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SLUB YARN PRODUCING ATTACHMENT

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2 Sheets-Sheet 2

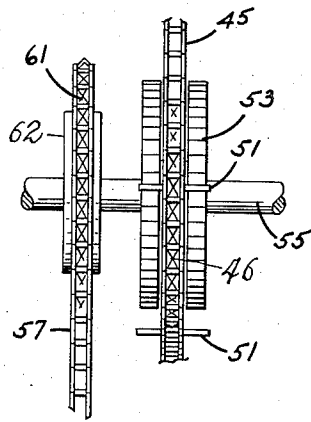


Fig. 3

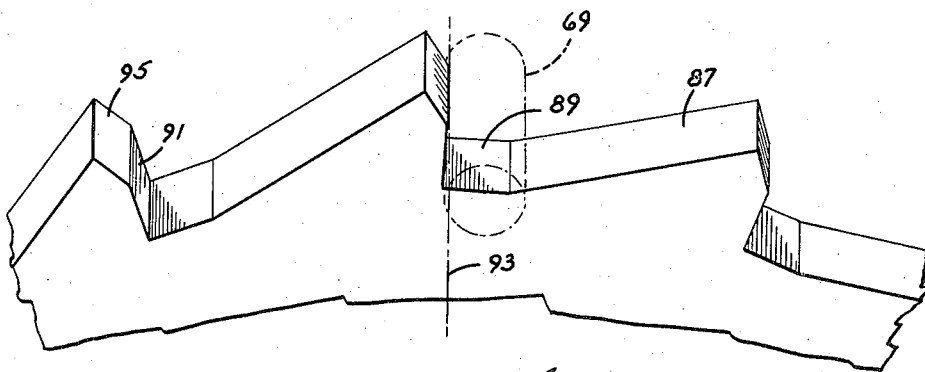


Fig. 4

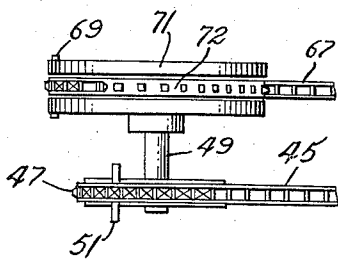


Fig. 5

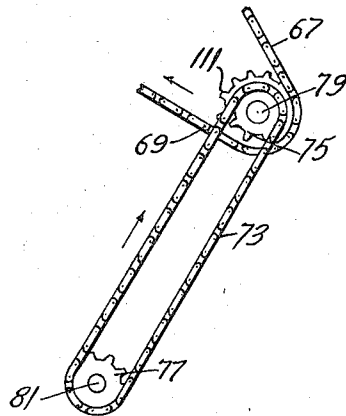


Fig. 6

1

2,879,550

SLUB YARN PRODUCING ATTACHMENT

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The invention relates to a slub yarn producing attachment for use with spinning or roving frames.

In the weaving of various fabrics having a decorative and novel appearance, as for example shantung or Himalaya cloth, the yarns employed have thickened portions or slubs irregularly spaced along their lengths. The most desirable ornamental effect is produced when the slubs, in the woven fabric, appear randomly arranged, rather than as a definite pattern which is repeated throughout the length of the fabric. With conventional mechanisms for producing slub yarns a sprocket and pattern chain are combined with a drive means, as for example a ratchet wheel, which is intermittently accelerated for varying the speed of the feed rolls of the spinning frame. These known constructions have proved to be unsatisfactory since the slubs are formed in a definite pattern which repeats itself with each revolution of a pattern chain. In many cases, an extremely long pattern chain has been utilized to increase the interval between recurring slub patterns, but this necessitates the use of a large support frame and numerous guiding idlers, besides being time consuming when a pattern change is desired.

With the conventional slub yarn producing attachments, in which ratchet wheels are employed, additional difficulties are encountered in the mechanical operation of the attachment itself. The teeth on a common ratchet wheel have what appears to be a modified involute shape which tends to cam the pins of the pattern chain upwardly and out of engagement with the ratchet wheel when the pattern chain is traveling at a relatively high speed. The driving force exerted on the ratchet teeth, combined with the camming action of the teeth themselves, is sufficient to lift the chain out of mesh with the sprocket and cause it to jump over one or more of the ratchet teeth. The resulting shock, especially when repeated often, damages or breaks the pattern chain or its drive pins, and also results in noisy operation.

Aside from the design of the ratchet wheels themselves, their continuous rotation at the same speed as the spinning frame feed rolls is often not coordinated with that of the pattern chain so that proper engagement between the drive pins on the pattern chain and ratchet teeth is not always insured. This results in a jamming of the apparatus, in addition to possible damage to the parts. It is therefore an object of the invention to provide a generally improved and more satisfactory slub yarn producing attachment.

Another object is to provide an apparatus which is capable of providing yarns having irregularly spaced slubs which are not formed in any repetitious pattern or sequence.

Still another object is the provision of an attachment for forming slub yarns in which the slubs are of non-uniform length.

A further object is to provide a slub yarn producing attachment having intermittently accelerated ratchet wheels in which the teeth are shaped to prevent jumping of the pattern chains which engage therewith.

2

A still further object is the provision of an attachment which varies the rotational speed of the spinning frame feed rolls by intermittently accelerated ratchet wheels which remain stationary between accelerations.

A still further object is to provide a slub yarn producing device which is simple and compact in construction, reliable in use, and may be economically fabricated.

These and other objects and advantages of the invention will be apparent from the following description and accompanying drawing in which:

Fig. 1 is a fragmentary front view of a portion of a spinning frame showing the yarn feed rolls and their driving mechanism as viewed in the direction of the arrows I—I of Fig. 2;

Fig. 2 is a left side view of the structure shown in Fig. 1, along with the driving mechanism for intermittently accelerating the rotary movement of the spinning frame rear feed rolls;

Fig. 3 is an edge view of a ratchet and sprocket assembly as viewed in the direction of the arrows III—III of Fig. 2, illustrating the cooperation between the ratchets and the pattern chains;

Fig. 4 is a side view, on an enlarged scale, of a portion of a ratchet, illustrating the faces of the ratchet teeth and their cooperation with a pattern chain drive pin, shown in broken lines;

Fig. 5 is an edge view of a second ratchet and sprocket assembly as viewed in the direction of the arrows V—V of Figure 2; and

Figure 6 is a side view of a chain and sprocket assembly for imparting a uniform movement to one of the pattern chains.

The invention is directed to a slub yarn producing attachment for use with spinning or roving frames and includes a relatively short pattern chain which intermittently accelerates a pair of ratchet wheels at irregular intervals. This accelerated movement of the ratchet wheels is transmitted, through a pair of overriding clutches, to the rear feed or draw rolls of the spinning frame and varies their speed accordingly. A second pattern chain reacts upon the first pattern chain at irregular intervals through a second pair of ratchet wheels, which are stationary until acted upon by the second pattern chain to intermittently accelerate the first pattern chain. The attachment of the present invention is capable of producing randomly spaced slubs which are of approximately the same length or which differ in length, also in an irregular pattern. This latter effect is produced by a pair of non-circular gears, as for example elliptical in shape, cooperating with the second pattern chain to uniformly vary its velocity.

With reference to the drawings, Fig. 1 illustrates a portion of a conventional spinning frame capable of imparting a desired draft and twist to the rovings 11 and 13 drawn from a suitable supply source, as indicated by the arrow 15, through a guide 17, and then passed through sets of rear and front draw or feed rolls carried by the support 19. When not acted upon by a slub producing attachment, a continuous and uniform rotary movement is imparted to the lower roll 21 and 23 of the front and rear draw rolls, respectively, by the shafts 25 and 27 formed as extensions of or connected integrally with their respective rolls. The shaft 25 is turned directly by any conventional driving means (not shown), while the shaft 27 is driven by the gear train including pinion gears 29, 31, and 33, and the ring gear 35. The ring gear 35 and pinion gear 31 are carried by the shaft 37, with the gear 35 being connected to the shaft 37 through an overriding clutch 39 which permits the rear rolls to be accelerated above their normal speed as hereinafter described. As with the usual spinning frame construction, the lower rolls 21 and 23 are provided with pe-

ripheral longitudinally extending grooves or serrations to insure proper gripping with the surfaces of their respective upper rolls 41 and 43.

To provide the yarn with slubs, it is necessary to intermittently accelerate the rotational movement of the rear draw rolls above their normal speed so that an excess of rovings is fed between the front rolls. In accordance with the present invention, the intermittent acceleration of the rear rolls 23 and 43 is provided by a pattern chain 45 passing over the sprocket 46 and intermittently driven at a faster rate than the normal speed of the rear rolls, through a sprocket 47 fixed to the shaft 49. Before and after each acceleration by the drive means hereafter described, the chain 45 assumes a stationary position. The chain 45 is merely a standard link chain in which certain of the ordinary pivot pins have been replaced by elongated pins 51, the end portions of which extend outwardly from the sides of the chain, at irregular intervals, for engagement with the ratchet wheels 53 connected to the shaft 55, preferably on opposite sides of the sprocket 46 as shown in Figure 3. Unless acted upon by the pins 51, the ratchet wheels 53 remain in a stationary position notwithstanding the continuous rotation of the shaft 55 at a uniform speed by the link chain 57 traveling over the sprockets 59 and 61 secured to the shafts 37 and 55 respectively. This action on the part of the ratchet wheels 53 is facilitated by the overriding clutch 62 interposed between the shaft 55 and sprocket 61. Upon engagement, the pins 51 each rotate the ratchet wheels 53 at a speed faster than the normal speed of the shaft 37, thereby locking the overriding clutch 62 in operative position, while the clutch 39 is caused to slip to permit a temporary acceleration to be imparted to the rear rolls of the spinning frame. While a single ratchet wheel 53 may operate satisfactorily in some cases, use of a pair of spaced ratchet wheels, as shown in Fig. 3, is considered preferable to insure that the shaft 55 is subjected to a symmetrical driving force and more important to prevent bending of the chain pins. The pattern chain 45 is supported along its length by any desirable number of idler sprockets 63, at least one of which is adjustable to permit the sprocket 64 to be moved along a slotted arcuate guide 65 which has its center of curvature on the axis of shaft 55. It will be noted that varying the position of the sprocket 64 along the guide 65 varies the time interval within which the pins 51 on the chain 45 will be engaged and have driving connection with the ratchet wheels 53. Thus, the lengths of the slubs produced may be varied, as desired, by merely altering the position of the sprocket 64 relative to its guide 65.

From the structure thus far described, it is seen that each intermittent actuation of the pattern chain 45 will cause the ratchet wheels 53 to rotate, which rotary movement is conveyed to the rear draw rolls of the spinning frame to produce slubs as heretofore described. To impart this intermittently accelerated movement at irregular intervals to the pattern chain 45, a second pattern chain 67 is provided. This second pattern chain 67 rotates at a speed greater than that of the rear draw rolls and has certain of its pivot pins, preferably randomly selected, substituted for by elongated pins 69, similar to the pins 51 of the first pattern chain described. The pins 69 of the second pattern chain 67 cooperate with the ratchet wheels 71 carried by the shaft 49 on opposite sides of the sprocket 72 which is also mounted on the shaft 49 but is rotatable relative thereto. The ratchet wheels 71 are similar to the corresponding structure previously described in relation to the first pattern chain, and also remain in a stationary position until acted upon by the pins 69 of the second pattern chain. Movement is imparted to the pattern chain 67, for example as shown in Figure 6, by a standard link chain 73 passing over the sprockets 75 and 77 connected to the idler shaft 79 and the drive shaft 81, respectively. As with the pattern

chain 45, the pattern chain 67 is supported along its length with a plurality of idler sprockets 83, at least one of which is preferably adjustable to allow the sprocket 84 to be moved along its arcuate guide 85. This adjustment also determines the interval of driving connection between the pins 69 and the ratchet wheels 71, and in effect causes the lengths of the slubs to be varied.

It is seen that the uniform rotary movement of the rear rolls of the spinning frame is intermittently accelerated by the action of the pattern chain 67 acting through the pattern chain 45 and the intermediate ratchet wheels and overriding clutches. The pattern chains 45 and 67 are so proportioned that the number of pins in one chain differs from the number of pins in the other chain by at least one pin, and preferably in a manner as to provide one pattern chain with an even number of pins while the other pattern chain is formed with an odd number of pins. This relationship between the pins of the two pattern chains 45 and 67 produces the same effect as a single pattern chain having a number of pins equal to the product of the number of pins in the chain 45 multiplied by the number of pins in the chain 67. It is thus evident that the arrangement of pattern chains described above insures against a systematic repetition of slub patterns occurring at close intervals, yet is compact and simple in operation.

With particular references to Fig. 4, it will be noted that each of the ratchet teeth of the wheels 53 and 71 has an outer surface 87 inclined downwardly toward a notch formed by the faces 89 and 91. The planes of the faces 89 are approximately at right angles to planes extending radially of the ratchet wheels, while the planes of the faces 91 are inclined forwardly relative to a radial line, as for example the line 93 shown in Fig. 4. Thus, as the pins 51 or 69 engage the faces 91, they are cammed downwardly toward the center of the ratchet wheels, with the camming action increasing as the driving force of the pattern chain becomes greater. The beveled edges 95 between the surfaces 87 and the faces 91 permit the pins to be more easily withdrawn out of engagement with the ratchet wheels after they have performed their desired function.

With the structure described above, the slubs produced are randomly spaced and non-uniform in length. The slubs may be produced in various lengths also by modifying the attachment described above to provide the second pattern chain 67 with a uniformly varying velocity. This effect is obtained by means of a pair of cooperating non-circular gears, as for example the elliptical gears 97 and 99 shown in Fig. 2, fixed at their foci to the shafts 79 and 101 respectively. In this modification, the chain 73 is eliminated and the sprocket 77 on the drive shaft 81 causes the gear 99 to rotate by means of the link chain 103, the sprocket 105, and spur gear 107, the latter two elements being fixed to the shaft 109. The meshing engagement of the gear 99 with the gear 97 causes the shaft 79 to turn with a uniformly varying velocity, rotating the sprocket 111 and imparting a rotary movement to the second pattern chain 67. By means of the non-uniform movement of the second pattern chain, the intermittent acceleration of the first pattern chain 45 will vary in velocity also, ultimately causing the rear feed rolls to advance different amounts of rovings with each acceleration thereof and thus produce slubs of the various lengths.

As described, it is evident that the irregular intermittent acceleration of the first pattern chain by the second pattern chain provides a slub pattern which will not repeat itself at close intervals. Further, by adjusting the sprockets 64 and 84 relative to their guides or by subjecting the second pattern chain 67 to the action of the non-circular gears, or other velocity varying means, the lengths of the slubs can be varied to still further improve the novel and decorative appearance of the finished fabrics woven from the slub yarn produced by the

5

attachment of the present invention. The compact arrangement of the pattern chains and their related mechanisms provide for a simple and reliable construction, and the various overriding clutches insure positive driving action without jamming or damage to any of the parts.

It is seen from the above description that the objects of the invention are well fulfilled by the structure described. The description is intended to be illustrative only and it is to be understood that changes and variations may be made without departing from the spirit and scope of the invention as defined by the appended claims.

I claim:

1. In a yarn drafting mechanism including draw rolls, means for rotating the draw rolls at a uniform operating speed, a first pattern chain, an overriding clutch operatively connecting said first pattern chain with certain of said draw rolls of said yarn drafting mechanism, and a second continuously moving pattern chain being operatively connected with said first pattern chain for intermittently accelerating the speed thereof at irregular intervals and for irregular periods of time.

2. A construction as defined in claim 1 wherein said first and second pattern chains are link chains each having elongated pivot pins randomly spaced along its length.

3. A construction as defined in claim 1 wherein said second pattern chain is driven at a uniform speed.

4. A construction as defined in claim 1 wherein said second pattern chain is driven at a varying speed.

5. A construction as defined in claim 1 wherein said first pattern chain is formed of links pivotally connected to each other by pins, certain of said pivot pins being of elongated construction, and further including a ratchet wheel operatively connected with said overriding clutch and adapted to be actuated by said elongated pivot pins.

6. A construction as defined in claim 5, further including means for adjusting the position of said first pattern chain relative to said ratchet wheel to vary the interval of engagement between said elongated pivot pins with said ratchet wheel.

7. In a yarn drafting mechanism including draw rolls, means for rotating the draw rolls at a uniform operating speed, a first pattern member, a ratchet wheel intermittently accelerated by said first pattern member at irregular intervals, means operatively connected with said ratchet wheel and certain of said draw rolls for transferring the intermittent acceleration of said ratchet wheel to said certain draw rolls, and a second pattern member operatively connected with said first pattern member, said second pattern member being driven at a uniform speed greater than that of said draw rolls and adapted to intermittently accelerate said first pattern member at irregular intervals.

8. A construction as defined in claim 7 wherein said operative connection between said first and second pattern members includes a second ratchet wheel.

9. A construction as defined in claim 8 further including means for adjusting the position of said second pattern member relative to said second ratchet wheel to vary the interval of driving engagement between said second pattern member and said second ratchet wheel.

10. In a yarn drafting mechanism including draw rolls, first means for rotating the draw rolls at a uniform operating speed, second means operatively connected with certain of said draw rolls, a pattern chain continuously operated and adapted to intermittently and irregularly increase the speed of said second means and means for driving said pattern chain at a uniformly varying speed.

11. An attachment for a textile frame including a first shaft, a first sprocket fixed to said first shaft, a pattern

6

chain cooperating with said first sprocket and having elongated randomly spaced pivot pins, means for rotating said pattern chain, at least one ratchet wheel carried by said first shaft alongside of said first sprocket and adapted for engagement with said elongated pivot pins, a second sprocket connected to said first shaft, a second shaft, a third sprocket fixed to said second shaft, chain means connecting said second and third sprockets, and an overriding clutch connecting said second sprocket to said first shaft to permit intermittent acceleration of said first and second shafts when said elongated pivot pins on said pattern chain engage with said ratchet teeth.

12. A construction as defined in claim 11 wherein said means for rotating said pattern chain includes a third shaft, a fourth sprocket carried by said third shaft, at least one ratchet wheel carried by said third shaft alongside of said fourth sprocket, a second pattern chain engaging said fourth sprocket and having elongated randomly spaced pivot pins adapted to engage with said last mentioned ratchet wheel and means for rotating said second pattern chain whereby engagement of said pivot pins of said second pattern chain with said last mentioned ratchet wheel causes said first pattern chain to be intermittently accelerated.

13. A construction as defined in claim 12 wherein said means for rotating said second pattern chain includes a pair of cooperating non-circular gears which provide said second pattern chain with a uniformly varying velocity.

14. A construction as defined in claim 12 wherein each of said ratchet wheels includes a plurality of teeth spaced peripherally by flat portions disposed at approximately right angles to planes extending radially of the ratchet wheels, said ratchet teeth each including a pin-engaging face extending upwardly from and inclined toward an adjacent flat portion, an inclined surface extending upwardly and outwardly from each of said flat portions, and a beveled edge disposed between said pin-engaging face and inclined face of each of said ratchet teeth.

15. In an attachment for use with a spinning frame and adapted to produce yarns having irregularly spaced thickened portions, said attachment including a pattern chain having a plurality of elongated randomly spaced pivot pins, the improvement comprising a ratchet wheel adapted to be intermittently rotated by said pattern chain and having a plurality of teeth with which said pivot pins are adapted to engage, said teeth being spaced peripherally by flat portions disposed at approximately right angles to planes extending radially of said ratchet wheel, said ratchet teeth each including a pin-engaging face extending upwardly from and inclined toward an adjacent flat portion, and an inclined surface extending upwardly from each of said flat portions and toward said pin-engaging faces whereby said elongated pivot pins are adapted to ride down said inclined surfaces onto said flat portion and be cammed radially toward the center of said ratchet wheel by said pin-engaging faces.

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