July 20, 1943. L. A. RUNTON 2,324,539

SLIVER FORMING MACHINE

Filed Dec. 16, 1939 3 Sheets-Sheet 1

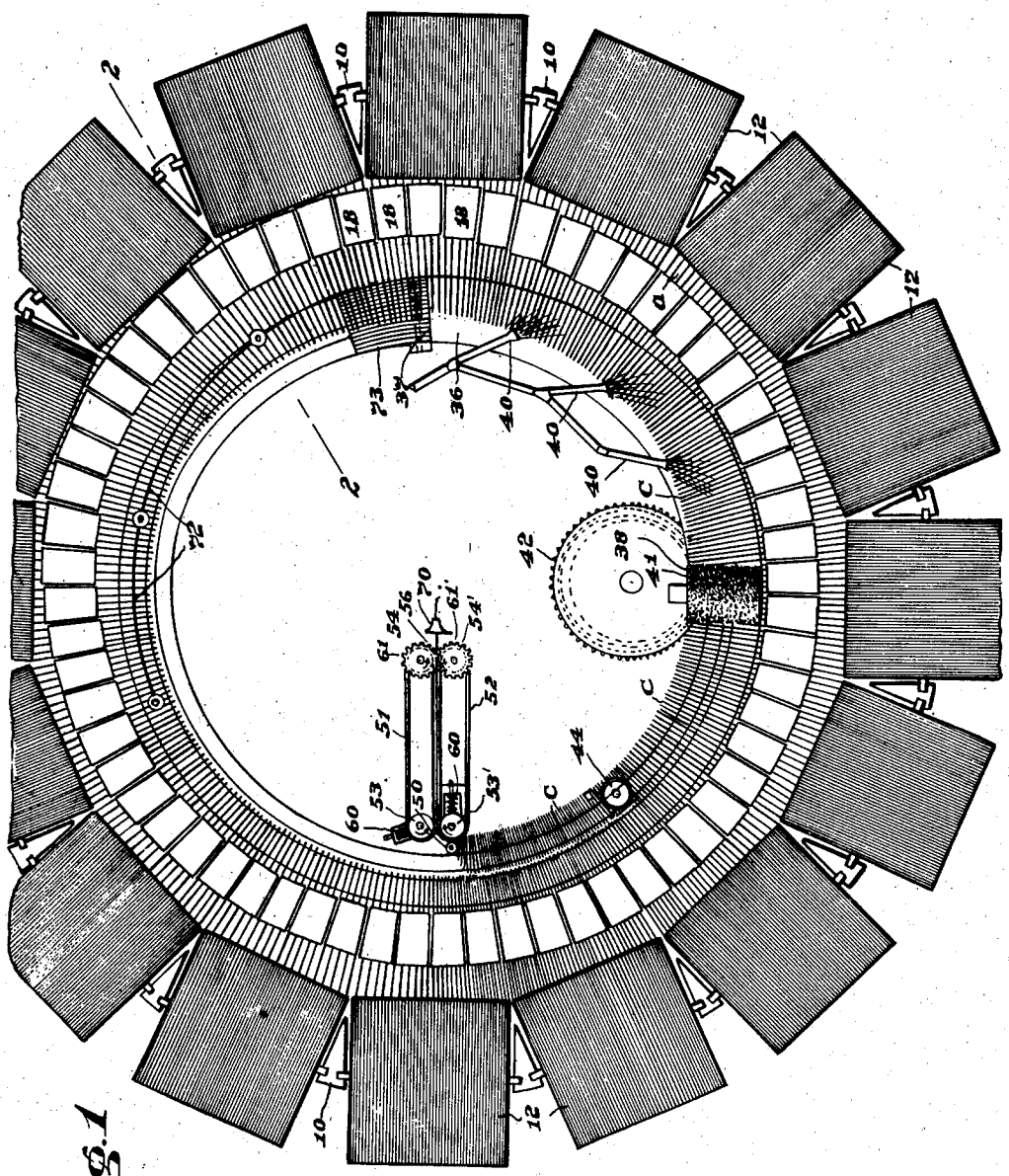


Fig. 1

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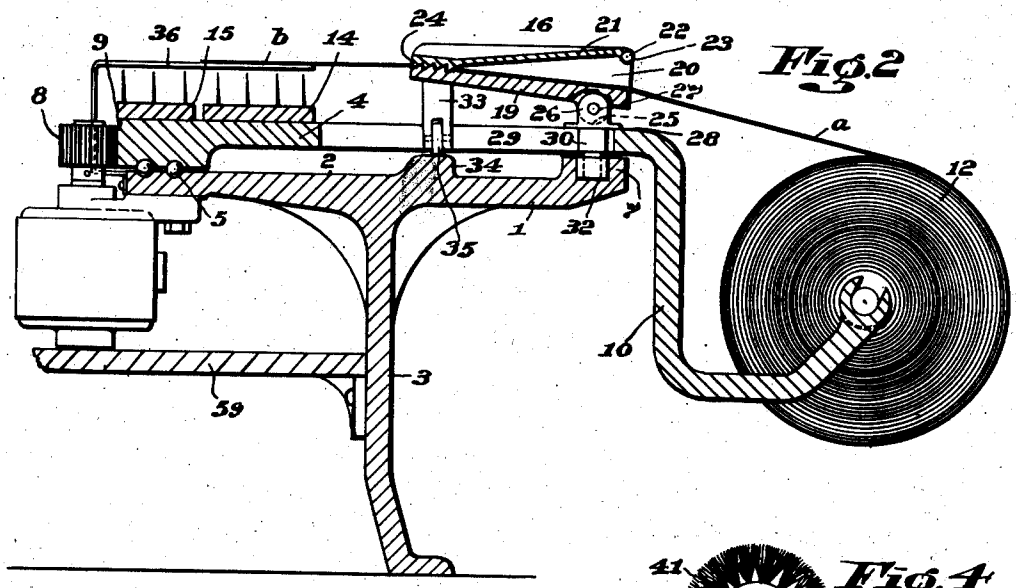


Fig. 2

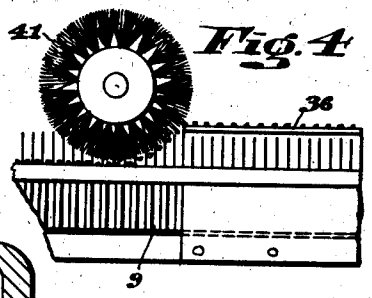


Fig. 4

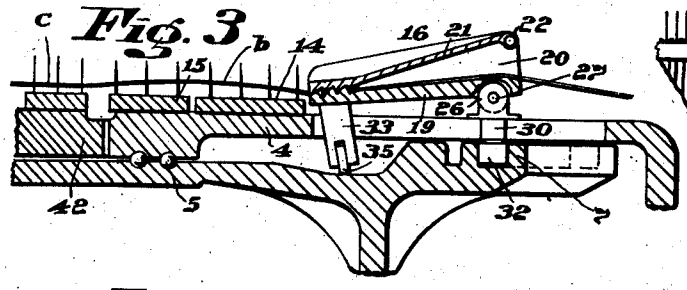


Fig. 3

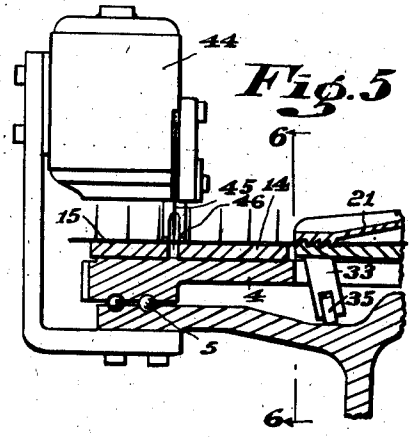


Fig. 5

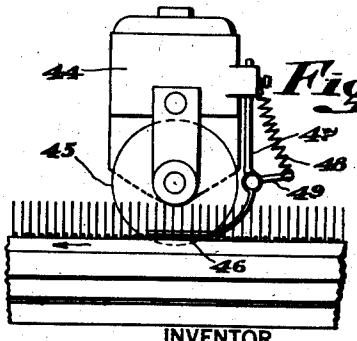


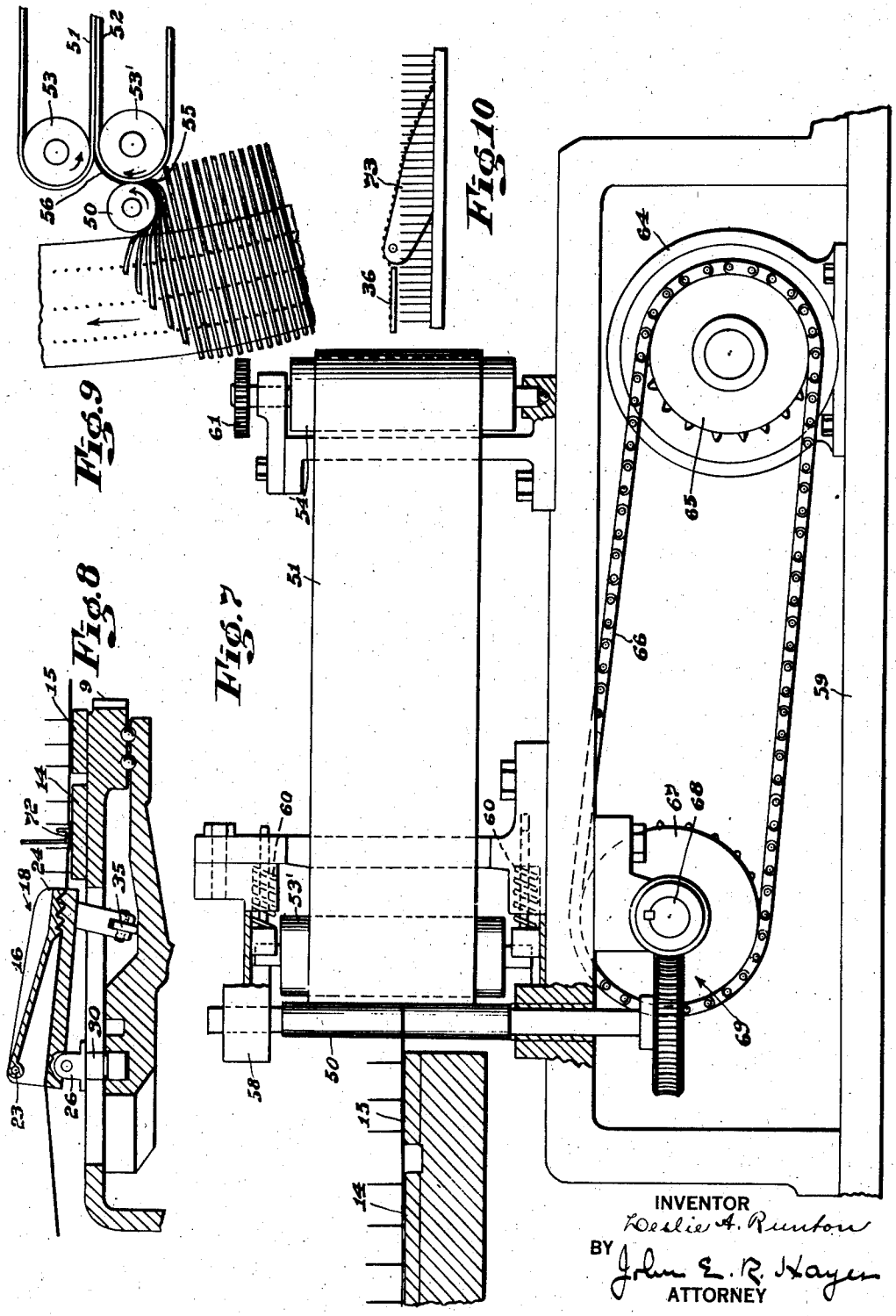
Fig. 6

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Patented July 20, 1943 2,324,539

UNITED STATES PATENT OFFICE

2,324,539

SLIVER FORMING MACHINE

Leslie A. Runton, Andover, Mass.

Application December 16, 1939, Serial No. 309,602

2 Claims. (Cl. 19—1)

The invention relates to a sliver forming machine, and the object of the invention is to provide a machine by which rayon lap of indeterminate length may in continuous operation be cut into sections of determinate length, and these sections brought into overlap, or pieced together, preparatory to spinning.

A further object is to provide a quick-acting machine and one that is precise and positive in its operation.

The invention can best be seen and understood by reference to the drawings in which

Fig. 1 is a plan of the machine.

Fig. 2 is a cross sectional view thereof showing the feed boxes, later to be referred to, in their retracted position.

Fig. 3 is a cross sectional view showing the feed boxes in their advanced position.

Fig. 4 is a view in side elevation of a detail of construction which includes especially the brush later to be referred to.

Fig. 5 is a view in front elevation of the cutter, later to be referred to, in its relation to certain of the operating parts of the machine shown in cross section.

Fig. 6 is a cross sectional view on the line 6—6 of Fig. 5.

Fig. 7 is a view partly in side elevation and partly in section of the drawing off mechanism later to be referred to.

Fig. 8 is a cross sectional view of another portion of the machine showing especially the lap hold-down blade later to be referred to.

Fig. 9 is a plan in enlarged detail of a portion of the drawing off mechanism; and

Fig. 10 is a view in side elevation of a detail of construction which includes especially one of the lap lifting blades later to be referred to.

1 represents the stationary bed of the machine. This bed is circular in form and presents a generally flat top surface 2 at all points of its cross section. It is supported in any suitable manner as off legs, or a web, 3, which rests upon any suitable base of support.

Mounted to rotate upon the stationary bed is an annular table 4. This table, in the part thereof adjacent its interior edge, rests to ride upon the bed of the machine through interposed ball bearings 5, both bed and table being suitably channeled to receive these bearings. In the part adjacent its outer edge the table rests to slide upon a raised cam rail 7 adjacent the outer edge of the stationary bed. Thus mounted the table 4 may be rotated to turn on the top of the stationary bed. Rotation of the table is obtained by a motor driven gear 8, mounted on the stationary bed of the machine as shown in Fig. 2, which engages teeth 9 on the inner edge of the table, the table being turned as the gear is rotated by the motor.

Borne by hangers 10 on the table 4 are a plurality of spools 12 each bearing a mass of wound strands of continuous filament. The spools are mounted in the hangers in any manner suitable to permit of the strands being withdrawn from the individual spools. The spools extend around the annular table lying in relatively close proximity to one another. They are carried around by the table as it is rotated.

Affixed to the top surface of the table 4, in the part thereof adjacent its inner edge, is a set of pin carrying rings 14 and 15, respectively. These rings lie concentric with one another in the same horizontal plane, but are slightly spaced from each other. The outer pin carrying ring 14 is preferably slightly wider than the inner pin carrying ring with preferably four rows of pins, circumferentially arranged, while the inner ring has preferably three rows of pins.

Mounted upon the table 4 outside the pin carrying rings borne by it are feed units 16 which correspond in number and location with the respective spools. The strands on each of the spools are withdrawn from the spool in a precise and determinate manner at proper timed interval during the rotation of the table 4 through the operation of its attending unit which in turn is operated from off the stationary bed of the machine as the table 4, on which the unit is mounted, is rotated.

Before referring specifically to the construction of each of the units 16 in its relation to the circular table 4 and stationary bed of the machine, it will be first explained that the strands upon each of the spools are wound to present a multiplicity of ends, and, also, so wound that when withdrawn from the spool, in the operation of its attending unit, the strands will lie and project in parallelism with each other, and with the same extent of end projection.

Each of the units 16, preferably made sectional, is composed of a plurality of feed boxes 18 which are disposed side by side. Each of these feed boxes has the form of an elongated tray with a bottom 19, sides 20, and a cover 21. The ends are open. The covers for all the boxes in any unit are pivoted to turn upon a common pin 22 which is fixed to extend through the sides of all the boxes at the rear top ends thereof. The pins 22 extend through slots 23 in the sides 20. These

slots are preferably slightly elongated to permit of the covers having a slight endwise or longitudinal movement or play with relation to the body of the box. The covers are made relatively heavy. Each cover at its fore end is provided with a flattened foot **24** which, when the box is devoid of strands, has gravity bearing against the bottom of the box. The bearing surface of each of these feet together with the face portion of the box bottom against which the foot has bearing are preferably made serrated.

Each of the boxes **18**, forming as it does a part section of each feed unit **16**, is, in its relation to the table **4**, so mounted upon the table as will enable it to have longitudinal movement in or out radially across that portion of the table on which the box is mounted, and to also have a tipped up and down movement when the fore end portion of the box is either raised or lowered. To this end the bottom of each box at a point adjacent its outer or rear end is provided with a fin **25** interposed between a set of hubs **26** on a pivot pin **27** which extends through both hubs and fin. The hubs are borne by a bearing **28** which slidably rests upon the table **4** along a radial slot **29** therein. The bearing **28** is provided on its under side with a stud **30** which slidably extends through the slot **29** in the table with extension into a slot **32** formed in the cam rail **7** on the stationary bed of the machine where the stud is provided with a wheel enabling it to run within the slot in the rail. The slot **32** cut in the top of the bed of the machine is a waving slot so that the bed will form a cam for moving the feed boxes in or out along the radial slots **29** in the table as the table is turned. The in and out radial movement of all the feed boxes as the table is turned, is governed by this slot, and the precise location of any feed box at any determinate point of the table's turning is, also, governed by the slot.

Besides their endwise or longitudinal movement the feed boxes may be raised or lowered, turning on their rear end pivotal connections. Secured to the bottom of each feed box, at a point adjacent its fore end, is an arm **33**. This arm projects downwardly through the slot **29** in the table, above which the box lies adjacent, with sliding fit within this slot. The arm projects to either rest and slide upon a raised rail **34** on the stationary bed of the machine for holding the box in an upturned position, as shown in Fig. 2, as the table is turned, or rest and slide upon the top surface **2** of the bed of the machine, as shown in Fig. 3, which permits of the then gravitated downturned position of the feed box. In order to facilitate the movement of the arms **33**, either upon the raised rail **34** or upon the top surface **2** of the bed, as the table is turned, the arms for all the feed boxes are preferably each fitted with a roller bearing **35**.

As previously explained it is by means of the feed units **16** and feed boxes forming these units that the strands are withdrawn from the spools during the rotation of the table **4**. The strands *a* from the respective spools extend through the feed boxes, the strands on any one of the spools being drawn to extend through the unit **16** adjacent to it, and the strands on any spool are separated into separate hanks to pass through the various sections, or feed boxes, forming the unit. At a determinate point in the table's rotation which corresponds with the section line **2—2**, Fig. 1, the stationary bed of the machine, acting as a cam, will have moved one of the feed boxes of some one of the units **16** associated with a spool into a position substantially as shown in Fig. 2. All the parts will in turn as the table is rotated arrive at this same position as indicated in Fig. 2. Accordingly, description will be made in the light of this particular feed box located as aforesaid.

Referring, accordingly, to Fig. 2 it will be seen that the feed box is occupying a position at the outer end of the slot **29** in the table, and is occupying its upturned position with its arm **33** resting upon the upturned rail **34** on the bed of the machine. It will also be seen that the strands *a*, from the adjacent spool, extend outwardly through the feed box with the flattened serrated foot **24** of its cover **21** resting upon the strands. The strands extend forward from the fore end of the feed box and rest by a lap *b* upon a guard **36** having fore and outer ends **37**, **38** respectively. This guard is fixed to the bed of the machine and extends over the pins on the respective rings **14**, **15**. The guard is arcuate in form, and its position and the amount of its arcuate extension in the circle described by the table during its rotation is substantially as shown in Fig. 1 where it will be seen that the guard is of some considerable length. The lap *b* on the guard extends over the pin carrying ring **14** to a point about midway between the two pin carrying rings **14** and **15**. As the table is turned the stationary bed of the machine acting as a cam will then operate through its cam connection with the feed box to move it inwardly along the slot **29** in the table. As the feed box moves forward it draws the hank of strands with it from off the adjacent spool. This drawing action takes place because the strands are gripped between the foot of the heavy cover and the adjacent bottom of the feed box. This gripping action is facilitated by the serrating or roughening of the foot and box bottom as aforesaid, and also by the fact that the cover by reason of its loose pivotal connection is permitted to have a certain amount of play in order that the serrations on its foot may better grip the strands. As the feed box moves forward by the rotation of the table the strands will gradually be further projected over the guard, and in due course over the pins of both rings. The movement of the feed box will continue as the table continues to rotate, until the box has been moved to a point substantially adjacent the outer end **38** of the guard **36**, when the feed box will have been advanced so far that the strands will have been extended beyond the inner edge of the guard to form a fringe *c* beyond this edge, the fringe extension being substantially that shown in Fig. 3.

While description has been made of this single feed box it will be understood that other of the feed boxes, through which hanks of strands are extending lying forward of the feed box just considered, are undergoing the same operation, so that a lap *b* is continuously being formed on the guard with gradual extension to form the fringe *c* as approach is made to the outer end **38** of the guard.

In order that the lap *b* upon the guard, and fringe extension therefrom, may maintain correct positioning during the period of their formation, and especially to stop back drag of the strands, both lap and fringe are subjected to air blasts through jet forming connections **40**, air under pressure being introduced from any suitable source.

Located on the machine at points just forward

of the outer end 38 of the guard is a brush 41, and a pin carrying wheel 42. Both the brush and wheel are borne by an arbor (not shown) connected to the bed of the machine. The brush is freely rotatable. The wheel has geared connection with the inside toothed edge of the rotary table so that the wheel will be rotated as the table turns. The wheel turns in the same horizontal plane with the pin carrying rings 14, 15 on the table, the wheel being so mounted that as it turns the pins thereon will align with the pins on the respective rings, as shown in Fig. 3. The brush is so arranged as to mesh into the pins on the respective rings and those upon the wheel as it is rotated by the table. In consequence when the lap *b* and fringe *c* pass the outer end 38 of the guard, as the table turns, both lap and fringe will be pressed down by the brush into the pins on the rings and those on the wheel. The lap *b* will be pushed into the pins of the respective rings while the fringe *c* will be pressed into the pins on the rotating wheel. In consequence while the lap *b*, or that portion of the fibres contained within the pins on the respective rings will be carried forward as the table turns, the fringe acted upon by the pins of the rotating wheel will be combed and straightened as the circles described by the table and wheel draw apart.

The lap and combed fringe then pursue a relatively short arcuate course in the table's turning, and the lap *b* is then cut, separating that portion of the lap in the pins of the inner ring 15, which bears the fringe *c*, from that portion of the lap lying within the pins on the outer ring 14. 44 represents the cutter which is an electric cutter of common type having a cutting blade 45. The cutter, mounted on the bed of the machine, is so arranged that its blade will enter the space between the rings 14 and 15 and there sever the lap as aforesaid. In order to facilitate the cutting of the lap the cutter is provided with a split foot 46 which is borne by a lever 47 on the cutter and so arranged that the foot will enter between the pin carrying rings and engage the running lap under slight pressure, thus holding the lap in place while being cut. Pressure is obtained by a spring 48 connected at one end of the body to the cutter, and at its other end to an arm 49 on the lever bearing the foot.

After the lap has been cut, the section thereof in the pins on the ring 14, and the cut section thereof bearing the fringe in the pins on the ring 15, will be carried forward together as the table turns. After a short space of arcuate movement that portion of the lap in the pin carrying ring 14 will continue to be carried forward by the rotating table, but the portion of the fringe carrying lap on the pins of the inner ring will be withdrawn therefrom in the form of a continuous sliver as the strands forming the fringe are brought forward, or presented, by the rotating table. In this sliver the strands overlap due to the difference in the time of their withdrawal.

For drawing the strands of the fringe carrying lap from the pins of the inner ring a nip roll 50 is arranged in the path of the fringe. This nip roll is arranged in a vertical position, or one normal to the path of the fringe, and is preferably a relatively small steel roll with a fluted or serrated surface. This roll works in co-operation with a set of endless aprons 51 and 52, which at their forward ends travel around rolls 53, 53', and at the outer ends around rolls 54, 54'. The disposition of the aprons is such that the nip roll will lie in engagement with the fore end of the apron 52 which is passing around the roll 53', thus forming a bight 55 between the nip roll and the apron. As the fringe is brought forward in the rotation of the table it will engage the nip roll, and also the end of the apron 52 with which the nip roll is co-operating, with the effect that the ends of the fringe forming strands will be brought into the bight 55 of the roll and apron, and the strands will accordingly be withdrawn from the pins of the inner ring to pass as a sliver 56 between the nip roll and the apron with which it is in engagement, and thence pass through the respective aprons which are arranged to snugly hold the sliver between them and carry it forward. The sliver is formed with the strands thereof arranged in overlapping relation to one another owing to the fact that these strands are withdrawn from the fringed lap in successive order of withdrawal and by reason, also, of the fact that nip roll and the apron with which it is co-operating are rotating at a speed faster than the speed of the rotating table, the preferred ratio being about 2 to 1, though this may be changed as requirements demand. The nip roll 50 and the roll 53' which assists in bearing the apron 52, are suitably supported to turn within bearings in a stationary frame 58 supported off the bed of the machine which is provided with a suitable inside support 59. The bearings for the roll 53' are backed by springs 60 which tend to yieldingly hold this roll, and the apron passing around it, hard against the nip roll. The bearings for the roll 53 which supports the fore end of the apron 51 are also controlled by springs 60 which tend to hold the apron 51 in yielding contact with the apron 52 at the fore end thereof where the sliver is entering. At the outer end of the aprons the rolls 54, 54' are preferably geared together by gears 61, 61' arranged on their respective shafts in order that these rolls may rotate in unison.

The nip roll is rotated by a variable speed motor 64 arranged on the inside support 59 in the stationary bed of the machine. This motor drives a sprocket wheel 65 in chain connection 66 with a sprocket wheel 67 on a shaft 68 in worm drive connection 69 with the end of the nip roll or shaft bearing this roll. The rotation of the nip roll turns the apron 52 through frictional engagement therewith, and the apron 52 turns the apron 51 with which it is in frictional engagement.

After leaving the aprons the sliver 56 preferably passes through a trumpet 70, and is then taken care of, or processed, as may be desired.

That portion of the lap left in the pins of the outer ring 14 is carried forward as the table continues to rotate, and attention will now be directed especially to that arcuate space in the table's turning which lies between the point where the strands are drawn off from the pins of the inner circle and the inner end 37 of the guard 36. At the time that the strands are withdrawn from the pins of the inner circle, the feed boxes 18 will not have been returned from their forward position to which they have been moved for feeding the lap onto the guard, and it is during this arcuate space that the feed boxes are moved back into a retracted position, from which they may be again moved forward for feeding the strands onto the guard for forming the lap as the table continues to turn. Soon after leaving the point where the strands are drawn off, the lap left in the pins of the outer circle is held

firmly in place by a hold-down blade **72**, which traps the strands in the outer circle of pins, while the feed boxes are being moved outwardly to get a fresh hank of strands equal in length to the ones cut off. The feed boxes are gradually moved outwardly along the slots **32** cut in the top of the bed of the machine, and reach their outermost retracted position just before approach is made to the inner end of the guard. At this time the lap will be lifted out of the pins in the outer circle to pass onto the guard, as the table continues to rotate, by stationary blades **73** which are located between the rows of pins. The feed boxes will then be occupying a raised position so that they may feed the lap onto the guard as the table continues to rotate, the operation being repeated. In consequence a sliver **56** is being continuously formed as the strands are drawn off from the respective packages.

I claim:

1. In a sliver forming machine the combination comprising a stationary bed, a rotary table bearing inner and outer sets of pins, means for rotating said table, a plurality of packages carried by said table each bearing wound strands of continuous filament and from which packages the wound strands may be withdrawn, a stationary guard covering said pins for a substantial distance along and above the path thereof as the table is rotated, means borne by said rotary table for drawing the strands from said packages during determinate periods of arcuate movement of said table as it is rotated and for feeding the strands inwardly over said guard to rest thereon whereby lap lifted from out of the outer set of pins and resting upon said guard will be moved inwardly and the lap progressively deepened by strands drawn from said packages with ends forming an inward fringe forming extension to said lap, means for maintaining the strands in proper aligned position during their passage over said guard as the table is rotated, means for impaling the fringe carrying lap in the pins after the lap has left the guard in the rotation of the table, means for severing the impaled lap whereby the fringe carrying portion of the lap, severed from the portion of the lap remaining in the outer set of pins, will lie impaled only upon the inner set of pins, drawing means whereby the fringe carrying portion of the lap remaining in the inner set of pins will be withdrawn therefrom to form a sliver with overlapping strands through draft applied to the ends of said fringe as said ends of the fringe are brought into engagement with said drawing means in the rotation of the table, and means whereby the lap left in the outer set of pins after the severance of the fringe forming portion thereof as aforesaid will be lifted to pass onto said guard during the rotation of the table.

2. In a sliver forming machine the combination comprising a stationary bed, a rotary table bearing inner and outer sets of pins, means for rotating said table, a plurality of packages carried by said table each bearing wound strands of continuous filament and from which packages the wound strands may be withdrawn, a stationary guard covering said pins for a substantial distance along and above the path thereof as the table is rotated, means borne by said rotary table for drawing the strands from said packages during determinate periods of arcuate movement of said table as it is rotated and for feeding the strands inwardly over said guard to rest thereon whereby lap lifted from out of the outer set of pins and resting upon said guard will be moved inwardly and the lap progressively deepened by strands drawn from said packages with ends forming an inward fringe forming extension to said lap, means for maintaining the strands in proper aligned position during their passage over said guard as the table is rotated, means for impaling the fringe carrying lap in the pins after the lap has left the guard in the rotation of the table, means for straightening the fringe after the fringe carrying lap has left the guard and been impaled in the pins as aforesaid and before severance of the lap, means for severing the impaled lap whereby the fringe carrying portion of the lap, severed from the portion of the lap remaining in the outer set of pins, will lie impaled only upon the inner set of pins, drawing means whereby the fringe carrying portion of the lap remaining in the inner set of pins will be withdrawn therefrom to form a sliver with overlapping strands through draft applied to the ends of said fringe as said ends of the fringe are brought into engagement with said drawing means in the rotation of the table, and means whereby the lap left in the outer set of pins after the severance of the fringe forming portion thereof as aforesaid will be lifted to pass onto said guard during the rotation of the table.

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