March 31, 1942. G. M. YOUNGMAN 2,278,032

APPARATUS FOR CUTTING FILAMENTS INTO STAPLE LENGTHS

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Fig. 1.

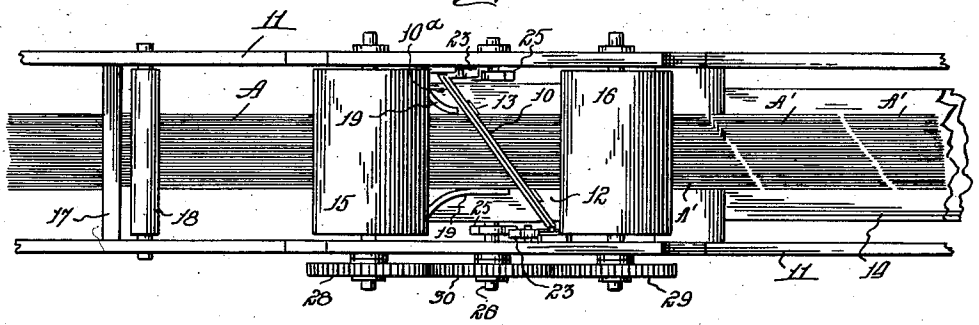

Fig. 2.

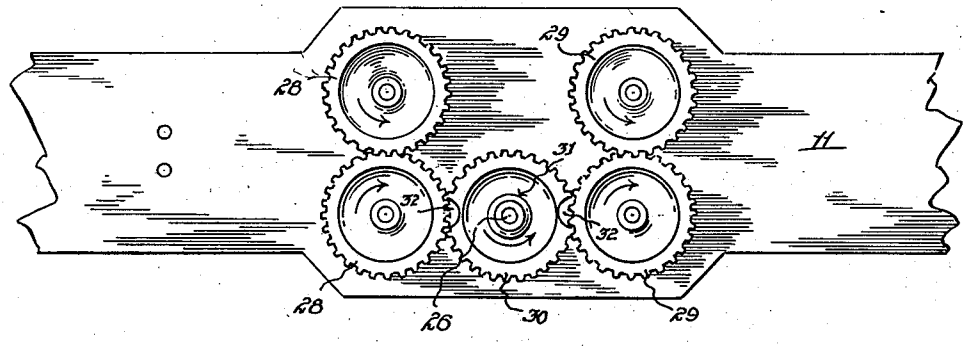

Fig. 3.

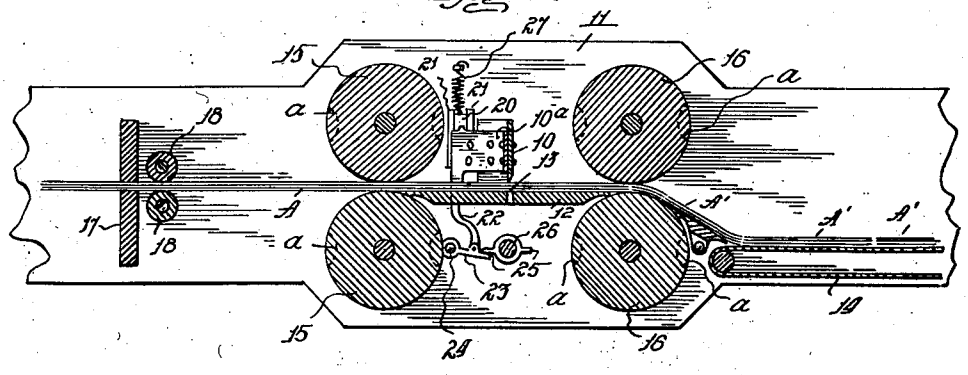

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Fig. 4.

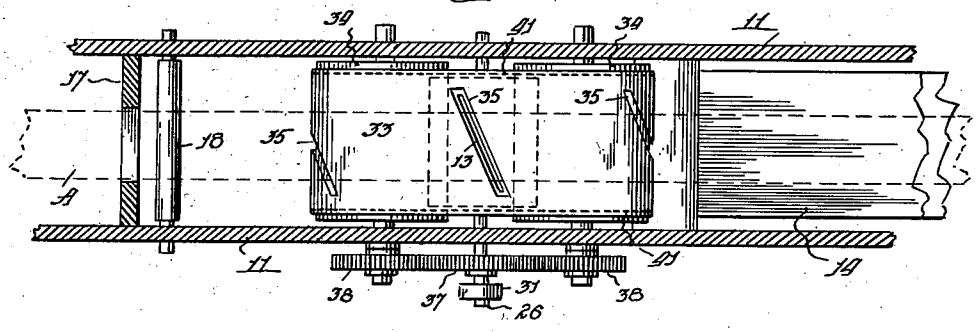


Fig. 5.

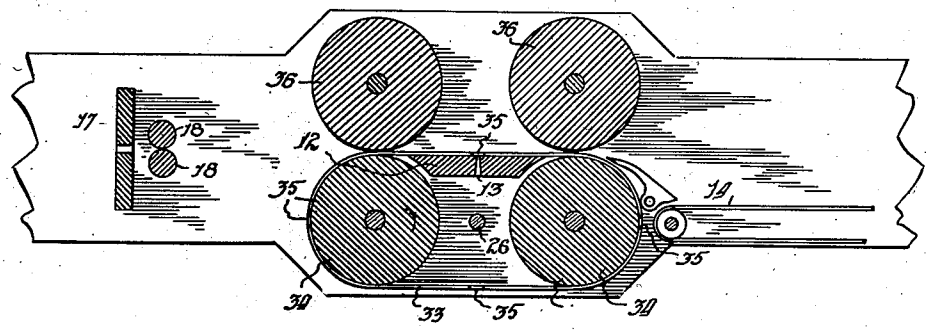
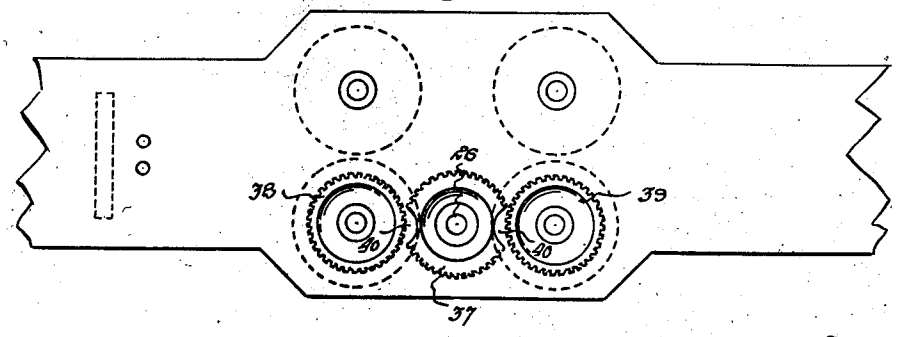


Fig. 6.



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UNITED STATES PATENT OFFICE

2,278,032

APPARATUS FOR CUTTING FILAMENTS INTO STAPLE LENGTHS

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Application March 27, 1941, Serial No. 385,564

5 Claims. (Cl. 164—49)

My invention relates to the art of producing yarn of that character in which there is an admixture of wool with fibers such as rayon or other synthetic fibers, and has particular reference to means for cutting continuous fibers or filaments into staple lengths in producing sliver or top by apparatus such as disclosed in my prior Patent No. 2,145,144, dated January 24, 1939.

In the process of manufacturing yarn containing rayon or other synthetic fibers these fibers are usually furnished to the manufacturer of the yarn in the form of a sliver composed of cut fibers of staple length, and although machines or apparatus have been provided to expedite the formation of the sliver, difficulty has been experienced in cutting the continuous filaments into the desired lengths to be subsequently aggregated in the formation of the sliver; that is to say, rayon and other synthetic fibers or filaments are produced in continuous lengths, and for use in combination with wool or other fibers in the manufacture of yarn they are cut into staple lengths of from three to seven inches and the sliver formed by assembling the cut staple fibers in overlapping relation to facilitate blending with the wool or other fibers.

The primary object of my present invention is to provide improved means for cutting the continuous fibers or filaments into staple lengths and delivering the cut filaments on to a conveyor belt or belts to form a sliver, as for instance by the apparatus disclosed in my aforementioned patent, and to provide for a more effective arrangement of the cut fibers in the formation of the sliver the aggregated continuous filaments or flattened-out tow are cut diagonally or at an oblique angle.

It is therefore contemplated by this invention to combine with the cutter means for feeding the continuous filaments thereto in such manner as to prevent bunching at the cutting knife, implemented in this instance by an intermittent feeding movement of the continuous filaments so that the cutting action will take place coincident with the interval between movement, and including means to insure an even flow of the filaments to and beyond the knife.

With these principal objects in view my invention consists in the provision of cutting mechanism including a table over which the continuous filaments move to be operated on by the cutting knife, in combination with means for effecting an intermittent feeding movement of the filaments, and contemplating the employment of a belt for carrying the filaments over the table to and beyond the knife, as hereinafter fully described and claimed.

In the drawings:

Figure 1 is a plan view of a form of cutting mechanism constructed in accordance with my invention.

Fig. 2 is a side elevation of a train of gearing to effect an intermittent feeding movement of the continuous filaments for the cutting operation.

Fig. 3 is a longitudinal sectional view.

Fig. 4 is a plan view illustrating a modification of the feeding mechanism.

Fig. 5 is a longitudinal sectional view thereof, and

Fig. 6 is a side view illustrating the gearing between the driving gearwheel and intermeshing gears for the belt carrying rollers.

In carrying out my invention the cutting knife 10 is mounted between the side pieces 11, 11 of a supporting frame to have a vertical reciprocating motion in cooperation with a table 12, the latter being provided with a slit 13 into which the cutting knife passes, and for feeding the filaments over the table and on to a conveyor belt 14, cooperating pairs of rollers 15, 15 and 16, 16 are located at opposite ends of the table—the continuous length of aggregated fibers or ribbon-like tow being led to the first pair of rollers through a guide 17 and tension rollers 18, 18. The slit in which the knife works extends diagonally across the table to impart a corresponding cut to the tow, although a transverse cut is contemplated, and as the tow travels along the table at the center thereof it is not necessary that the slit 13 extend clear across the table and therefore it terminates a short distance within the opposite side edges of said table—the guiding of the ribbon-like tow to the knife being provided for by baffles or curved rails 19, 19.

The knife may be supported for vertical reciprocating movement in any suitable manner, the means illustrated in the drawings, and located at each end of the knife blade 10 and its backing 10a, consisting of a slide 20 working between channeled guide plates 21, 21—with the extended end of the backing plate connected to the slide—and for imparting a downward cutting movement to the knife blade a depending operating arm 22 is connected to a rocking arm 23 carried by a stub shaft 24 mounted in the supporting frame. Rocking movement is imparted to the stub shaft and arm by a tappet member 25 fixed to a shaft 26 extending transversely between the side pieces of the supporting frame and rotated by the gearing hereinafter described, it being understood that

a rocking arm and companion tappet member are provided at opposite sides of the supporting frame to balance the operation of the cutting knife, and that the knife is returned to normal or raised position by a suitable spring, as for instance a spiral spring **27**.

The feeding rollers are geared together to operate in unison by intermeshing gears **28**, **28** and **29**, **29**, with an interposed driving gearwheel **30** fixed to a shaft turnable by a belt (not shown) passing over a pulley **31** on said shaft. The driving gearwheel is preferably mounted on the shaft **26** which operates the cutting knife, and as an important feature of my invention said gearwheel is cut away at diametrical opposite sides, at **32**, so as to impart an intermittent motion to the feed rollers for the operation of the knife blade during the interval of motion of the ribbon-like tow as it is moved over the table by the feed rollers, and although I have shown two sets of feed rollers it will be understood that a single set may be employed for feeding the tow to the knife, in which instance the cut filaments would be deposited directly onto the carrier belt immediately beyond the edge against which the knife cuts. It will be obvious by reference to the drawings that the turning of the driving gearwheel **30** will turn the feed rollers in the direction indicated by the arrows to feed the continuous filaments or ribbon-like tow to the knife blade by means of the rollers **15**, **15** and the cut filaments on to the conveyor belt **14** by rollers **16**, **16**, and that the cut-out portions of the driving gearwheel will cause an interruption in the feed of sufficient duration to permit the knife to effect the cut and be returned by the spring. The cut-out portions are provided at diametrically opposite sides of the driving gearwheel so that both sets of rollers will pause in rotation simultaneously on each half turn of the said gearwheel, and consequently the length of the cut staple fiber will be determined by the distance between the cut-out portions. However, where a single pair of feed rollers, **15**, **15**, are employed and the cut filaments are delivered direct from the cutting edge at the end of the table (as hereinbefore suggested) a single cut-out portion on the driving gearwheel may be provided, and in this instance the length of staple fiber will correspond approximately with the circumference of said gearwheel; that is, from one side of the single cut-out portion to the other.

In the form of my invention shown in Figs. 1 to 3 the ribbon-like tow is fed over the table to the cutting knife by the first set of rollers and the cut fibers pass on to the second set of rollers, but in order to feed the filaments over the table in a more positive manner I purpose employing an endless belt **33**, as illustrated in the modification, Figs. 4, 5, and 6, said belt passing around the lower feed rollers, **34**, **34**, and over the table and being provided with diagonal slots, **35**, adapted to register with slit **13** in the table, it being understood of course that the slots will be spaced along the length of the belt to bring successive slots in position with respect to the operation of the knife blade. In this instance the upper rollers **36**, **36**, are not geared to the lower rollers but press the tow on to the belt either by gravity of the rollers or they may be spring-actuated downward, and in order that the movement of the belt may synchronize with the operation of the knife blade (illustrated in the other figures of the drawings) the gearing shown in Fig. 6 is employed; that is, the interposed driving gearwheel **37** is a little larger than the gearwheels **38** and **39** on the shafts of the lower rollers in order to compensate for the cut-out portions **40** of said driving gearwheel. Accordingly, the diameter common to both rollers is proportioned to the length of the endless belt so that one of the slots will register with the slit in the table—in which the knife works—on each half turn of the rollers, and to insure this operation the rollers are provided with short pins **41** entering corresponding holes in the belt at the opposite edges thereof. The employment of the belt will carry the filaments over the table from one set of rollers to the other, and the pause in the feeding of the tow by the intermittent movement of the lower rollers operated by the driving gear will allow for the operation of the knife and provide a smooth flow of the material.

As a further modification an intermittent motion of the aggregated filaments may be effected by having the cut-out portions at diametrical opposite sides of the pairs of rollers as indicated by the dotted lines *a* in Fig. 3 instead of at opposite sides of the main driving gearwheel.

When the cutting machine forming the subject matter of the present invention is employed in connection with the sliver forming apparatus disclosed in my prior patent referred to, each carrier belt will be provided with one of the cutting machines for depositing the staple fibers thereon, and by cutting the tow diagonally a more effective or diversified overlapping of the fibers will be effected, which may be augmented by having the diagonal cut alternate in direction; that is, one aggregation of continuous fibers or tow is cut at the acute angle (as in Fig. 1) and another at an obtuse angle.

I claim:

1. A machine for cutting continuous filaments or tow into staple lengths for forming a sliver to be used in the production of yarn, comprising a cutting implement including a reciprocating knife blade and companion cutting edge associated with a table, said cutting edge being at one side of a slit in the table, a pair of rollers for delivering the tow to the cutting implement, a second pair of rollers receiving the cut filaments, gearwheels connecting each pair of rollers for rotation in unison, and a driving gearwheel having cut-out portions at opposite sides of the toothed periphery thereof to impart intermittent rotary motion to the rollers; together with mechanism operated by the driving gearwheel for operating the cutting implement coincident with the pauses in rotation of the rollers.

2. A machine for cutting continuous filaments or tow into staple lengths for forming a sliver to be used in the production of yarn, comprising a reciprocating knife blade and a table or plate having a slit with a knife edge at one side thereof, the knife blade and slit extending diagonally across the table, pairs of rollers for feeding the tow to the knife blade and for delivering the cut filaments to a conveyor belt, and rails for guiding the tow to the knife blade; together with means for operating the cutter, and gearing for rotating the rollers in unison and including a driving gearwheel having cut-out portions at opposite sides of the toothed periphery thereof to impart intermittent rotary motion to the rollers, the operation of the cutting implement and intermittent motion of the rollers being coordinated for cutting action coincident with the

pauses in movement of the tow over the table to prevent bunching of the tow at the cutting implement during the operation of the latter.

3. A machine for cutting continuous filaments or tow into staple lengths for forming a sliver to be used in the production of yarn, comprising cutting mechanism including a knife blade and plate having a cutting edge, means for operating the knife blade at regular intervals, an endless belt passing over the plate to feed the tow to the knife blade, said belt having slots therein adapted to register with the cutting edge in the plate for the operation of the knife blade through the slots, and means for imparting an intermittent motion to the belt to synchronize with the operation of the knife blade through the aforementioned slots coincident with the pauses in the movement of the belt.

4. A machine for cutting continuous filaments or tow into staple lengths for forming a sliver to be used in the production of yarn, comprising cutting mechanism including a knife blade and plate having a cutting edge, means for operating the knife blade at regular intervals, a belt passing over spaced apart rollers and over the plate, said belt feeding the tow to the knife blade and having slots adapted to register with the cutting edge for the operation of the knife blade through the slots, rollers cooperating with the belt and aforementioned rollers to assist in feeding the tow, and means for imparting intermittent motion to the belt to synchronize with the operation of the knife blade through the slots coincident with the pauses in the movement of the belt.

5. A machine for cutting continuous filaments or tow into staple lengths for forming a sliver to be used in the production of yarn, comprising cutting mechanism including a reciprocating knife blade and plate having a slit therein with a cutting edge at one side thereof, the knife blade and slit being disposed diagonally with respect to the travel of the tow over the plate, an endless belt passing over the plate from rollers at opposite ends of said plate, said belt having spaced apart diagonal slots adapted to register with the slit for the operation of the knife blade through said slots, gearwheels for operating the belt and including a segmental driving gearwheel for imparting an intermittent motion to the belt, and means actuated by the driving gearwheel for operating the knife blade through the aforementioned slots coincident with the pauses in the movement of the belt.

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