Feb. 16, 1943. I. V. HITT 2,311,174

TEXTILE CRINKLER

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Fig. 1.

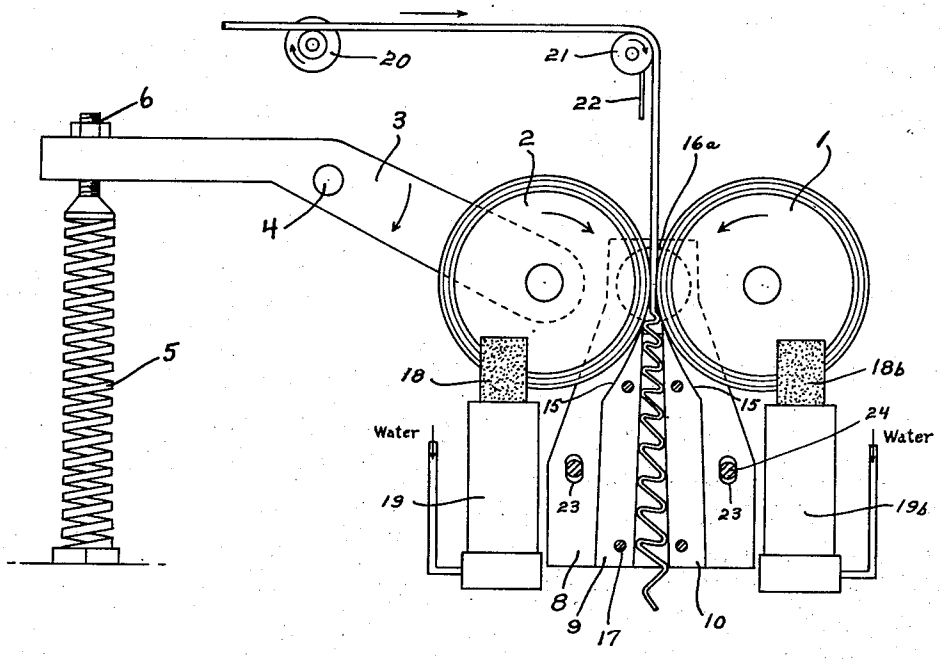



Fig. 7.

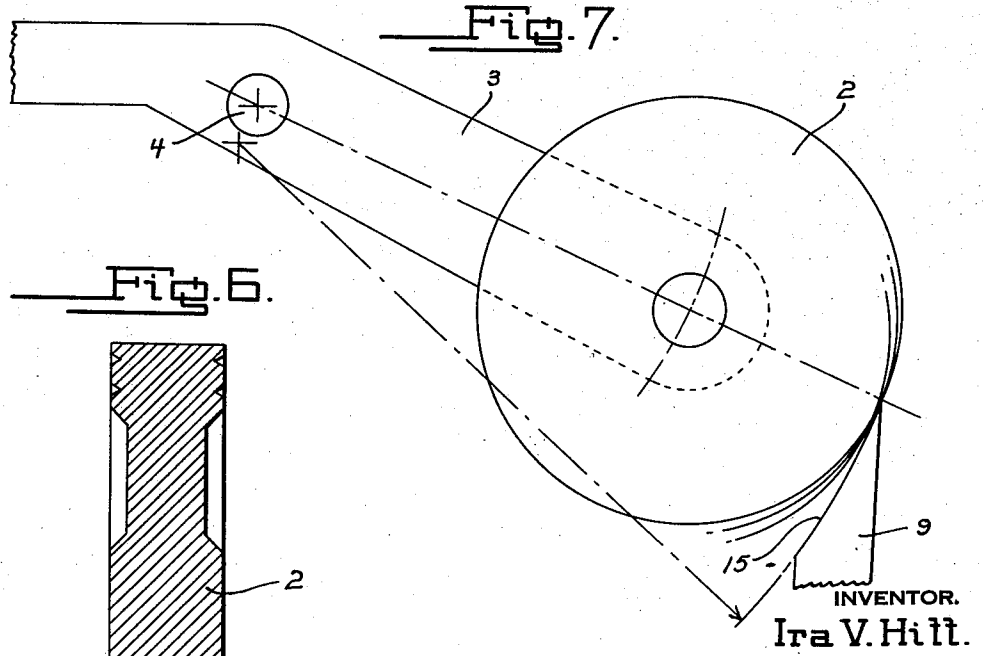



Fig. 6.




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Fig. 2.

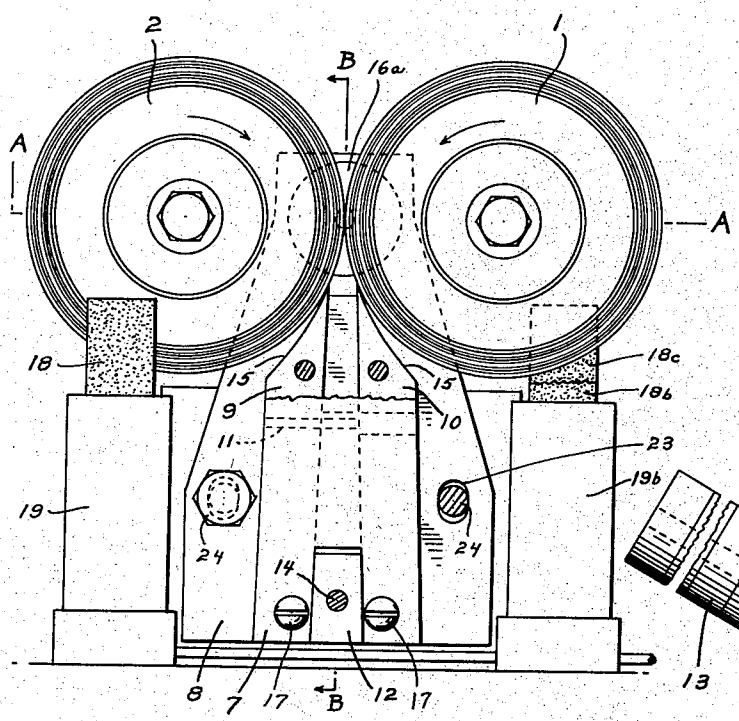



Fig. 4.

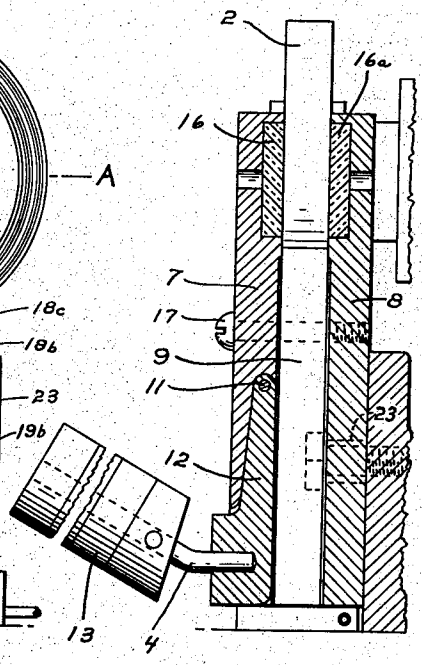



Fig. 3.

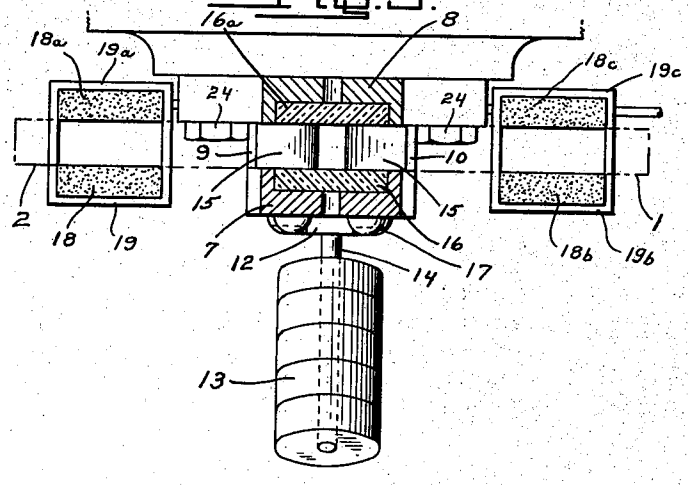
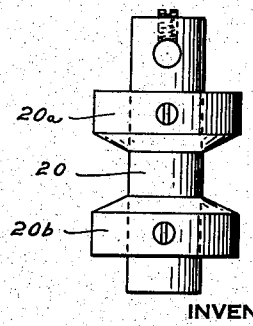



Fig. 5.




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Patented Feb. 16, 1943

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# UNITED STATES PATENT OFFICE

2,311,174

## TEXTILE CRINKLER

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Application December 6, 1940, Serial No. 368,925

6 Claims. (Cl. 19—66)

This invention relates to apparatus for imparting crinkle to ropes or bundles of substantially parallel artificial textile filaments. More particularly, it relates to apparatus for crinkling ropes or bundles of continuous filaments of cellulose acetate whereby to place the filaments in a form best suited for the manufacture of staple.

In order to satisfactorily spin rayon staple, it is necessary or at least highly desirable that the staple have a retentive curl, crimp, or crinkle so that the fibers will bind themselves to each other in the spun yarn. Numerous devices and processes have been proposed to impart this desired crimp or crinkle to artificial filaments or fibers. Nevertheless, the crinklers described heretofore have certain limitations that fail to produce a well crinkled staple without otherwise deleteriously affecting the properties of the staple or uniformity and continuity of operation. While it is important that the staple have a retentive crimp, it must not be imposed on the staple at the expense of strength. In addition to maintaining the strength originally in the filament, it is also highly important to maintain uniform dyeing and maintain the fibers or filaments separate and distinct and not coalesced or fused together and it is, of course, desirable to crinkle the bundle of filaments continuously and at a high rate of production with the minimum of attention from the operator.

My invention has as its chief objective the provision of apparatus which will operate to crinkle ropes or bundles of substantially parallel continuous artificial filaments, without in any way damaging or deleteriously affecting the desirable qualities of the filaments. A further object is to provide a device which operates to impart crinkle to continuous cellulose acetate filaments in bundle or rope form, and which will not impair the tensile strength, the elongation, and the uniform dyeing properties of the filaments, and which will not tend in any degree to fuse the filaments together. Still another object is to provide a crinkling device which is easily adjustable and which will operate continuously and at a high rate of production with a minimum of attention from the operator. These and other objects will more clearly appear hereinafter.

These objects are accomplished by the following invention which in brief comprises two relatively narrow, positively driven cylindrical feed rolls between which the rope or bundle of continuous filaments is fed into a vertically disposed straight channel restricting chamber located directly below the rolls and which chamber is closely and adjustably fitted to overlap the lower portion of the feed rolls whereby the rolls serve as a filament-tight closure assembly for the upper end of the chamber. Resistance to the flow of the bundle of filaments through the chamber with a bunching and resultant crinkling of the bundle of filaments, as explained hereinafter, is provided for by a clapper plate, pivotally mounted in one wall of the chamber, and adjustably counterweighted to operate within the chamber. Adjustable means to effect shifting of one roll with respect to the other, whereby to automatically accommodate the rolls to varying thickness of the bundle of filaments, and a special construction for tightly fitting the chamber walls to the rotating rolls, including special lubricating features, are essential elements of the invention.

For a detailed description of the invention in its preferred form, reference is made to the accompanying drawings wherein:

Fig. 1 is a diagrammatic sketch of the apparatus;

Fig. 2 is a front elevation with parts torn away for a better showing of detail;

Fig. 3 is a top sectional view on the line A—A of Fig. 2;

Fig. 4 is an end section on the line B—B of Fig. 2;

Figs. 5 and 6 are detail views of the adjustable-width guide roll, and of a feel roll, respectively; and

Fig. 7 is a diagrammatic view, detailing the manner in which the shoe element is shaped to accommodate the movable feed roll through its range of movement.

With reference to Fig. 1, two rolls, 1 and 2, preferably of solid metal, and having smooth cylindrical faces of a relatively narrow width, not appreciably greater than the maximum width of the bundle of fibers to be crinkled, are mounted in opposed relationship to engage and forcibly feed the bundle of filaments vertically between the oppositely rotating cylindrical faces. Rolls 1 and 2 are positively driven in opposite directions by any suitable drive mechanism (not shown) such as gearing, belts, or the like.

It frequently happens that the bundle or rope of filaments will vary widely in size, and therefore to prevent uneven operation and possible jamming, as well as to adapt the crinkler to a relatively wide variation in bundle thicknesses, the shaft of feed roll 2 is mounted on lever 3 which is pivoted to the framework of the device at 4. The pivot point 4 is so located with respect to the axis of the rolls that roll 2 in its upward limit

of movement bears against the face of roll 1 and the movement of roll 2 about pivot 4 is therefore down and away from roll 1. Roll 2 in its operative position tends always to bear yieldably against the face of roll 1 and hence against the bundle of filaments because of the downward pull on the opposite end of lever 3 exerted by a coiled spring 5 fixed at one extremity to the framework, and at the other extremity to lever 3 by any suitable means, such as a screw-threaded rod and nut combination 6 which will permit of a fine and stable adjustment of the spring tension.

Located directly below the bite formed by feed rolls 1 and 2 is a vertically disposed straight channeled restricting chamber made up principally of front and back plates 7 and 8 respectively, and shoe plates 9 and 10 which act as separators for plates 7 and 8 (Figs. 2, 3 and 4). Pivotally mounted in the lower portion of plate 7 by a pin 11 is a clapper plate 12 which is counterweighted by adjustable weights 13 supported on upwardly bent rod 14, to swing within the chamber.

Clapper plate 12 impedes to a predetermined extent free flow of the yarn through the restricting chamber and causes the yarn to fold back upon itself into the upper portions of the chamber, thus forming a crimp or crinkle in the filaments, as shown in Fig. 1. To secure continuous and satisfactory operation of the crinkler, and to insure a satisfactory product, it is essential that there be no openings in the upper portion of the restricting chamber which could trap stray filaments of the bundle under pressure. To this end the upper portion of the chamber overlaps rolls 1 and 2, as shown, and plates 7, 8, 9, and 10 are especially constructed for a tight fit at all points of contact with the rolls. Shoes 9 and 10 which form the side walls of the restriction chamber contact the cylindrical faces of the rolls and are arcuately shaped at their upper end 15 to conform generally to the curvature of the rolls, the arc terminating at the upper end, and inner face of the shoes, to form a knife edge at the line of contact with the curved face of the roll. This construction permits of an accurate and close fit of the curved faces of the rolls with the two side walls of the restriction chamber, and effectively seals the restriction chamber at these points.

In Fig. 7 is shown how the shoe plate is arcuately shaped at its upper end to closely fit against movable feed roll 2 throughout a relatively wide range of movement. By reason of this construction it is possible to safely accommodate a considerable variation in the thickness of the bundle without readjustment of the apparatus, and without affecting the uniformity and quality of the crinkled filaments produced.

For an accurate fit with the side faces of the rolls, front and back plates 7 and 8 extend over and above shoes 9 and 10 and overlap the two outside side faces of rolls 1 and 2 at the point where the rolls engage the bundle of filaments. Plates 7 and 8 are provided with recesses, centered at the point where rolls 1 and 2 tend to contact, and into these recesses are fitted inserts 16 and 16a of a vitreous material, preferably of the composition known as "Alsimag." I have found that stationary contacts of this nature provide smoother action and longer wear than can be realized through metal to metal contact, and that additionally the vitreous inserts suffer less damage from the bunched filament than does metal. Shimming or any other suitable means can be employed to adjust inserts 16 and 16a to compensate for wear.

Any convenient arrangement can be employed for mounting, and for attaching plates 7, 8, 9, and 10 together to form the restriction chamber, but the preferred arrangement is to fasten plates 9 and 10 to plates 7 and 8 by machine screws 17 whereby to form a unitary open-ended chamber and then mount the chamber in position on the frame of the crinkler by means of screw bolts 24 fitted in slotted openings 23 formed in plates 7 and 8. The slotted openings permit of an easy adjustment from time to time, of the restriction chamber with respect to rolls 1 and 2, for example, to compensate for wear on knife-edged shoe plates 9 and 10.

Referring to Figs. 1, 2 and 5, an important feature of the crinkler is the means for lubricating the feed rolls 1 and 2 and the contacting stationary elements such as the "Alsimag" inserts 16 and 16a. For this purpose, cellulose (viscose) sponges 18, 18a, 18b, and 18c are provided operating from reservoirs 19, 19a, 19b, and 19c containing water maintained at a constant level by an inlet pipe connection and any suitable overflow (not shown). The sponges rub against the faces or sides of the feed rolls in such a manner that the edges are always lubricated with water at the points of contact between the rolls and the restriction chamber. The side faces of discs 1 and 2 are preferably grooved, as shown in Fig. 6, to provide channels for a more efficient distribution of the lubricant. This lubricating method prevents buildup or sticky finish on the edge of the rolls and eliminates fiber trapping and damage. It also substantially eliminates wear between the feed rolls and the "Alsimag" inserts.

A guide roll 20 having adjustable flanges 20a and 20b (Fig. 5) serves to restrict the substantially parallel filaments into a bundle of proper and uniform width shortly before they are led into the bite of feed rolls 1 and 2. Guide roll 21 disposed directly above and between rolls 1 and 2 is provided with a scraper blade 22 to prevent winding of any broken filaments about the guide.

In operation the rope or bundle of filaments, generally coated with a finish composition, is passed over guide 20 adjusted to the proper width, and is led over guide 21 and between feed rolls 1 and 2 which have been preadjusted to the proper pressure by manipulation of screw adjustment 6. The pressure between the revolving rolls 1 and 2 is sufficient to positively force the bundle into the restricting chamber and against clapper plate 12 which causes the bundle to fold back upon itself in the restricting chamber until sufficient pressure is built up to force the bundle past the clapper plate and into a collection receptacle. The combination of fold and pressure in the restriction chamber operates to crinkle or crimp the filaments, which is a state best suited for the manufacture of staple. The pressure between the rolls 1 and 2, the speed of the rolls, and the back pressure exerted by clapper plate 12, all of which are easily controlled, determine in the main, the intensity of crinkle.

It is understood, of course, that my invention is not limited to the exact mechanical details set out above, but is obviously susceptible to a wide variation of equivalents. For example, the apparatus is not limited to the use of cellulose sponges for supplying lubricant to the rolls, for many other absorbent materials could be used with like effect, or the lubricant could be fed to

the rolls by any other means operative to supply a controlled amount of lubricant, as by controlled spray means for example. Furthermore, many materials other than "Alsimag" could obviously be employed as inserts.

With my improved apparatus, the crinkle can be easily and quickly varied to any desired intensity without substantial loss in strength of the yarn. The vertical restricting chamber arrangement has completely eliminated the fusing of the filament even at speeds as high as 400 yards per minute. The lubrication of the wheels and "Alsimag" inserts have greatly reduced wear and substantially eliminated damage to the edge of the rope and heating-up of the crinkler wheels. The apparatus is essentially simple, easily adjustable and operates satisfactorily over long periods of time without failure or shut down and with practically no maintenance cost. Flow of bundles or ropes in the restricting chamber is quite uniform and stability of operation is much improved over any machine previously used.

My invention is applicable to the crimping or crinkling of any continuous filament bundle such as cellulose derivative yarns; for instance, cellulose acetate, cellulose propionate, cellulose butyrate, mixed esters such as cellulose aceto-propionate, cellulose aceto-butyrate, cellulose ethers such as methyl cellulose, ethyl cellulose, benzyl cellulose, or glycol cellulose or cellulose ether-esters; or regenerated cellulose yarns made from viscose, cuprammonium cellulose, or the like; or continuous filament bundles produced from casein or other proteins, or from synthetic polymers or resins such as polyvinyl acetals, vinyl acetate, vinyl chloride, or mixed polymers or synthetic linear polymers such as Nylon or the like.

I claim:

1. Apparatus for treating bundles of artificial filaments comprising two horizontally disposed, positively driven, cooperating cylindrical feed rolls, having smooth cylindrical faces and closely spaced whereby to form a bite therebetween, means for permitting the movement of one roll down and away from the other roll, adjustable and yieldable means for resisting said movement, a four-walled, straight channeled chamber located below and in overlapping relationship with the lower portion of said rolls, said chamber comprising vertical front and rear walls overlapping and contacting the ends of said rolls at the bite thereof, and vertical side walls, spacing the front and rear walls, each side wall being shaped to a knife edge at the upper end and inner edge thereof, and being arcuately shaped from the knife edge to the outer edge thereof to conform approximately to the curvature of the cylindrical face of the rolls, said side walls being positioned to closely fit the cylindrical faces of the rolls just beneath and to either side of the bite of the rolls, a plate located at the lower portion of said chamber and pivoted at its upper edge to a wall of said chamber, said plate being yieldably pressed to operate as an obstruction within said chamber whereby to resist the free flow of the bundle of filaments through said chamber.

2. Apparatus according to claim 1 wherein the front and rear walls of the chamber at the area of contact with the rolls are of a vitreous material.

3. Apparatus according to claim 1 wherein those areas of the front and rear walls of the chamber which are in direct contact with the rolls, are of "Alsimag" material.

4. Apparatus according to claim 1, including means for lubricating the apparatus at the areas where the rolls, and the walls of the chamber, contact.

5. Apparatus according to claim 1 wherein the end faces of the rolls are grooved near their circumference to provide channels for lubricant, and cellulose sponges bear against each end face of the rolls in the path of the grooves, each sponge being partly submerged in a reservoir of lubricant.

6. Apparatus for imparting a crinkle or crimp to bundles of artificial filaments comprising two horizontally disposed, positively driven, cylindrical feed rolls having smooth cylindrical faces closely spaced whereby to form a bite therebetween, and being provided with circularly extending grooves on the end faces and near the circumference thereof, means for permitting limited movement of one roll down and away from the other roll, adjustable spring tension means for yieldably resisting said movement, a four-walled, straight channeled chamber located below and in overlapping relationship with the lower portion of said rolls, said chamber comprising vertical front and rear walls overlapping the rolls at the bite thereof, said walls being recessed in the overlapping portions centered at the bite to receive inserts of "Alsimag" material whereby that portion of the front and rear plates which contact the rolls are of "Alsimag" material, vertical side walls, spacing the front and rear walls, each side wall being shaped to a knife edge at the upper end and inner edge thereof and being arcuately shaped from the knife edge downwardly and outwardly to the outer edge to conform approximately to the curvature of the cylindrical face of the rolls, said side walls being positioned to closely fit the cylindrical faces of the rolls just beneath and to either side of the bite formed between said rolls, a plate fitted in, and pivotally mounted at its upper extremity to the lower portion of the front wall of the chamber, said plate being adjustably counterweighted to project into the chamber space and into the path of the bundle of filaments through the chamber, and cellulose sponges partly immersed in a reservoir of lubricant and bearing upon each end face of the rolls and in the path of the grooves thereon.

IRA V. HITT.