit of the twisted body part of the twine; said cutter being located and adapted to engage those portions of fibers of the twine which are thus forced outward.

5. In a fiber twisting device, a rotating flyer having a twine carrying portion mounted eccentrically; and a cutter, fixed in close proximity to the path of travel of said portion of the flyer, arranged and adapted to trim projecting portions of fibers as the flyer travels past the cutter.

6. In a fiber twisting device, a rotating flyer, having eccentrically-located twine-guiding elements, for positioning a length of twine eccentrically, extending in the direction in which the axis of the flyer extends; said elements being adapted for the twine to move therealong in the eccentric position; and a knife with its edge fixed in position closely adjacent to the path of revolution of the guided twine; the said knife edge being located and adapted to cut fibers projected from the guided twine by centrifugal force.

7. In a fiber twisting device, a rotating flyer, having eccentrically-located twine-guiding elements, for positioning a length of twine eccentrically, extending in the direction in which the axis of the flyer extends; said elements being adapted for the twine to move therealong in the eccentric position; a knife with its edge fixed in position closely adjacent to the path of revolution of the guided twine; and means in said guide for engaging the body of twine and restraining that body from being bowed outward by centrifugal force, while permitting loose ends of fibers on said body to move centrifugally to projecting positions; said knife edge being located and adapted to engage and cut fibers thus projecting as the guided body of twine travels past it on the flyer.

8. In a fiber twisting device, a rotating flyer having a twine guiding portion spaced a substantial distance outward from the axis of the flyer; a blade fixed in close proximity to the path of revolution of said outward portion of the flyer; and a guard for the blade, movable between a position where it shields the blade and an out-of-the-way position; said outward portion of flyer being adapted to carry twine; and said blade being arranged and adapted to trim fibers projecting from the body of twine which the flyer carries past the blade.

9. In a fiber twisting device, a rotating flyer, having eccentrically-located twine-guiding elements, for positioning a length of twine eccentrically, extending in the direction in which the axis of the flyer extends; said elements being adapted for the twine to move therealong in the eccentric position; a knife with its edge fixed in position closely adjacent to the path of revolution of the guided twine; and means comprising a sheet of metal with bent edge, engaging around said body of twine enough to restrain that body from being bowed outward by centrifugal force, but permitting long loose ends of fibers on said body to be thrown outward by centrifugal force to projecting positions; said knife edge being located and adapted to engage and cut fibers thus projecting as the body of twine travels past it on the flyer; and said twine-restraining metal edge being located close to said knife edge to make the fiber cutting in the nature of a shearing action.

10. In a fiber twisting device, a rotating flyer having a twine guiding portion spaced a substantial distance outward from the axis of the flyer; a blade fixed in close proximity to the path of revolution of said outward portion of the flyer; a cover for the flyer; and means adapted to coact with said cover, for guarding said blade, comprising a guard element, a spring urging said element to guarding position, and a push rod connected to said guard element and reaching to position to be engaged by said cover when the latter is closed, whereby the guard element assumes its blade guarding position when the said cover is open, and is pushed to and held in non-guarding position by the said cover when closed.

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