April 26, 1938. J. A. MATTHEW ET AL 2,115,313

APPARATUS FOR CRIMPING TEXTILE FIBROUS MATERIAL

Filed May 29, 1935 5 Sheets-Sheet 1

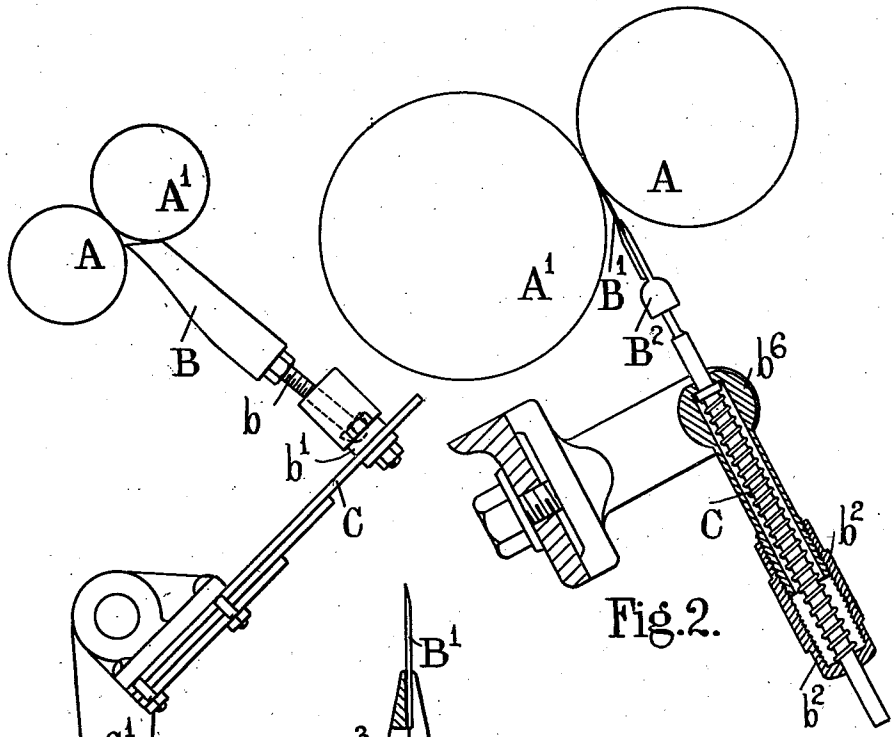


Fig.2.

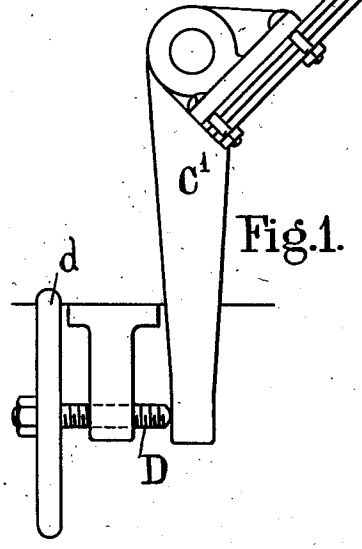


Fig.1.

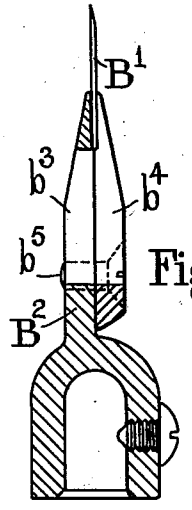


Fig.8.

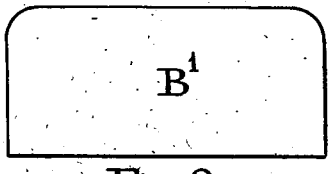


Fig.9.

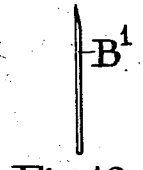


Fig.10.

Fig.11.



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APPARATUS FOR CRIMPING TEXTILE FIBROUS MATERIAL

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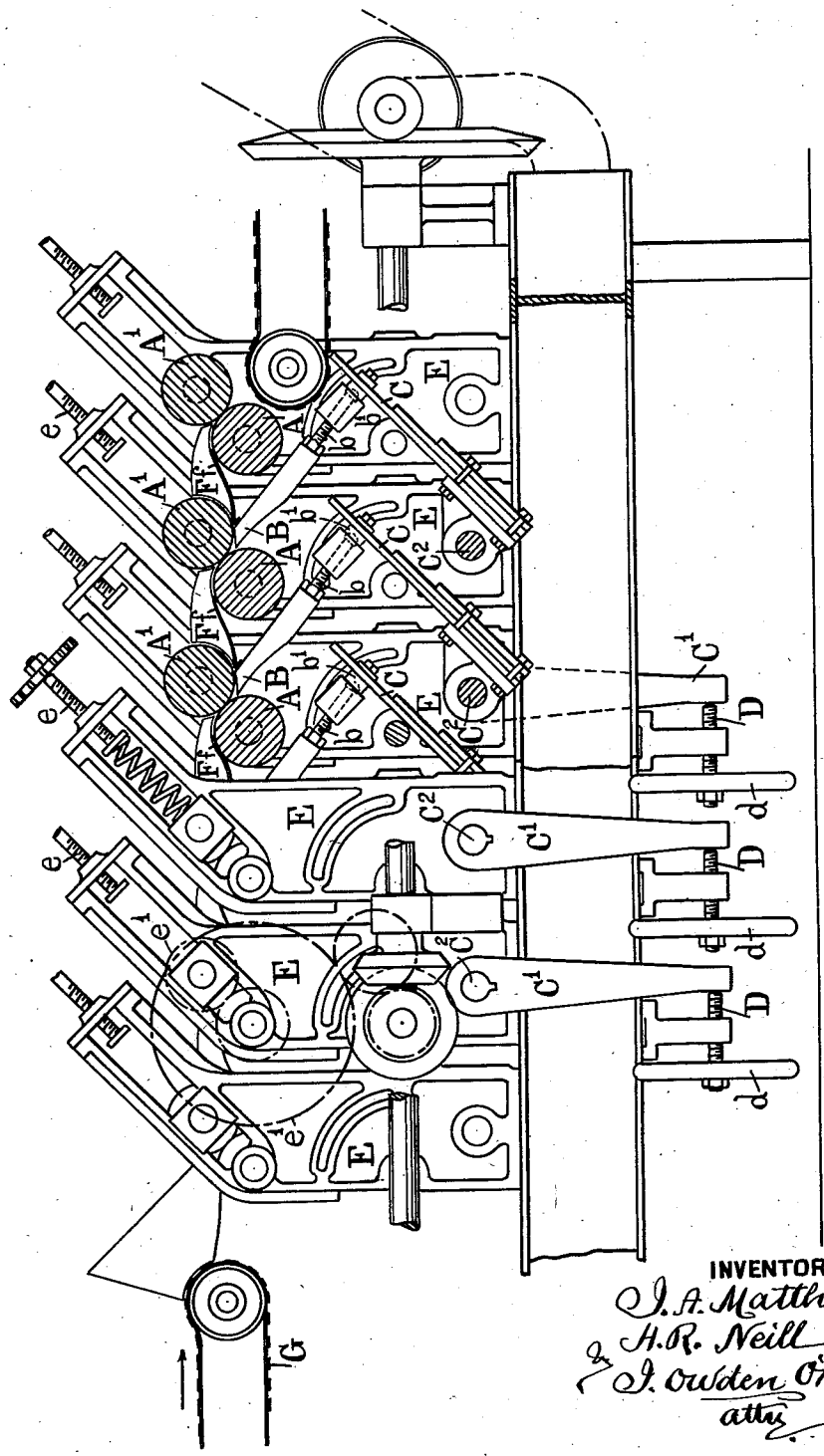


Fig.3.

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APPARATUS FOR CRIMPING TEXTILE FIBROUS MATERIAL

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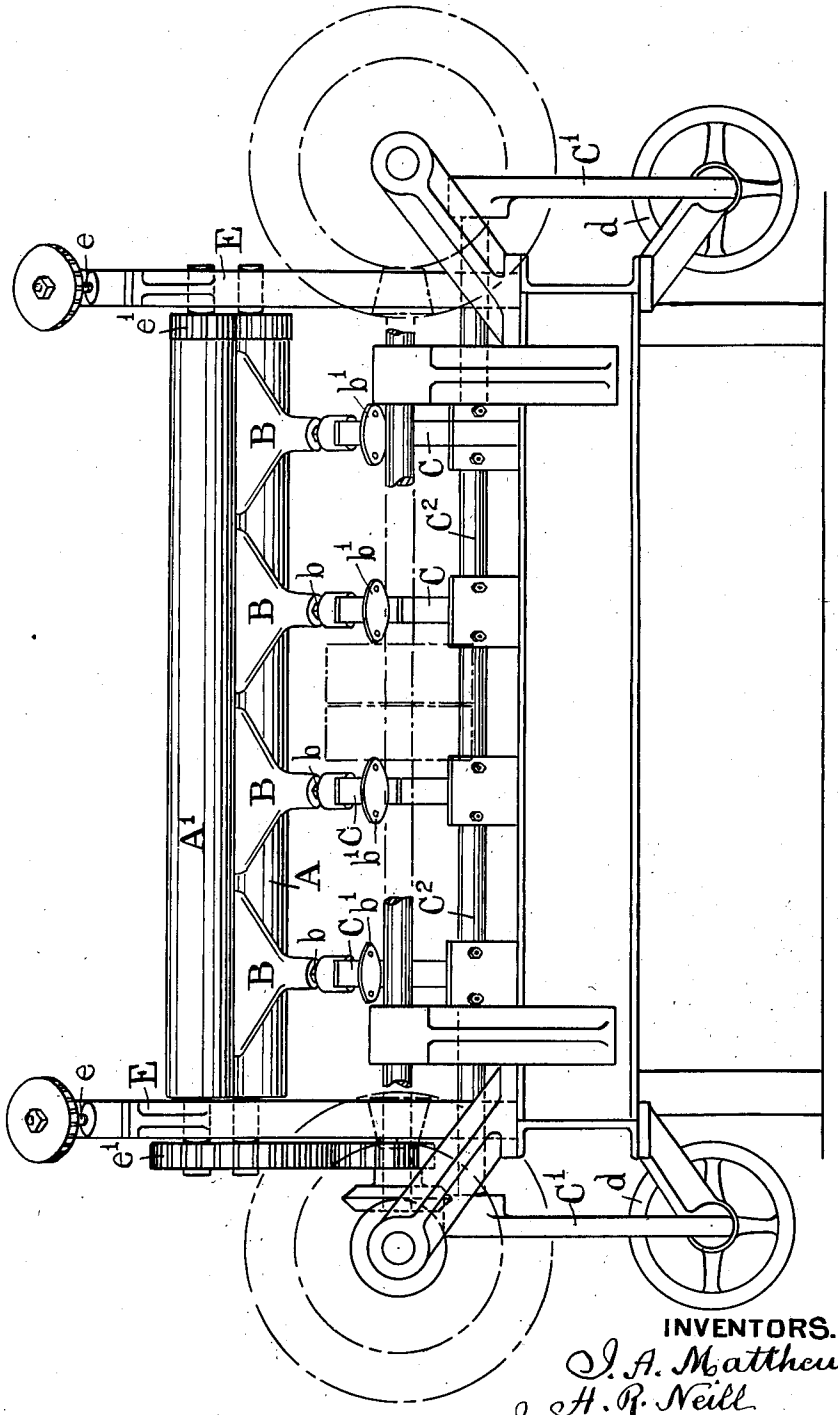


Fig.4.

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APPARATUS FOR CRIMPING TEXTILE FIBROUS MATERIAL

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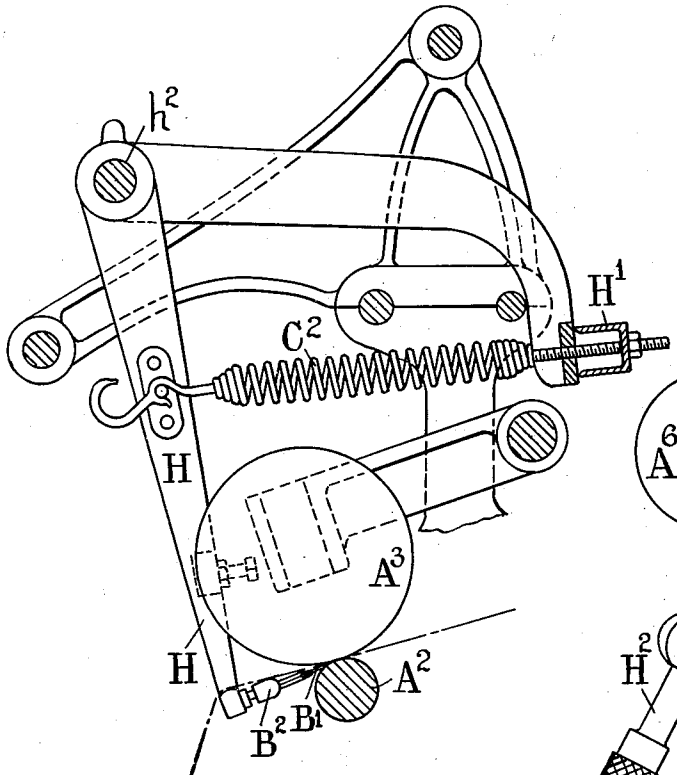
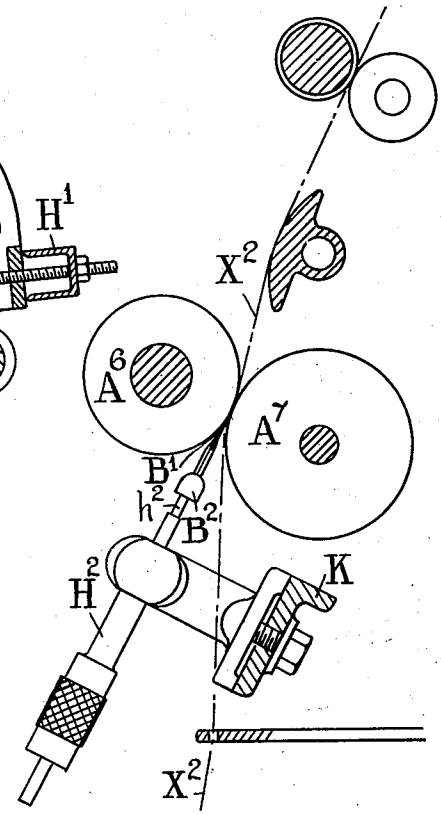


Fig.5.



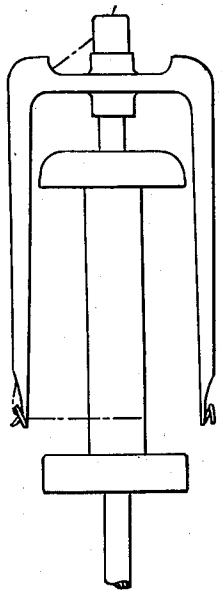
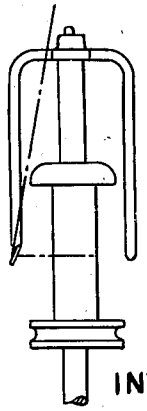


Fig.7



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APPARATUS FOR CRIMPING TEXTILE FIBROUS MATERIAL

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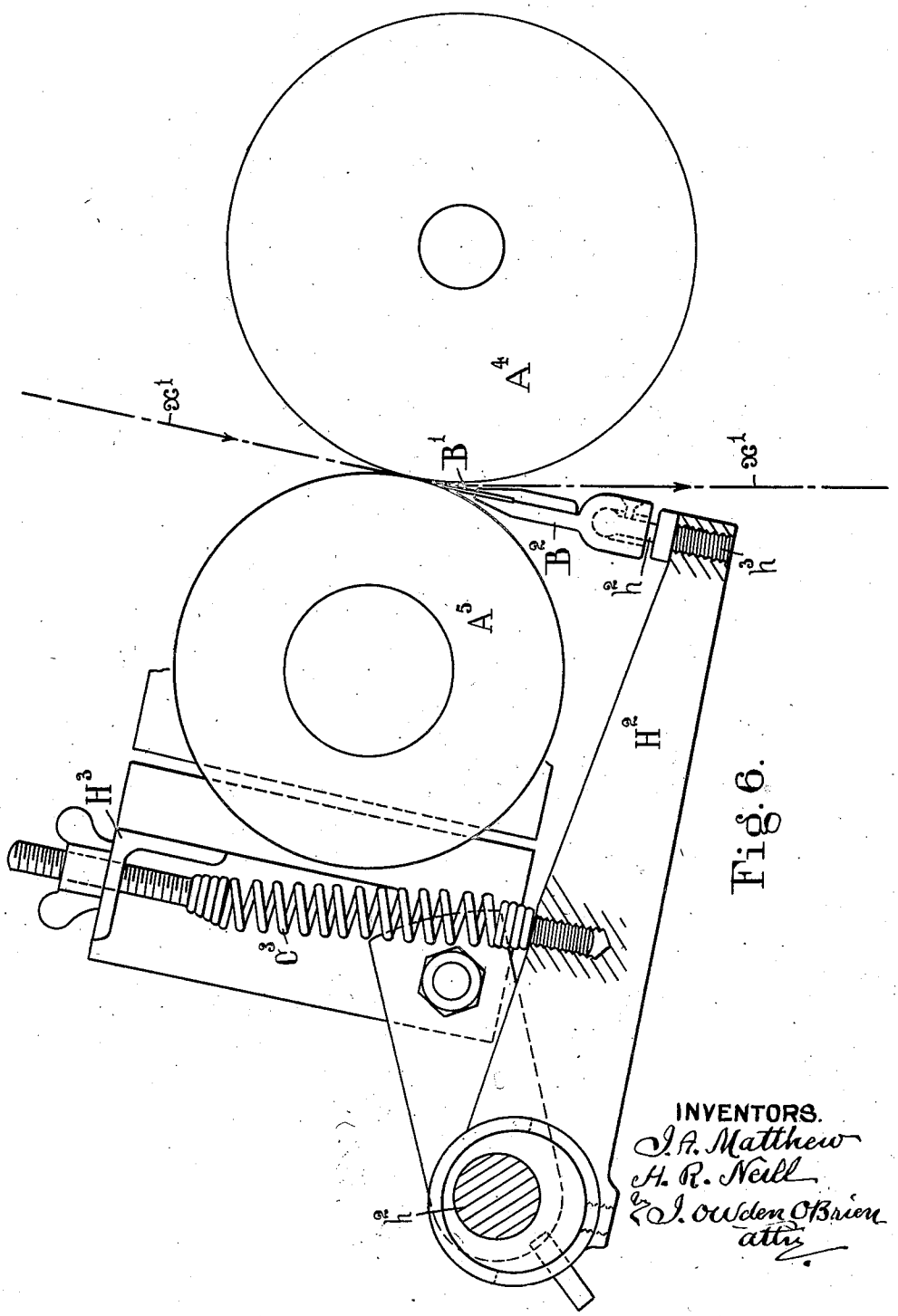


Fig. 6.

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UNITED STATES PATENT OFFICE

2,115,313

APPARATUS FOR CRIMPING TEXTILE FIBROUS MATERIAL

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Application May 29, 1935, Serial No. 24,024
In Great Britain June 12, 1934

5 Claims. (Cl. 19—66)

The invention relates to the treatment of textile fibers whether associated with non-fibrous tissue or not such as flax, hemp, jute, cotton, wool, artificial silk or hair, and the manufacture of yarns, threads and fabrics from such fibers and to apparatus for carrying out such treatment.

The object of the invention is to impart a crimp or serration to the individual fibers in a mass of textile fibers whether associated with non-fibrous tissue or not whereby the separation of non-fibrous tissue may be facilitated and the properties of fibers during preparing and spinning may be modified to enable the production of yarns, threads and fabrics of a greater diversity of properties than are obtainable from the same fibers in the ordinary way. Thus, for example, the yarns and threads may be made softer, more bulky or porous, to have a greater superficial diameter, to be more extensible and to be elastic, to differ in lustre, have better heat retaining properties and absorbency and possess adequate tensile strength with very low twist.

It has been proposed to wave or crimp a sliver of bast and long fibers during preparation for spinning to increase the cohesion or longitudinal strength of the sliver where there are extremely short fibers in the sliver to allow the sliver to be withdrawn from cans.

Hitherto, as applied to slivers the term "crimped" has been used in the sense of undulated, waved or corrugated and to the mass of fibers as a whole whereas throughout our specification in all places we use the word "crimped" in the sense of notched, crenated or serrated and we are concerned with putting a crimp or serration into individual fibers crossing the line of serrations.

The textile fibers may be treated, whether associated with non-fibrous tissue or not in a more or less open or consolidated or partly manufactured condition such as bunches of flax fibers, loose cotton or wool, in a more or less orderly form in a layer or sheet, or fibers in sliver or ribbon form, yarn or thread.

The improved treatment according to the invention consists in imparting a serrated effect to the fibers transversely of their longitudinal axis whereby the fibers in the mass are so sharply crimped or serrated that the individual fibers in the mass crossing the line of serrations are themselves sharply serrated or crimped.

The invention further comprises a subsequent mechanical treatment whereby the pleated formation may be removed from the sliver or rove leaving the individual fibers crimped or serrated according to the degree of treatment given.

It also further comprises apparatus constructed with a pair of plain rollers driven to rotate together with a single serrating or crimping blade disposed against and pressed into the nip of the rollers on the delivery side by a spring or other suitable means which permits intermittent movement of the serrating or crimping blade away from and back to the rollers.

The invention will be fully described with reference to the accompanying drawings:—

Figs. 1 and 2 show diagrammatically two forms of constructing the serrating or crimping mechanism.

Fig. 3 is a side elevation partly in longitudinal section of a serrating or crimping machine.

Fig. 4 is an end elevation of the delivery end of the machine.

Fig. 5 is a side elevation of the serrating or crimping mechanism as applied to a roving or drawing frame.

Fig. 6 is a side elevation of the modified disposition of the serrating or crimping mechanism as applied to a dry spinning frame.

Fig. 7 is a side elevation of a further modified disposition as applied to a spinning frame.

Fig. 8 is a sectional view (enlarged) of holder B^2 for the serrating or crimping blade B^1 shown in Figs. 4, 5 and 6.

Fig. 9 is a front view detached of the serrating or crimping blade B^1 (enlarged).

Fig. 10 is a transverse section of the serrating or crimping blade B^1 (enlarged).

Fig. 11 is a transverse section of the blade B^1 (drawn to an exaggerated scale).

In carrying out the invention the serrating or crimping process may be a preliminary or intermediate stage in manufacture applied to the fibers:—

(*a*) Before removal of associated non-fibrous tissue such as wood;

(*b*) While in the loose or open state prior to the preliminary stages of spinning;

(*c*) At an intermediate stage while in a sliver or rove;

(*d*) After spinning to a yarn or thread.

The serrations or crimp may be removed from the mass of fibers during subsequent processes but will be retained to a greater or less degree in the individual fibers of the finished article.

The serrating or crimping apparatus is constructed with a pair of plain rollers A A^1 between which the fibers pass with a single serrating or crimping blade B or B^1 disposed against

and pressed into the nip of the rollers on the delivery side by a spring C which permits of a movement of the blade B to and from the rollers. The rollers A and A^1 may be any of the well known types of plain rollers used for drawing fibers of various kinds or mangle or calender rollers such as a steel under roller and a wood upper roller, and may be driven by frictional contact or geared together to rotate in unison. The serrating or crimping blade B or B^1 is mounted to permit of adjustment of the pressure against the rollers and of the inclination of its axis relative to a line joining the centres of the pair of rollers.

In the construction shown in Fig. 1 the serrating or crimping blade B is fitted on a screwed stem *b* with rounded end which engages in a cup socket b^1 carried on a plate spring C attached to a lever C^1 controlled by a screw D and hand wheel *d*. In the construction shown in Fig. 2 the holder B^2 of the serrating or crimping blade B is carried in a bracket b^6 and the pressure applied by a coiled spring C the tension of which is adjusted by the screwed sleeve b^2.

The serrating or crimping blade is in the form of a flat hardened steel member, cast iron or other suitable material, shaped at the end like a chisel blade, and may be of a width equal to the length of the rollers A, A^1 or may be divided into two or more sections. It is shaped and the angle of the bevel adjusted according to the nature of material being treated, the size of the rollers and the size and nature of the serration or crimp desired, and is pressed into the nip of the rollers in the delivery side, with the thin edge foremost and against the steel roller A and the bevelled face towards and close to the roller A^1.

The material is fed between the rollers A A^1 and as it is delivered therefrom it is compressed against the end of the serrating or crimping blade and forced into a series of serrations the material being caused to leave one roller and pass between the face of the other roller and the stationary face of the blade B where it is further compressed together giving a strong pleated formation. The pressure of the material tends to force the blade away from the rollers and can do so when this pressure exceeds the force applied by the spring C.

In the form shown in Figs. 3 and 4 the apparatus is designed for the serrating or crimping of fibers while in a loose open state such as stricks or bunches of fiber or for serrating or crimping fibers in the form of heavy slivers, which may require to be operated upon several times to produce the required serrating or crimping. It comprises two or more sets of pairs of plain rollers A A^1 and blades B in succession similar to that shown in Fig. 1 the blade B being of cast iron or steel and the bevelled edge flat as shown or slightly curved. The rollers A A^1 are mounted in housings E and compressed together by screws *e* (or by suitable springs as in a mangle) and geared together at the ends by gear wheels e^1. The screwed stem *b* is mounted in a cup socket b^1 bolted in a suitable position, according to the required angle of entry into the nip, on a flat spring C the lower end of which is fixed in a clamp bolted to a shaft C^2 suitably supported. On to the end of this shaft is keyed a lever arm C^1 which engages the end of a screw D passing through a fixed bracket on the frame of the machine; by rotating the hand wheel *d* on the screw, the lever is made to turn the shaft and vary the pressure applied by the spring C. The pairs of rollers A A^1 are spaced at equal intervals with blades B acting on each pair of rollers. In the drawings, four blades B are shown in action. The blades B are arranged in rows, and between each pair of rollers is a guide plate F on which are fixed covered conductors *f* which may be adjustable as to width, for conducting the material from one serrating or crimping blade to the next pair of rollers throughout the machine.

The material is placed on a travelling conveyor G (or a stationary table) and so carried through a conductor to the first pair of feed rollers which may be either plain or fluted rollers or a pair of plane rollers with a serrating or crimping blade attachment fitted as described but used with a low pressure so that the material is flattened or rolled but not crimped. This passes to the next pair of rollers which has the same surface speed, and here the material is serrated or crimped and passes on over guide plate and through conductors to another pair of rollers and serrating or crimping blade; this pair of rollers has a surface speed greater than that of the previous pair, so that the material received is straightened out before being again serrated or crimped. The material may be passed through as many more similar treatments as desired, each successive pair of rollers being driven faster than the previous pair. The last pair of rollers is plain and not fitted with crimping blades.

The pieces of material fed to the machine may be slightly overlapped on the conveyor belt so that a continuous ribbon is treated through the machine. This is fed out on to another conveyor, or table and can be separated into its original component pieces by having a suitably large increased speed of the last pair of rollers.

In Fig. 5 the serrating or crimping apparatus is shown applied to a roving or drawing frame to crimp the sliver or rove as it is delivered therefrom the rollers A^2 and A^3 being the ordinary delivery rollers of the machine to the nip of which the serrating or crimping blade B^1 is applied. The holder B^2 of the blade is carried at the end of a pivoted lever H and the blade B^1 is pressed against the nip of the rollers A^2 A^3 by a spiral spring C^2 one end of which is anchored to a fixed bracket H^1.

In Figs. 5, 6 and 7 the sliver or rove *x* as it is delivered by the rollers is serrated or crimped at the edge of the blade B^1, squeezed out between it and the roller A^3 as a pleated concertina-like ribbon contracted in its length the individual fibers being permanently sharply serrated. The pleated ribbon or rove *x* is fed to the top of the flyer with sufficient tension between the rollers and the flyer to draw out or straighten it without drafting or relative movement of the fibrous strands and any desired amount of twist may be inserted. This may be regarded as the final yarn, or as rove to be subjected to further spinning according to the amount of twist inserted. In the former case, a yarn is obtained composed of individual fibers sharply serrated and is totally different in character from ordinary yarn, being very soft and of large diameter. In the case of rove, the product will be subjected to the usual spinning operation in which case the fibers will be superficially straightened out and the yarn may be of normal appearance but may differ from normal in extensibility.

In Fig. 6 the crimping apparatus is shown applied to a roving or dry spinning frame to serrate or crimp the rove or yarn as it is delivered from the rollers A^4 and A^5 which may be the ordinary delivery rollers of the machine to the nip of

which the serrating or crimping blade B^1 is applied. The holder B^2 of the blade B^1 is carried at the end of a pivoted lever H^2 on a stud h^2 in a supporting bracket h^3 and the blade B^1 is pressed against the nip of the rollers A^4 A^5 by a spiral spring C^3 one end of which is anchored to a fixed bracket H^3. The lever H^2 is mounted on an eccentric bush on the stud h^2 to permit of angular adjustment of the blade B^1 relative to the rollers A^4 and A^5. The yarn x^1 is delivered from the rollers and blade B^1 in a pleated state and is drawn out by the tension applied in winding it upon the bobbin. Or the drawing out may be effected by a separate pair of rollers.

In Fig. 7 the serrating or crimping apparatus is shown as applied to a roving or dry spinning frame the apparatus being similar to that shown and described with reference to Fig. 2 to serrate or crimp the rove or yarn as it is delivered from the rollers A^6 and A^7 which may be the ordinary delivery rollers of a spinning or roving frame. The holder B^2 of the blade B^1 is mounted on a spindle h^2 in an adjustable tubular bracket H^2 affixed to a rail K below the rollers. A compression spring within the tubular bracket H^2 (see Fig. 2) presses the blade against the nip of the rollers A^6 and A^7. The rove or yarn X^2 is delivered from the rollers and blade B^1 in a pleated state and is drawn out by the tension of winding it upon a bobbin or by a separate pair of rollers leaving the individual fibers serrated or crimped.

Figs. 8 to 11 show details of serrating or crimping blade B^1 and holder B^2 such as applied to roving and spinning frames Figs. 5, 6 and 7. The blade B^1 is formed with a flat back and a curved or bevelled edge to fit into the nip of a pair of rollers. The blade holder B^2 is formed of two plates b^3 and b^4 clamped together by two screws b^5 between which the blade B^1 is firmly held. The blade B^1 may be of hardened steel and the shape and detailed construction of the accessory holder and fittings may be varied as required for attachment to different machines.

The pleated ribbon of sliver or rove or yarn may be treated in various ways by known methods, according to the properties desired in the final product. The following examples may be mentioned by way of illustration:—

(*a*) The pleated ribbon may be used as a final product for making up into fabric either as delivered or after treatment, say, by bleaching, dyeing or impregnation with any known finishing materials.

(*b*) The pleated ribbon may be drawn out mechanically to remove the crimp from the sliver but leaving the individual fibers serrated or crimped, by passing the pleated ribbon between a pair of rollers lightly pressed together situated in front of the drawing rollers, and having a surface speed greater than the linear velocity of the pleated ribbon delivered from the said serrating or crimping blade. This drawn out sliver or rove containing the serrated or crimped individual fibers may then be rolled or passed through a false twist tube and then wound on to any suitable carrier of known kind, or the said sliver or rove may have any desired amount of twist inserted by the usual means before being wound on to the carrier such as a bobbin or cop.

(*c*) The pleated ribbon may be drawn out mechanically to the required amount and have the desired amount of twist inserted by the usual means such as a revolving spindle and flyer by suitable adjustment of the winding on tension.

(*d*) The pleated ribbon may be wetted out in hot or cold water when much of the crimp in the sliver is released; while that on the individual fibers is retained.

The yarn can be made in various sizes or counts, as single yarns or several yarns can be doubled and twisted together, and these may be subjected to dyeing, or bleaching. The yarns and threads so produced, either before or after treatment with reagents for dyeing or bleaching may be made up into fabrics by knitting or weaving and the fabrics may be subjected to dyeing or bleaching. Fabrics made in this way from any staple fiber may be napped or raised by known methods.

The yarns can be made regular or various slubbed yarn effects can be introduced by a simple mechanical device arranged to withdraw the blade B from the nip of the drawing rollers at intervals for any desired time during which time a normal sliver of unaltered fiber will be delivered and on subsequent twisting of the yarn, this part will form a length of yarn of small diameter compared with adjacent lengths containing serrated or crimped fiber. The lengths of yarn having large and small diameter can be varied. In a slubbed yarn of this kind the lustre on the large and small diameter lengths of yarn will be different. Further, slubbed effects can be produced by crimping the fiber prior to twisting the roving, making a rove containing crimped fiber and, for example, spinning yarn from double rove, one end of ordinary and one of the said special rove, and the spinning may be done in the usual way or as described using the special crimping device.

It will be understood that the pleated ribbon containing the serrated or crimped fibers can be treated in any other way by known means, either mechanical or chemical, without in any way departing from the scope of this invention.

As applied to loose fibers, the fibers are passed through the serrating or crimping machine and are subsequently treated in known manner to produce sliver, rove or yarn the individual fibers retaining more or less of the crimp imparted to them.

What we claim as our invention and desire to protect by Letters Patent is:—

1. Apparatus for treating textile fiber in the mass to serrate the individual fibers of the mass transversely of their longitudinal axes comprising a pair of plain rollers driven to rotate together, a single hard metal serrating blade with the front end chisel or bevel shaped disposed in the nip of said rollers on the delivery side and pressed into the said nip with the forward edge resting under pressure against the bottom one of the said pair of rollers and the face of the bevel pressed against the top one of the pair of rollers and means to impart pressure to the blade which will permit intermittent movement of the face of the bevelled front of the blade away from and back to the top roller, and will maintain the forward edge of the blade always in contact with the surface of the bottom roller and means to draw out the resulting fibers under tension to remove the pleated formation from the mass while leaving the individual fibers serrated transversely of their longitudinal axes.

2. Apparatus for treating textile fibers in the form of sliver or rove to serrate the individual fibers thereof transversely of the longitudinal

axis comprising a pair of plain rollers, a single hard metal serrating blade with chisel bevel shaped edge pressed into the nip of said rollers on the delivery side, a blade holder with socket at the back, a short round ended stud fitting into the socket making a ball and socket joint therewith secured by a set screw in the side of the socket, an arm carrying the round headed stud pivoted at its other end on an eccentric bush, a tension spring connected to the pivoted arm, and a screw and adjusting nut.

3. Apparatus for treating textile fibers in the form of sliver or rove to serrate the individual fibers thereof transversely of the longitudinal axis comprising a pair of plain rollers, a single hard metal serrating blade with chisel bevel shaped edge pressed into the nip of said rollers on the delivery side, a blade holder with socket at the back, a short round ended stud fitting into the socket making a ball and socket joint therewith secured by a set screw in the side of the socket, an arm carrying the round headed stud pivoted at its other end on an eccentric bush, a tension spring connected to the pivoted arm and a screw and adjusting nut and in combination therewith of a spindle and flyer and a bobbin upon which to wind the rove with sufficient tension to extend it to remove the pleated formation therefrom leaving the individual fibers serrated transversely of their longitudinal axes.

4. Apparatus to treat a mass of textile fibers to serrate the individual fibers thereof transversely of their longitudinal axes comprising in combination a plurality of successive sets of pairs of plain surface rollers driven to rotate together, a plurality of hard metal rigid serrating blades each blade with the front end chisel bevel shaped and disposed in the nip of one pair of rollers with the forward edge resting under pressure against the bottom one of said pair of rollers and the face of the bevel pressing against the top one of said pair of rollers, a plurality of springs, one connected to each serrating blade to impart pressure to the several blades respectively which will permit intermittent movement of the bevel face of the blade away from and back to the top roller and maintain the forward edge of the blade always pressed in contact with the surface of the bottom roller, and a lever and adjusting screw connected to each spring to regulate the pressure on each serrating blade.

5. Apparatus for treating textile fiber in the mass to serrate the individual fibers of the mass transversely of their longitudinal axes comprising a pair of plain rollers driven to rotate together, a single hard metal serrating blade with the front end chisel or bevel shaped dispos[illegible] in the nip of said rollers on the delivery side and pressed into the said nip with the forward edge resting under pressure against the bottom one of the said pair of rollers and the face of the bevel pressed against the top one of the pair of rollers the material passing between the bevel face and the top roller and means to impart pressure to the blade which will permit intermittent movement of the serrating blade to and from the top roller and its bevelled face out of contact with the top roller, and will maintain the forward edge of the blade always in contact with the surface of the bottom roller.

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