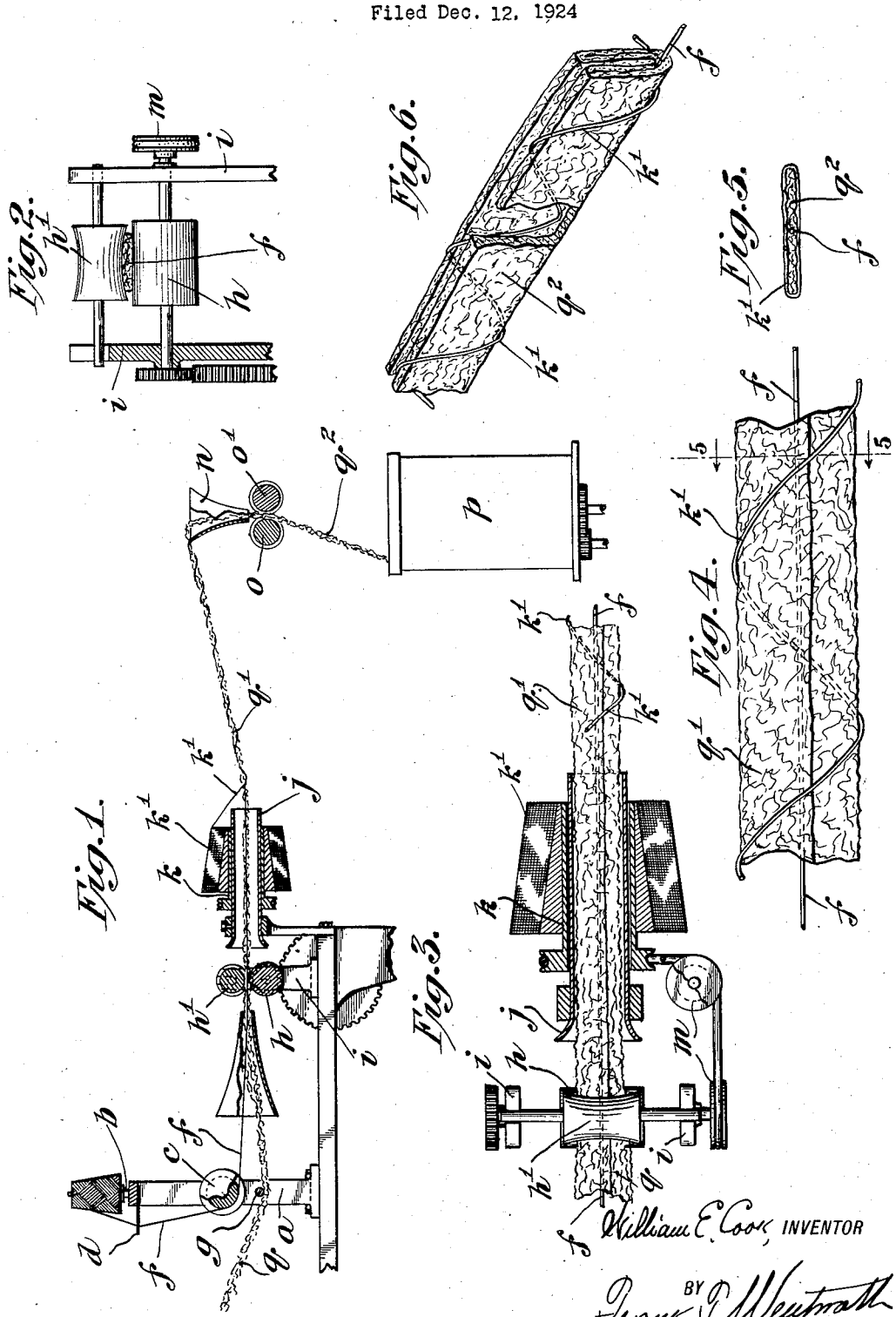
Oct. 20, 1925. 1,557,804

W. E. COOK

SLIVER FORMING MACHINE

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UNITED STATES PATENT OFFICE.

WILLIAM E. COOK, OF NEW YORK, N. Y.

SLIVER-FORMING MACHINE.

Application filed December 12, 1924. Serial No. 755,377.

To all whom it may concern:

Be it known that I, WILLIAM E. COOK, a subject of the King of the United Kingdom of Great Britain and Ireland, residing at St. George, in the borough of Richmond, city of New York, county of Richmond, and State of New York, have invented certain new and useful Improvements in Sliver-Forming Machines, of which the following is a specification, reference being had therein to the accompanying drawings, which form a part thereof.

My invention relates to sliver forming machines, and more particularly to a mechanism adapted to receive a sheet of cotton sliver as it leaves the carding machine, and so fold and reinforce it as to produce a continuous strip which may be coiled in a container ready for use in high speed wire covering machines.

Heretofore in the production of cotton sliver strips for use in making insulated wire, it has been the practice to fold the opposite longitudinal edges of a sheet of cotton sliver upon the central portion thereof with the principal object of forming a strip of the desired thickness so as to adapt it for application to a conductor wire to form a thick insulation, such wires being commonly used for outdoor work and in factories. The strip is spirally wound upon the conductor wire and compacted after being thus wound upon the wire. After this compaction of the wire, it is passed through a bath of an asphaltum or similar composition, the absorbent properties of the sliver, and its being merely compacted upon the wire instead of being felted permits the rapid absorption of this composition, and the saturation of the sliver throughout the entire body of the insulation so as to produce a conductor wire having an insulating coating consisting of a fibrous mass, the fibers of which will be firmly bonded together by an adhesive medium which in itself possesses high electro non-conductive properties.

In the production of such wire, particularly when using high speed covering machines, there has been a tendency, because of the fibers of the sliver strip being only loosely matted, of the longitudinal stresses or strains thereon, in passing from the container to the wire in the covering machine, to attenuate or break the sliver, thus necessitating the shutting down of the machine, a back-running thereof, and the splicing of the strip. To overcome this condition, I have heretofore imbedded or enclosed within the folds of the strip, and cemented to the fibers of the inner surface, a longitudinally extending reinforcing thread, cord or strand which has been found to reduce likelihood of this breakage of the strip. There has been a tendency, however, growing out of the loose matting of the fibers of the strip, for the outer fibers to fluff away from the strip proper either as a result of rubbing action of the strip in passing over the edge of the container or guides, or even upon entering the compacting die, or the first of such dies if a plurality is used. Even when the strip is running free from engagement with any obstructions, its rapid passage through the air may act upon said fluff so as to cause it to accumulate in a bunch or ball, thus either resulting in the tearing of the strip, or the breaking of the loosely matted fibers at some point thereof, or the compaction of this ball or bunch upon the wire in a manner to have closely adjacent thin and relatively thick spots of the insulating covering. This condition also will cause portions of the sliver upon the wire to be more closely compacted than other portions thereof, and interfere with uniform saturation of covering insulation by the asphaltum or other composition, or prolong the time interval required to impregnate every portion of the covering for the wire.

With the above conditions in mind, I have devised a mechanism operative upon the sliver as it leaves the doffer of the carding machine, which to distinguish from the final strip product, I have herein designated the "sheet", which will fold the opposite longitudinal edges of the sheet upon the central portion thereof, place a longitudinally extending thread, cord or strand within the body of the sliver as it is thus being folded, without necessarily cementing this thread, cord or strand to the fibers of the sliver, and apply a thread, cord or strand upon the outside, or superficially, of the folded sheet, thus producing a strip which will resist the longitudinal stresses thereon, and at the same time prevent the accumulation of surface fluff in a bunch or ball of sufficient magnitude to cause the thinning or breakage of the strip. This mechanism

is so constructed that it will operate at a speed commensurate with that of the delivery of the loosely matted sliver by the carding machine, and will place no stresses upon the sliver while it is being formed in the strip for use in the covering machine, which will cause any material felting of the sliver, or cause a breakage thereof between the point of its delivery from the carding machine and its delivery in coil form within the container.

I embody in this mechanism a folding horn associated with a mechanism for feeding the longitudinal thread, cord or strand with relation to, and positioning it within, the folds of the sliver, a mechanism for flattening the strip after it has been thus folded and incidentally feeding it away from the horn and delivering it to a mechanism for applying the exterior or superficial thread, cord or strand thereto, and a mechanism for thereafter folding the wound strip upon itself to bring portions of the exterior or superficial strands within the body of the finished strip, and thereafter flattening the strip thus folded before delivering it to the container and coiling it in the usual manner.

These mechanisms operate without imparting any twist to the sliver, the resulting product being a continuous strip of loosely matted sliver, having a longitudinally extending reinforcing thread, cord or strand, and a superficial or exterior thread, cord or strand, the succeeding convolutions of which are spaced apart a distance which will not interfere materially with the porosity of the strip, and yet sufficiently close together to prevent the accumulation of any substantial bunch or ball of fluff, and in fact cause any such to be torn from the body of the sliver as it is passed from the container to the wire in the covering machine.

The invention consists primarily in a sliver forming machine adapted to co-operate with a carding machine, embodying therein a folding horn, the entrance of which is positioned toward the carding machine and adapted to receive a wide sheet of sliver, feed rollers beyond said folding horn for flattening the folded sheet, a hollow bearing, a spindle for a cop of thread rotatably mounted upon said bearing, means rotating said spindle, and means feeding the strip away from said hollow bearing and delivering it to the coiling mechanism of a container; and in such other novel features of construction and combination of parts as are hereinafter set forth and described, and more particularly pointed out in the claims hereto appended.

Referring to the drawings,

Fig. 1 is a longitudinal view of a machine embodying my invention;

Fig. 2 is a detail view of the rollers adjacent the folding horn for the strip as it leaves the carding machine;

Fig. 3 is a plan view of the feeding mechanism shown in Fig. 2, the spindle bearing and the spindle thereon for applying convolutions of a thread, cord or strand superficially or exteriorly of the folded sliver strip being shown in section;

Fig. 4 is a view upon a larger scale of a short section of the sliver sheet after leaving the hollow spindle showing the exterior or superficial thread, cord or strand applied thereto;

Fig. 5 is a section on the line 5—5 of Fig. 4; and

Fig. 6 is a perspective view of the finished strip as it is delivered to the container.

Like letters refer to like parts throughout the several views.

In the embodiment of my invention shown in the drawings, *a* indicates a standard adjacent the doffer mechanism of a carding machine, which standard has rotatably mounted thereon a bearing for a spindle *b* adapted to receive a cop of thread, cord or strand, said standard also having mounted thereon a roller guide *c* and a tension device *d*. Supported adjacent the standard *a* is a folding horn *e*, the axis of which is in substantial alinement with the periphery of the guide roller *c*, so as to properly position the thread, cord or strand *f*, with relation to the sliver sheet passing through said horn. The bell of the horn is presented towards the standard *a* and is of a diameter substantially equalling the width of the sheet of sliver to be folded thereby.

Upon the standard *a*, below the guide roller *c*, is a guide bar *g*, below which the sliver sheet passes with the twofold object of spacing this sheet away from said guide roller and directing it with a slightly upward pitch into the bell of the horn, to facilitate the folding of the opposite edges thereof as it is passing therethrough. This bar is used because the roller *c* is not of sufficient width to keep the sheet flat.

Beyond the small end of the horn is a pair of driven rollers *h* and *h'*, exerting light pressure upon the folded sheet, the upper of these rollers *h'* being mounted in slotted standards *i* so as to be capable of movement toward and from the roller *h*, and limit the pressure exerted upon the sliver sheet to the weight of this roller. Only a light pressure is exerted upon the folded sheet at this point, which pressure however, is sufficient to flatten the folded sheet and relieve the portions of the sliver sheet between said rollers and the doffer of the carding machine from such longitudinal stresses as would tend to break the sheet while within, or before entering, the folding horn.

I have found in actual practice that the roller h', to prevent undesirable compaction of the folded sheet and prevent breakage of the sheet between these rollers and the carding machine should have a concave surface as shown, thus relieving the pressure along the longitudinal center of the folded sheet, and facilitating the lateral expansion thereof as the sheet is flattened, while compensating for the slight additional thickness along said longitudinal center due to the presence of the thread, cord or strand, and the overlapping edges of the sheet. By driving only the roller h, the above results are obtained, and yet, all portions of the matted sliver between these rollers and the doffer are relieved from any feeding stresses greater than those developed by the light pressure exerted by the roller h'.

Beyond the rollers h—h' is a fixed hollow bearing j, through which the folded sheet with the enclosed thread, cord or strand passes after leaving said rollers, this bearing being fixedly supported from the frame of the machine so as to exert no twisting action upon the folded sheet.

Rotatably mounted upon the bearing j is a spindle k, carrying a cop of thread, cord or strand k' said spindle being driven in any desired manner as by the belt and pulley mechanism m, to spirally wind the thread, cord or strand about the folded sheet as it is leaving said hollow bearing.

Beyond the hollow bearing j is a second folding horn n spaced away from said spindle, and adjacent the outlet of this horn is a pair of driven flattening rollers o—o' which serve as feeding rollers for drawing the otherwise completed strip through the horn n, and except as modified by the action of the rollers h—h', from the doffer of the carding machine. After leaving the rollers h—h', the thread, cord or strand f will be so combined with the folded sheet as to permit a direct drawing action of these rollers, while preventing any attenuation of the folded sheet. The rollers o—o', however, are spaced apart sufficiently to limit the pressure exerted thereby to that required to flatten the folded sheet, there being no material felting action, since after leaving said rollers o—o', the mass of fibers of the strip will expand. The pressure exerted by said rollers will, however, matte the interior fibers sufficiently to hold the strip in folded form, the finished product being as shown in Fig. 6.

The horn n toward its outlet is so formed that it will merely give a single fold along the longitudinal center of the previously folded sheet.

After leaving the rollers o—o', the finished strip is delivered to and coiled within the container p in the usual manner, such being shown merely conventionally in the drawings, the coiling mechanism not being shown in detail as this is old and well known in this art.

In the accompanying drawings the sliver sheet before being folded is indicated at q; after folding with the enclosed longitudinal reinforcing thread, cord or strand q', and the finished strip at q^2.

The operation of the herein described machine is substantially as follows:—

In the accompanying drawings, I have shown a single unit for forming a strip for use as the insulation of a conductor wire, it being understood that a plurality of such units will be used in each carding machine according to the width of sliver produced by such machine, this sliver being cut into sheets of a width desired to form an insulating strip of the desired width. The construction and operation of each unit, however, is the same as every other, the duplication of parts resulting merely in the simultaneous production of a number of strips from the output of a single carding machine.

As a single sheet of sliver leaves the doffer roll and slitters of the carding machine, it passes below the guide bar g and through the folding horn e, opposite edges of the sheet being turned first upwardly, and then downwardly, of the central portion thereof. The thread, cord or strand f is also threaded through the folding horn above the sheet q so that these edges are folded thereupon by said horn.

Owing to the light fluffy properties of the sheet q, this folding action may be somewhat irregular, and there is a tendency to bunch the folded sheet toward the center thereof.

As the folded sheet with the enclosed or imbedded thread, cord or strand f leaves the horn e it is passed between the rollers h—h' through the hollow bearing j, through the horn n and between the rollers o—o'. When the end of the folded sheet has been engaged between the rollers o—o', it will thereafter be continuously drawn through the sliver forming mechanism by said rollers at substantially the same rate at which the sheet q is delivered by the carding machine.

As the folded sheet q passes between the rollers h—h', the movable upper roller h' will exert sufficient pressure to flatten out the folded sheet and at the same time exert a sufficient feeding action to draw the sliver sheet through the horn e, incidently strengthening the bond between the folded edges and the longitudinal central portion of said sheet by a more effective entanglement of the fibers of the sliver within said folds.

The concaved or curved periphery of the roller h' compensates for the increased

bulk of the folded sheet along the longitudinal center thereof, and permits the desired feeding and flattening action throughout substantially the entire width of the folded sheet, thus avoiding attenuation of the portion q of the sliver or breakage thereof. At the same time since the roller h is positively driven at a fixed speed, these rollers will prevent the transmission of the longitudinal stresses upon the sheet as a result of the pull exerted upon the folded sheet by the rollers o—o', thus limiting the main longitudinal feeding stresses exerted by the rollers o—o' to the portion q, of the folded strip between said roller h—h' and said rollers o—o'.

The hollow bearing j serves merely to permit the passage of the folded sheet substantially axially of the spindle k. As the folded sheet leaves said bearing j, the constant rotation of the spindle k will cause the thread, cord or strand k' to be wound spirally about the folded sheet q', the rotation of the spindle k being in a direction counter to that required to unwind the bobbin, serving merely to give the desired motion to the cop to cause the spiral trend of the thread, cord or strand, the actual feeding of same resulting from the lineal traverse of the folded sheet.

In passing through the folding horn n, the portion q' receives one fold, opposite edges thereof being folded together, thus causing portions of the thread, cord or strand k' to be folded within the finished strip as shown more particularly in Fig. 6, the rollers o—o' serving to temporarily but lightly compact the strip thus folded for the purpose of flattening same and for imparting continuous traverse of uncompleted portions of the strip through the machine

It is to be noted that as the sliver passes through the machine, its treatment is such as to avoid any twisting action thereupon, or effect any material compaction thereof so that as the finished strip leaves the rollers o—o, it is still a light fluffy mass having practically all of the characteristics of the portion q except as to its increased thickness, and possibly slightly greater density. The fibers will still lay substantially longitudinally of the strip and will still be lightly enmeshed or entangled.

The location of the exterior or superficial spaced portions of the thread, cord or strand k' will prevent surface fluff from accumulating in a ball or bunch of any material volume. If the outer fibers, by reason of entanglement with succeeding convolutions of strip in the container, or by frictional engagement with parts of the container or the machine, pull outwardly so that if the rapid passage of the strip through the air between the container and the wire in the covering machine, tends to separate this fluff from the rest of the strip, when this light fluff reaches one of the spaced portions of the exterior thread, cord or strand, it will either break loose from the rest of the strip as a result of the resistance encountered due to the rapid movement of the strip, or will be laid upon and will combine with portions of the strip beyond this point.

It has been found in actual practice, with high speed covering machines, that this fluff or loosened surface fibers will not tear free of the strip in the absence of the thread, cord or strand k', but will gradually increase in size until a ball or bunch of considerable size is formed which will possess sufficient weight and meet sufficient resistance when passing through the air to ultimately be torn therefrom by the air resistance, or engage the mouth of the compacting die and be torn from the strip, this tearing action resulting in a complete severance of the strip at this point. If the bunch or ball is not sufficiently great to cause the die to tear it from the strip, it will enter the die, and be compacted therein, the portions of the strip from which the fluff is formed receiving a much lesser degree of compaction because of loss of bulk, the result being variance in the diameter of different portions of the covered wire, as well as in the degree of compaction at different portions thereof.

In coiling the strip in the container p, the coils are formed between the center and the wall of the container, portions of succeeding convolutions only overlaying each other. Sometimes when one coil is drawn from the container, the outer fibers thereof will be found to be enmeshed with the outer fibers of an adjacent coil so that there is a tendency, as the strip runs from the container, to lift up several coils at once. This tendency is apt to cause rapid, long runs of the fluff, due to the weight of the coils which are lifted, but the thread, cord or strand k' will prevent this tendency by causing the fluff to break from the strip, thus dropping the coils within the container and avoiding any possible obstruction of the outlet thereof, or the entanglement of the coils, due to a bunch thereof being drawn from the container at the same time.

The fold of the portion q' by the horn n bringing portions of the thread, cord or strand k' within this fold, will interrupt the continuity of the spiral trend of the thread, cord or strand k', and also provide obstructions within the fold which will prevent the running of the fluff inside of this fold.

I have found in actual practice that a sliver strip produced by a mechanism embodying my invention permits the effective use of high speed covering machines, ensures a more uniform product and avoids that curtailment of the output of the ma-

chine incidental to breakages of the strip, however infrequent, due to the action herein referred to of the surface fluff.

It is not my intention to limit the invention to the precise details of construction shown in the drawings, it being apparent that such may be varied without departing from the spirit and scope of the invention.

Having described the invention, what I claim as new and desire to have protected by Letters Patent, is:—

1. A sliver forming machine adapted to co-operate with a carding machine, embodying therein a folding horn, the entrance of which is positioned toward the carding machine and adapted to receive a wide sheet of sliver, feed rollers beyond said folding horn for flattening the folded sheet, a hollow bearing, a spindle for a cop of thread rotatably mounted upon said bearing, means rotating said spindle, and means feeding the strip away from said hollow bearing and delivering it to the coiling mechanism of a container.

2. A sliver forming machine adapted to co-operate with a carding machine, embodying therein a folding horn, the entrance of which is positioned toward the carding machine and adapted to receive a wide sheet of sliver, upper and lower feed rollers beyond said folding horn for flattening the folded sheet, means positively driving the lower of said rollers, means whereby the upper of said rollers may have movement toward and from said lower roller, to apply a light yieldable pressure upon the folded sheet passing between said rollers, a hollow bearing, a spindle for a cop of thread rotatably mounted upon said bearing, means rotating said spindle, and means feeding the strip away from said hollow bearing and delivering it to the coiling mechanism of a container.

3. A sliver forming machine adapted to co-operate with a carding machine, embodying therein a folding horn, the entrance of which is positioned toward the carding machine and adapted to receive a wide sheet of sliver, upper and lower feed rollers beyond said folding horn for flattening the folded sheet, means positively driving the lower of said rollers, means whereby the upper of said rollers may have movement toward and from said lower roller, to apply a light yieldable pressure upon the folded sheet passing between said rollers, the upper of said rollers having a concaved periphery, a hollow bearing, a spindle for a cop of thread rotatably mounted upon said bearing, means rotating said spindle, and means feeding the strip away from said hollow bearing and delivering it to the coiling mechanism of a container.

4. A sliver forming machine adapted to co-operate with a carding machine, embodying therein a folding horn, the entrance of which is positioned toward the carding machine and adapted to receive a wide sheet of sliver, feed rollers beyond said folding horn for flattening the folded sheet, a hollow bearing, a spindle for a cop of thread rotatably mounted upon said bearing, means rotating said spindle, a folding horn beyond said hollow bearing and a pair of rollers beyond said last named folding horn operative upon the strip to apply a final compaction, and a drawing stress thereto as far as said first named feeding rollers.

5. A sliver forming machine adapted to co-operate with a carding machine, embodying therein a folding horn, the entrance of which is positioned toward the carding machine and adapted to receive a wide sheet of sliver, upper and lower feed rollers beyond said folding horn for flattening the folded sheet, means positively driving the lower of said rollers, means whereby the upper of said rollers may have movement toward and from said lower roller, to apply a light yieldable pressure upon the folded sheet passing between said rollers, a hollow bearing, a spindle for a cop of thread rotatably mounted upon said bearing, means rotating said spindle, a folding horn beyond said hollow bearing and a pair of rollers beyond said last named folding horn operative upon the strip to apply a final compaction, and a drawing stress thereto as far as said first named feeding rollers.

6. A sliver forming machine adapted to co-operate with a carding machine, embodying therein a folding horn, the entrance of which is positioned toward the carding machine and adapted to receive a wide sheet of sliver, upper and lower feed rollers beyond said folding horn for flattening the folded sheet, means positively driving the lower of said rollers, means whereby the upper of said rollers may have movement toward and from said lower roller, to apply a light yieldable pressure upon the folded sheet passing between said rollers, the upper of said rollers having a concaved periphery, a hollow bearing, a spindle for a cop of thread rotatably mounted upon said bearing, means rotating said spindle, a folding horn beyond said hollow bearing and a pair of rollers beyond said last named folding horn operative upon the strip to apply a final compaction, and a drawing stress thereto as far as said first named feeding rollers.

7. A sliver forming machine adapted to co-operate with a carding machine, embodying therein a folding horn, the entrance of which is positioned toward the carding machine and adapted to receive a wide sheet of sliver, a spindle for a cop containing a reinforcing strand, a guide for said strand in substantial axial alinement with said folding horn, whereby said strand will be

positioned within the folds of the material passing through said horn, feed rollers beyond said folding horn for flattening the folded sheet, a hollow bearing, a spindle for a cop of thread rotatably mounted upon said bearing, means rotating said spindle, and means feeding the strip away from said hollow bearing and delivering it to the coiling mechanism of a container.

8. A sliver forming machine adapted to co-operate with a carding machine, embodying therein a folding horn, the entrance of which is positioned toward the carding machine and adapted to receive a wide sheet of sliver, a spindle for a cop containing a reinforcing strand, a guide for said strand in substantial axial alinement with said folding horn, whereby said strand will be positioned within the folds of the material passing through said horn, a guide bar for the sliver sheet positioned below and away from the guide for said strand, feed rollers beyond said folding horn for flattening the folded sheet, a hollow bearing, a spindle for a cop of thread rotatably mounted upon said bearing, means rotating said spindle, and means feeding the strip away from said hollow bearing and delivering it to the coiling mechanism of a container.

9. A sliver forming machine adapted to co-operate with a carding machine, embodying therein a folding horn, the entrance of which is positioned toward the carding machine and adapted to receive a wide sheet of sliver, a spindle for a cop containing a reinforcing strand, a guide for said strand in substantial axial alinement with said folding horn, whereby said strand will be positioned within the folds of the material passing through said horn, a tension device positioned between said spindle and said guide roller and operative upon said strand, a guide bar for the sliver sheet positioned below and away from the guide for said strand, feed rollers beyond said folding horn for flattening the folded sheet, a hollow bearing, a spindle for a cop of thread rotatably mounted upon said bearing, means rotating said spindle, and means feeding the strip away from said hollow bearing and delivering it to the coiling mechanism of a container.

10. A sliver forming machine adapted to co-operate with a carding machine, embodying therein a folding horn, the entrance of which is positioned toward the carding machine and adapted to receive a wide sheet of sliver, a spindle for a cop containing a reinforcing strand, a guide for said strand in substantial axial alinement with said folding horn, whereby said strand will be positioned within the folds of the material passing through said horn, a tension device positioned between said spindle and said guide roller and operative upon said strand, a guide bar for the sliver sheet positioned below and away from the guide for said strand, upper and lower feed rollers beyond said folding horn for flattening the folded sheet, means positively driving the lower of said rollers, means whereby the upper of said rollers may have movement toward and from said lower roller, to apply a light yieldable pressure upon the folded sheet passing between said rollers, the upper of said rollers having a concaved periphery, a hollow bearing, a spindle for a cop of thread rotatably mounted upon said bearing, means rotating said spindle, a folding horn beyond said hollow bearing and a pair of rollers beyond said last named folding horn operative upon the strip to apply a final compaction, and a drawing stress thereto as far as said first named feeding rollers.

In witness whereof I have hereunto affixed my signature this 8th day of December, 1924.

WILLIAM E. COOK.